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Section A – Keynote Speech

Estimating Values for Testing

Dr. Dilshan Silva

Nations Trust Bank PLC



An introduction to Big Data Analytics; Testing an Algorithm vs Conventional Software testing; An Overview on Montecarlo Simulation

Student to Entrepreneur

Lashan Silva

Founder & CEO @Enhancer



Lashan Silva an Award-Winning Startup Founder, graduated from University of Moratuwa in 2014. He was born and brought up in Ratnapura. Exposure he got since he was a child made him to write his very first program in grade 11 and sell it to a customer. Since then his ambitious to start a business of his own.

When he was a second-year undergraduate at University of Moratuwa, the first ever MIT GSL program in Sri Lanka started. He says that the MIT GSL program made him where he is today. Mainly the program helped him a lot to change his track from traditional engineer to an entrepreneur.

With MIT GSL program he with few university friends started one venture and later on at the time of gradation he was pivot into his own thing and founded Enhancer in spite of every obstacle which was thrown at him. Enhancer is on an exciting journey helping customers with world class modern software products. Started with just 1 member and today consisted with vibrant set of skilled members in the team and a rock-solid portfolio of clients.

After founding Enhancer in 2013 November, he started with developing few products under Mid-Sized Business integration solutions and started sell them off. After two years of time with the experienced he and his team got and the based on the customer feedbacks they decided to make a new move which is eZuite platform, today eZuite is the Enhancer's flagship product. For the last three years of eZuite, product being recognized in many times in national level competitions and award ceremonies as well.

He was privileged to participate in events at overseas representing Sri Lanka like Youth Business Summit 2017, at World Bank Head Quarters Washington DC, USA and Commonwealth – China Global Business Summit 2017, Shanghai, China and foreign exhibitions like InnovFest Unbound Singapore, 4YFN Barcelona Spain several times added the experience and exposure to the Global Market.

Section B– Invited Speech

Perceptions of Instructional Video Clips: Effects of the Presence or Absence of a Model in Instructional Video Clips on the Perception of the Model

Mr. Iresh Bandara

SLIIT Academy



This study aims to explore the effects of the presence or absence of a model in instructional video clips on the learners' perception of the model, self-efficacy beliefs and perceived learning.

Section C – Research Papers

Dr.H2O - Potable Water Monitoring and Management System

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Abstract — Currently, many organizations of various complexities use water dispensers to provide drinking water for the employees and other stakeholders who visit their premises. The monitoring and managing of such water dispensers is currently performed with much human interference. Moreover, individuals living in a fast moving world are negligent and not motivated to drink the required level of water recommended by medical practitioners. In order to find solutions for the above problems, a Potable Water Monitoring and Management System is developed. This system uses an Arduino Mega 2560 micro controller together with 2 load cell sensors as the major components to extract the necessary information regarding water level of water cans and employee water bottles. Barcode reader is used to extract employee details from the barcodes embedded in the employee water bottles. According to the facts collected through the literature review, it is found that there are no current systems that detect the water level of water dispensers using load cells. Moreover, there are no efficient methods to track the daily water intake of employees in an organization as well. The purpose of this Potable Water Monitoring and Management System is to provide an easy and efficient methodology to maintain the water dispensers using minimum human interference and to regulate and notify employees about their daily water intake levels. This system also enables the storage and management of details of employees and water can suppliers.

Keywords — Arduino, Water Dispenser, Load Cell, SMS Notification, Barcode Reader

I. INTRODUCTION

Potable water is water that is free from contamination and does not contain a certain amount of saline material[1]. In other words, potable water is water that is considered safe to drink. Water dispensers are widely used in many organizations around the world for the dispensing of potable water. Further, there is an increase in use of such dispensers in residences as well. A water dispenser can be described as a device that is used to dispense water thus enabling easy access to drinking water. A water dispenser may have the ability to perform functions such as filtering water, heating water and cooling water. Some water dispensers provide clean filtered water from replaceable bottles while some dispensers provide water straight from municipal water lines [2]. This system highlights the monitoring and management of water dispensers which have the ability to provide clean and filtered water from replaceable bottles placed in organizations.

Organizations of various complexities use water dispensers in their premises in order to enable the employees, customers and other stakeholders who visit the premises to fulfill their water requirements without a hassle. In order to fulfill this endeavor, there should be an efficient system to monitor the water levels of the replaceable water bottles attached to the dispensers when it reaches the minimum level so that those maybe replaced on time. Further, the managing of the water can stocks with minimum human interference is considered ideal especially for massive organizations.

Moreover, research shows that individuals of the current eras are negligent of drinking the recommended level of water that they require in order to maintain a healthy life. The daily water intake of human depends from person to person based on various factors such as age, gender, and their health conditions. The main objective of this system was to use Arduino technology and weight sensors to detect the water level of water cans by calculating the weight of water. The desktop application for the system will be maintained by the administrator. The Potable Water Monitoring and Management System consist of two main functionalities. The system monitors the weight of the water cans with the aid of load cells placed on the dispenser and sends a notification to the employee who is in charge of water can replacement when the water reaches a certain level. Meanwhile, auto stock updates take place when each water can is replaced. If the stocks reduce below the minimum level, an auto notification is sent to the supplier requesting for stock. The administrator may request for stock manually if required as well. On the other hand, the weight of water taken by the employee to his/her barcode embedded bottle is calculated. All employees who use this system will get a daily notification on how much water they have used per day. This solution is not only limited to massive organizations, but may also be implemented domestically in residences as well. The technology and concepts that have been used would be helpful for those who are hoping to conduct researches related to the same domain in future.

This paper is composed of 06 sections. Section 01 highlighted the Introduction. Section 02 highlights the literature review that was conducted. Section 03 explains the methodology followed in detail. Section 04 discusses the outcome of the developed system. Section 05 highlights the technical issues that had to be confronted during the development of this system. Section 06 is the conclusion.

II. BACKGROUND STUDY

We are living in an era where technology is developing drastically and is being used widely. The use of Arduino microcontrollers and sensors are gaining publicity as well, due to its capabilities. Research papers within the last five years have been deeply analyzed in order to ensure the viability of the development of the Potable Water Monitoring and Management System. Supportive ideas, theories and concepts that were necessary in order to develop this system have been gained by conducting a detailed review of related research papers. The background study includes sensor technology, use of barcode, SMS notifications and the need of water for a healthy living as the key components of study. Several concepts that had been previously implemented were analyzed for this purpose.

Since 2003 there had been 2163 reported cases of death due to dehydration [3]. Dehydration has been a major cause for various ailments such as kidney failures, hyper tension and low blood volume and may even sometime lead to death [4]. Moreover, a human body is composed of approximately 60% of water. An average adult is advised to consume at least 3.7 Liters (male) and 2.7 Liters (females) of water per day [5]. Not everyone is self-motivated to consume the required level. Individuals are negligent of the effects that would befall them due to lack of water intake that result in dehydration. Therefore, adhering to the daily recommended by medical practitioners is considered vital. Employees in an organization are mostly within air conditioned environments which further increases their risk of dehydration. Thus, they should especially be motivated to be hydrated by maintaining their regular water intake levels. This system has been developed by considering the need to develop a system to monitor and manage the water dispensers together with the urge to motivate employees of an organization to drink the recommended level of water as advised by medical practitioners in order to stay healthy and prevent various diseases.

Mittal in his research explains how an ultra-sonic sensor is used to detect the water level of a water tank by the use of waves. Liquid Crystal Display (LCD) display shows the water level and the status of the motor. As a result the research had revealed that this system aids in reducing water wastage and maximizes water usage. Further, power is saved thus saving money. It is an automatic process, so there is minimum human interference required [6].

Raveena, Deepa suggests the use of a load cell in order to measure the exact level of fuel in the fuel tank of a vehicle. A load cell is placed under the vehicle fuel tank and the weight is measured and taken as the fuel level. The fuel level is displayed each and every second by the Arduino Uno board on its display unit separately. A message will be sent to the user by GSM modem with regard to the fuel levels. Users will always be informed because of the instant message notifications sent. SMS text messages is always dependent on the available credit balance, in case the available balance is insufficient, the mobile phone user will not get the notification instantly [7].

Suheti, Sunandar explains a case control study which was based on people who suffer from hypertension and who do not suffer from hypertension in the village of Bandung, Indonesia. Samples of data such as water intake levels, habit of exercise was taken from 156 individuals (78 case, 78 control) between the age groups of 30-59. Univariate, Bivariate and multivariate analysis was conducted in order to find the relationship between amount of water consumed and hypertension. As a result, this research revealed that consuming water regularly has contributed in the prevention of hyper tension. The results of the experiment acts as an evidence, to motivate individuals to consume the required level of water regularly [8].

Oakley, Baird discusses about a study conducted to analyze how much water was drunk by patients from a wellness clinic in Ontario, Canada. As a result of the study, the patients got to know why it is important to adhere to the theoretical daily rules of drinking eight 8-Ounce glasses of water [9]. Lawrence et al explains the need of drinking water daily and shows how low water intake affects a persons' mood [10].

Sudha et al explains the use of barcodes to mark the attendance of students in a school. This system helps to identify each student individually and is considered as an efficient system compared to the manual process of marking attendance [11].

Anandhakrishnan et al. highlights the development of a smart gas monitoring system using Internet of Things (IOT). This system covers various issues that a user could face while using a gas cooker. This system enables the sending of immediate notifications to the user through an android app when a leakage occurs. Whenever gas level drops below threshold level, it is detected and the gas agency is notified to replace a gas cylinder. It is an automated process and requires minimal human assistance. [12]. Vinoj, Gavaskar explains about a system that uses load cell system was to detect the level of water in the dispenser. The main objective of the system was to detect water level of water dispensers and also encourage employees in an organization to drink the minimum required water levels. In order to accomplish this, the pivotal task of the sensors to detect the weight of an animal that steps onto the weight detector belt laid around the fence covering a breadth of

5 feet. A current is passed to the animal depending on the weight of the animal to prevent them from entering residential areas [13].

III. METHODOLOGY

The “Potable Water monitoring and Management System” was developed using the prototype methodology. The steps followed in the development process are highlighted in the sections below. This methodology was chosen in order to identify defects and missing functionalities earlier and enhance the functionalities that needs improvement in order to ensure the quality of the end product

A. Planning

In this phase, the topic of the research was analyzed and the objectives and the research problem were discussed. The background research regarding the project and its scope was conducted. An estimated budget was prepared by considering the requirements that were at that time. A feasibility study was also conducted in order to check whether the resources required are feasible to be achieved within the time frame of the project. A detailed analysis of the technical, ethical and economic issues was discussed.

B. Requirement Gathering and Analysis

The primary purpose of the research was to find out the availability and maintenance of water dispensers at various organizations. In order to be clear about the requirements a data gathering and analyzing process had to be conducted. Primary data that was required in order to develop the system was gathered and analyzed as per requirements. Gathering accurate data was vital before the development of the system begins. In order to fulfill this, information regarding the daily water intake of employees was sought. The population for our research was the general public who are /was employed in an organization. The research was conducted based on random sampling. A questionnaire was prepared in the form of a Google form and was distributed among prospective individuals.

The research that was conducted gathered information such as age group and gender of employees, the number of employees working in the respective organization, the number of bottles of water consumed daily from all respondents who answered the questionnaire. Specific questions were asked from the respondents depending on whether or not they had water dispensers in their organization. As a result, it was concluded that the majority of the respondents felt dehydrated while at work and that they would like to have a system to monitor their daily water intake level while at work. Therefore, a system to monitor their daily water intake level was considered ideal. Moreover, the respondents who said that they had water dispensers at their organization have included that there were situations when the water dispenser was empty when

they went to get water. It was also highlighted that there were no specific employees to maintain the water dispenser at their organization

The data gathered by the research team was supportive to the system that was to be developed. Further, secondary data was gathered by conducting a detailed literature review in order to support the initiative.

C. Design

Interfaces were designed in a simple and user friendly manner for the desktop application. The High Level Architecture Diagram was sketched in order to provide an idea about the functionalities of the system.

According to this diagram, the value of the weight of the water can when it reaches the minimum level (set by the administrator) is sent to the administrators’ system. Then the system sends an auto notification to the laborer in charge to replace the water can of that particular dispenser. Meanwhile, when the new water can is installed on to the dispenser, the weight is detected and water can stocks are instantly updated (reduced). Depending on the available quantity of water cans after updating, a purchase order is sent to the supplier via an email. On the other hand, whenever an employee uses his/her water bottle that has an already embedded barcode, he /she have to scan it using the barcode reader before they take water from the dispenser. The employee details can be retrieved by using the barcode. This information is stored in the system. At the end of the day a SMS notification is sent to the employee indicating the amount of water that he/she has dispensed from the water dispenser. Since this project primarily focuses on one dispenser Ethernet cables will be used to connect the PC to the Arduino board. Fig. 1. shows the High Level Architecture diagram of the system.

The Hardware Circuit Diagram was sketched in order to show the working components of the internal circuit. Two load cell sensors are connected to the Arduino Mega2560 through two HX711 Amplifier modules. The HX711 module is used to read the changes in resistance of the load cell. Jumper wires are used to connect the HX711 module to the Arduino board. The power is supplied to one load cell through the 5V pin and the other load cell through the 3.5V pin of the Arduino MEGA2560.

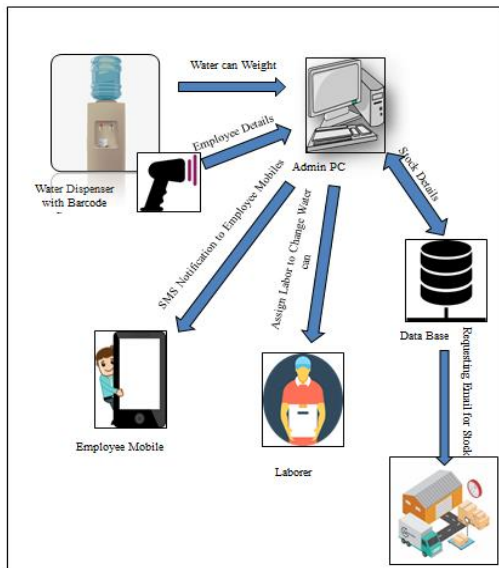


Fig. 1. High Level Architecture Diagram

Fig. 2. shows the illustration of the Hardware Circuit Diagram.

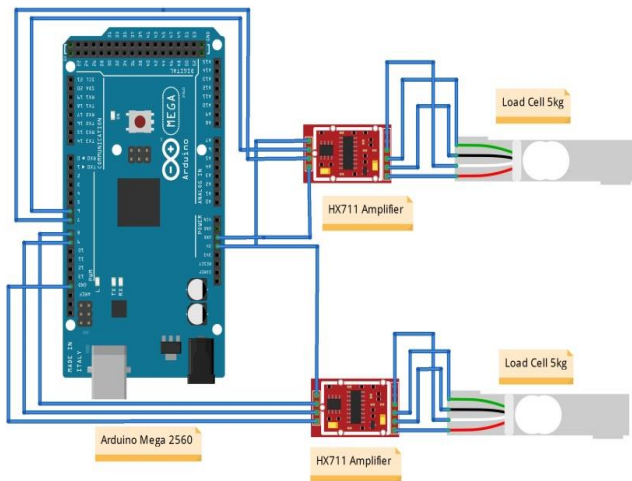


Fig. 2. Hardware Circuit Diagram

D. Implementation

Implementation can be considered as a vital stage of the software development lifecycle (SDLC) of the Potable Water Monitoring and Management System. Implementation was divided into two as hardware implementation and software implementation.

The major part of the system is based on the hardware circuits and the results derived from the hardware circuits. The functionalities that fall under the hardware implementation are detecting the water can values and calculating the daily employee water intake values. The hardware section of the system was developed using the Arduino Mega2560 microcontroller. In order to program this microcontroller,

Arduino IDE was used. Further, two load cell sensors (having the capability to weigh up to 5kg), 2 HX711 Amplifier modules and necessary jumper wires were used. The programming language used for the Arduino IDE is C++ and C language

The second part of the system focuses on the software implementation. Java was used as the programming language and NetBeans 8.2 was the IDE used for development. The database used was MySQL database connected through the XAMPP server. Employee management and Supplier management are the modules that were solely based on software while the results derived from the hardware implementation had to be integrated with the java application and the database.

E. Testing

The Potable Water Monitoring and Management System was tested in several stages. Each individual function was unit tested initially. Following the unit tests, integration testing was conducted. Finally the entire system had to undergo system testing. The required test cases were designed in order to obtain the maximum coverage. Since this system has hardware and software components, the crucial phase was when conducting the integration testing by combining the hardware and the desktop application. The tests were conducted in a way that the reliability and accuracy of the system was given high importance.

IV. RESULTS

This section highlights the final outcome of the system that was developed. The outcome of the software components are demonstrated through the interfaces and the functioning of the hardware system is depicted through a flowchart.

Fig. 3. shows the working model of the system that was developed.



Fig. 3. Prototype of the System

Fig. 4. shows the logic of the internal process that takes place in order to detect the water level of the water cans and the employee water bottles.

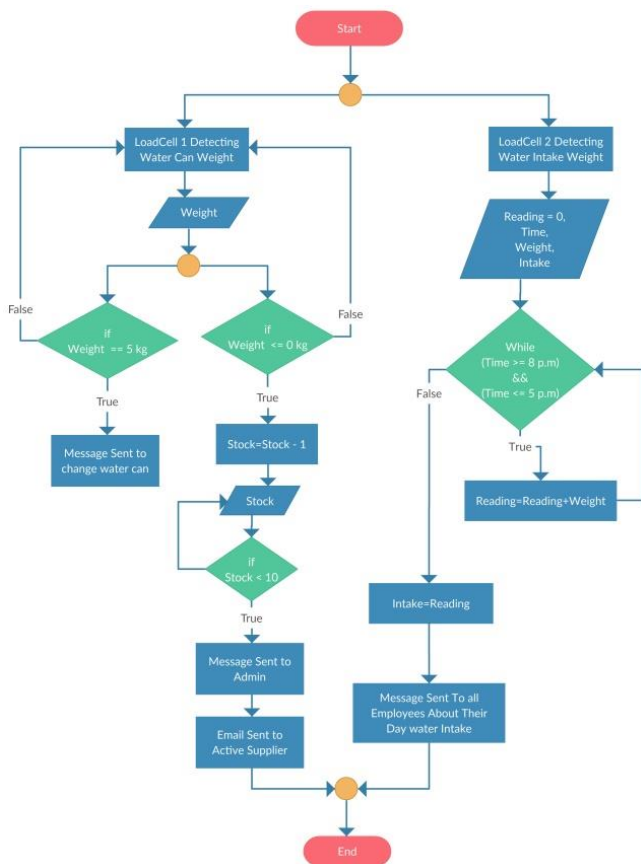


Fig. 4. Flow chart

Fig. 5. shows the main interface of the Desktop application through which the administrator can navigate to the separate sections.



Fig. 5. Home Interface

Fig. 6. shows the login interface that is required to view and modify the employee details.

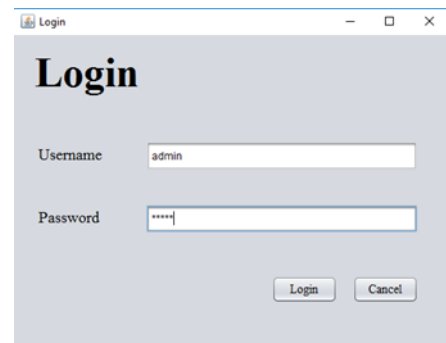


Fig. 6. Login Interface

Fig. 7. shows the interface used to add and modify the employee details. At the end of adding an employee, a barcode is printed. This barcode will be pasted on the employee water bottles. Fig. 8. shows the generated barcode.

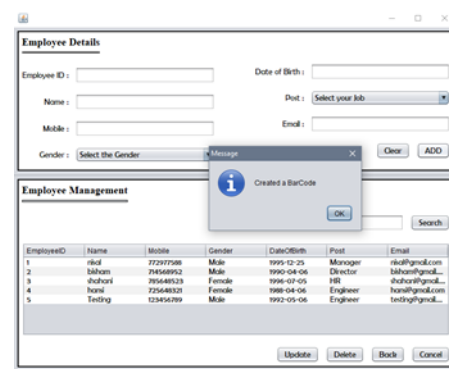


Fig. 7. Employee Interface



Fig. 8. Generated Barcode

Fig. 9. shows the interface that is used to display and modify the details of all the dispensers that are installed in an organization.

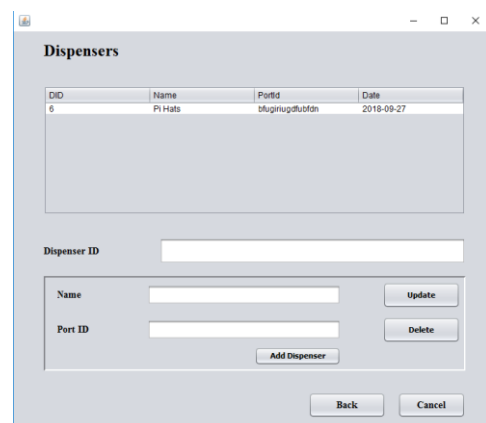


Fig. 9. Dispenser Interface

Fig. 10. shows the interface that the administrator can use to set the default recommended water intake levels for employees based on Gender.

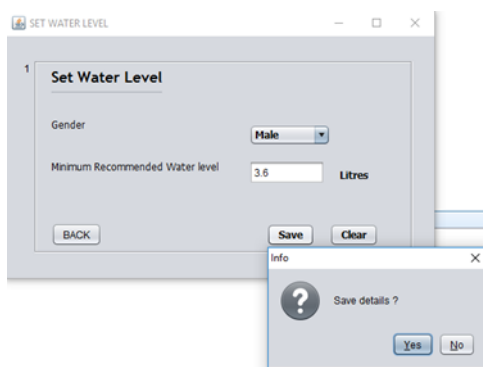


Fig. 10. Dispenser Interface

Each employee has a water bottle with a unique barcode embedded on it. Before an employee dispenses water to his/her bottle, that employee has to scan the barcode using the barcode reader placed next to the dispenser. The employee's identity will be detected and details will be displayed .Next, a message indicating the employee to place the bottle on the dispenser stand will be displayed as illustrated in Fig. 11.

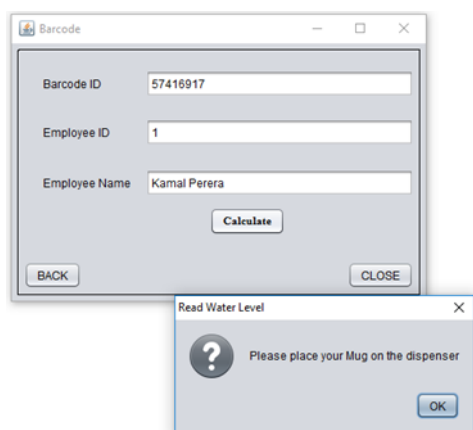


Fig. 11. Read Barcode

Fig. 12. shows the interface that is used to view the water intake of each employee

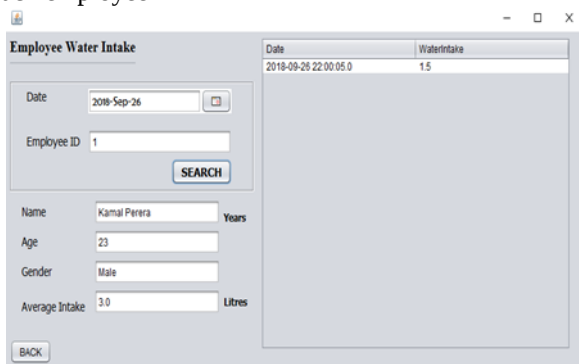


Fig. 12. View Employee Water Intake

Fig. 13. is the image of a SMS sent to the labourer indicating the labourer to change the water can when it has reached its minimum value

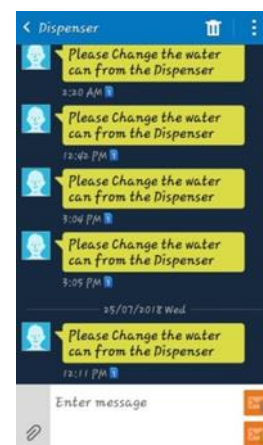


Fig. 13. SMS to Laborer

Fig. 14. is the image of an SMS sent to the employee indicating the employees water intake for the specific day

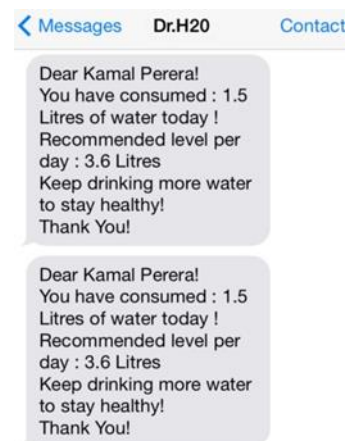


Fig. 14. SMS to Employee

Fig. 15. shows the main interface that is used to handle supplier details.

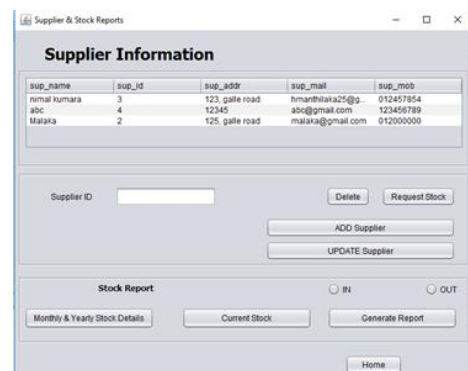


Fig. 15. Supplier Details

Fig. 16. depicts the interface that is used to generate reports for stocks

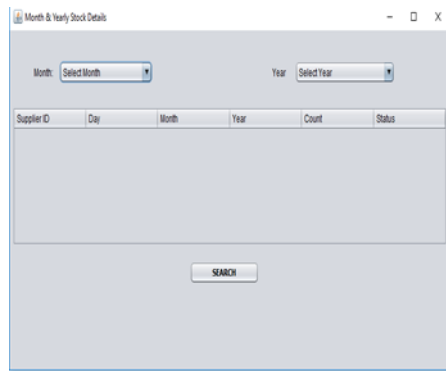


Fig. 16. Generate Reports

V. .DISCUSSION

Initially, the Potable Water Monitoring and Management System” was to use a load cell sensor of 30kg to measure the weight of the water can. This decision was taken with the intention of developing a system for a regular water dispenser that is capable of having 20 Liter water cans. Subsequently, the research team decided to develop the system for a mini water dispenser which is capable of having 2.5Litre water cans. Thus, a 5kg load cell sensor was used for this as well. This decision was taken in order to make portability more feasible. The weight of water was calculated using kilograms (kg). The research team has considered 1000grams (1kg) as equivalent to 1000ml (1Litre).Thus, the calculations have been performed accordingly

Since this system is mainly based on hardware components, several technical issues had to be faced during the setting up of the circuit. Calibrating the load cell sensors according to the necessity was a challenge. Since two load cell sensors were used, the research team had to make sure that the calibrations of both load cells were accurate. When the position of the load cell changes, the calibration factor also tends to change at certain circumstances. Therefore, the load cell had to be placed in a fixed position prior to calibrating it. In order to get the calibration factor, different objects of known weights were placed on the load cells. This system measures weight in kilograms, thus appropriate conversions had to be done until expected accuracy level was achieved. An accuracy level of 90% and a reliability of 80% were achieved. When transferring data from the Arduino IDE to the NetBeans IDE several issues were faced. This system uses the serial port to transfer data, therefore necessary libraries had to be used. There were few instances when the USB cable and other components that were used malfunctioned. Since hardware components tend to cause unpredictable changes, the components had to be carefully handled with much caution

The research team was able to successfully achieve all the objectives of the research within the stipulated period of time.

Several limitations were identified during the course of the research.

1. The power supply for the Arduino Mega2560 is supplied from the laptop through the USB cable. Thus the laptop has to have continuous power supply at all times. A backup solution would be to have a Lithium ion battery of 12V v 8000mah.
2. A reliable Internet connection is essential for the sending of email notifications. Therefore, an internet connection with an unlimited data plan must be activated for the system to function efficiently.
3. The transfer of data from the Arduino board to the java application takes place through the USB cable. Data transfer can be enabled through Wi-Fi by using a Wi- Fi module so that it can be used for larger organizations with multiple dispensers.

VI. CONCLUSION

The Potable Water Monitoring and Management System benefits the society as a whole in many ways. This system acts as a pioneer solution to monitor and manage water dispensers at organizations and to monitor the employees’ daily water intake. The targeted audience of this system was the employees of organizations. In an era where many organizations of various complexities are rising in number, the amount of water dispensers used will also be increasing. The purpose of developing this system was to provide an easy and efficient mechanism to monitor and manage water dispensers. Further, this system also motivates the employees of an organization to drink their recommended levels of water daily and prevent themselves from getting dehydrated.

Moreover, this system could also be implemented in hospitals, schools and any other place as needed. Although the project mainly focuses on organizations, this system can be implemented domestically as well. Thus, providing an easy and feasible solution for the users who are in need of such a helped us whenever we needed their support. Finally, we would like to extend our sincere thanks to all those who helped us in numerous ways although their names have not been mentioned.

The research team believes that the “Potable Water Monitoring and Management System” can be further enhanced by adding more features to it for the benefit of the majority. This area of research can be further extended by the following value additions.

1. Identification of the employee can be more precisely done using face recognition or by detecting the employee finger print. These methods can be considered more reliable than using the barcode based employee recognition system.

2. An interactive mobile application can be developed and employees can be notified about their daily water intake levels through this app. Further, motivational messages can be sent to the employees in order to make them drink more water.

3. Wi-Fi can be used to transfer data from the Arduino to the NetBeans IDE so that many dispensers can be controlled at once in large organizations.

4. Stocks can be updated instantly when the water can is replaced from the dispenser.

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The Research team of the "Potable Water Monitoring and Management System" would like to extend our sincere gratitude to our academic institution Sri Lanka Institute of Information Technology (SLIIT) for the valuable opportunity provided. We are also thankful to Dr. Yasas Jayaweera for his constructive advices and recommendations during the course of the project. We would also like to thank our family and friends who always.

REFERENCES

- [1] "potable water", TheFreeDictionary.com, 2018. [Online]. Available: <https://medical-dictionary.thefreedictionary.com/potable+water>. Accessed: 07- Mar- 2018].
- [2] "Water Dispenser Basics -How Do They Work? | NewAir", NewAir.comKnowledgeBase,018.[Online].Available: <http://www.newair.com/kb/water-dispenser-basics/>. [Accessed: 09-Mar-2018].
- [3] K. Rawlinson, "Dehydration and malnutrition led to 2,162 deaths in caresince2003", theGuardian,2018.[Online].Available: <https://www.theguardian.com/society/2013/dec/02/dehydration-malnutrition-care-homes-hospitals>. [Accessed: 09- Mar- 2018].
- [4] P. Charles Patrick Davis, "Dehydration: Symptoms, Signs, Headache, Treatment, Effects", eMedicineHealth, 2018. [Online]. Available: https://www.emedicinehealth.com/dehydration_in_adults/article_em.htm. [Accessed: 09- Mar- 2018].
- [5] "How Much Water Should I Drink?", Healthline, 2018. [Online]. Available: <https://www.healthline.com/health/how-much-water-should-i-drink#recommendations>. [Accessed: 06- Mar- 2018].
- [6] Vardaan Mittal," Automatic Water Level Controller", International Journal of Science and Research(IJSR),Vol.6, pp.136-138,May 2017
- [7] Raveena, Deepa," FUEL MEASUREMENT USING LOADCELL", International Research Journal of Engineering and Technology (IRJET),Vol.04,pp.941-943,October 2017
- [8] T. Suheti and K. Sunandar, "Habits Drinking Ordinary Water Can Prevent Hypertension", Open Journal of Nursing, vol. 06, no. 05, pp. 404-411,May 2016
- [9] Paul A. Oakley, Melissa L. Baird Do Patients Drink Enough Water? Actual Pure Water Intake Compared to the Theoretical Daily Rules of Drinking Eight 8-Ounce Glasses and Drinking Half Your Body Weight in Ounces, Journal of Water Resource and Protection 7, 883-887
- [10] Lawrence E. Armstrong, Matthew S. Ganio, Douglas J. Casa, Elaine C. Lee, Brendon P. McDermott, Jennifer F. Klau, Liliana Jimenez, Laurent Le, Bellego, Emmanuel Chevillotte, & Harris R. Lieberman (2011). Mild Dehydration Affects Mood in Healthy Young Women. merican Society for Nutrition 10.3945/jn.111.142000.
- [11] K.Lakshmi Sudha, Shirish Shinde, Titus Thomas, Aris Abdugani," Barcode based Student Attendance
- [12] S. Anandhakrishnan, D. Nair, K. Rakesh, K. Sampath and G. S Nair, "IOT Based Smart Gas Monitoring System", IOSR Journal of Electrical and Electronics Engineering, vol. 03, pp. 82-87, 2017.
- [13] J. Vinoy and S. Gavaskar, "A Novel Technique to Protect Human from Wild Animal with Arduino and LoadCell", International Journal of Scientific Research in Computer Science, Engineering and Information Technology, vol. 02, no. 05, pp. 1023-1026, 2017.

Elder Health Care Application

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Abstract— Advancement of the field of medical science, public health and technology had led to increase the life expectancy of people globally in past few decades. In future world aging population will increase from a considerable amount. So, caring of them will be a major issue. People may have to pay considerable amount for wellbeing of them. Also, with the current economic situation people will not be able to pay much attention on elder care, because of that the need of better elder care solution is essential. In order to provide a better elder care service, it is essential to develop user friendly, economical, and reliable elder care solution. When providing better eldercare service, both elder caring and health caring should be linked. The proposed system is designed to help daily routings of elders and also collect parameters like blood pressure and heart rate through a wrist band. Developed system will be able give real time updates to guardian or physician.

Keywords— Elder care, Elder health care, elder health care monitoring, Bluetooth, Wrist band, Public health

I. INTRODUCTION

Elder Health care is an essential service every nook and corner of the world. Each and every person will become elder. Caring of them is essential because many of them are facing many difficulties. Some elders may suffer from functional difficulties. Some elders are having multiple chronic conditions. Developed elder health care system will consist hardware device and a software component. This system is capable of gathering health parameters through a wearable device. Wearable device will detect parameters such as blood pressure and heart rate. Wearable wrist band is connected with the software component through (BLE) Bluetooth Low Energy at the elder's end. All the parameters can be checked at the care takers end.

Most of the researches carried out in the Elder health care applications mainly focused on collecting health parameters through wearable devices sending the physicians. There are no systems to support Elders in their daily routines such as Doctor meetings, Meals, Prescription and Special schedules.

Objectives of this research project are,

To take care of elders when caretakers having a busy life, to check elder person had his/her medicine on time, To Remind daily routines and

To check elder person's health parameters when caretaker in remote area.

II. LITERATURE REVIEW

A. Current Elder health care applications

Most of the elder health care systems focus only on gathering health parameters, storing them in a remote server and sending the to a care taker. Care taker may be an institution or a physician. System designed by Kai Guan, Minggang Shoa and Shuical consist of wearable ECG detector and which is connected to a home gate way, through the home gate way it is connected to the television and the server [1]. Physicians were

able to contact when needed through the application. Since application support on detecting parameters application does not support elder's daily routines and this application can detect only one parameter. Because that system can detect few health parameters.

Remote health monitoring system which is implemented by Evans able to masseur heart rate and blood pressure [2]. This is a high cost product. This system used Wi-Fi to connect to mobile application. Wi-Fi consumes more electrical power than the Bluetooth Low Energy (BLE)

When conducting the literature review in this aspect research team has found that most of the current systems are developed using power consumption methods. Also systems are considering about detecting health parameters and sending them stakeholders only. Tasks like notifying about daily routines are ignored by the current systems.

B. Mobile devices that can detect health parameters

Wearable devices are currently at the heart of just about every discussion related to the Internet of Things. The requirement for self-health monitoring and preventive medicine is increasing due to the projected dramatic increase in the number of elderly people until 2020. Developed technologies are truly able to reduce the overall costs for prevention and monitoring. This is possible by constantly monitoring health indicators in various areas, and in particular, wearable devices are considered to carry this task out. These wearable devices and mobile apps now have been integrated with telemedicine and telehealth efficiently, to structure the medical Internet of Things. Studies show that a well-informed patient improves quality of life and patient outcome because they are more likely to participate in healthy behavioural changes.

Although these devices have been shown to be accurate and have clinical utility, they continue to be underutilized in the healthcare industry. Incorporating smart wearable sensors into

routine care of patients could augment physician-patient relationships, increase the autonomy and involvement of patients in regards to their healthcare and will provide for novel remote monitoring techniques which will revolutionize healthcare management and spending.

C. Ways of Connecting IoT with mobile devices

Wireless Connecting technologies are considered one of the key research areas in computer science and the healthcare application industries for improving the quality of life. The purpose of this field is to provide a snapshot of current developments and future direction of research on wearable and implantable body area network systems for continuous monitoring of patients. The important role of body sensor networks and connecting devices each other in medicine to minimize the need for caregivers and help the chronically ill and elderly people live an independent life, besides providing people with quality care. The paper provides several examples of state of the art technology together with the design considerations like unobtrusiveness, scalability, energy efficiency, security and also provides a comprehensive analysis of the various benefits and drawbacks of these systems. Although offering significant benefits, the field of wearable and Implantable body sensor networks still faces major challenges and open research problems which are investigated and covered, along with some proposed solutions.

D. Current household medical devices and systems

Assuring the safety and safe use of medical devices in the home is becoming an increasingly important public health issue. The aging of the U.S. population and shifts toward shorter hospital stays continue to make home healthcare more common. With these trends, a significant number of medical devices, including Patient worn medical device, Wearable medical treatment device and Wearable heart rate monitor are now being used in the home.

However, the use of medical devices in the home also presents unique challenges and potential safety risks. Home medical care is often provided by lay caregivers, who may not have received proper training in the operation of the medical devices on which their loved ones rely. Moreover, many medical devices that are currently used in the home were not designed for use by lay caregivers or outside of a controlled clinical environment. As medical devices have become more compact and portable, it has become possible to conduct a variety of medical treatments in the home. Home healthcare devices can provide significant benefits to care patients. Such as Quality-of-Life Improvements, Cost Savings.

III. METHODOLOGY

Methodology is a formalized approach to develop software using software development life cycle. Software development

life cycle provides an engineering approach to developing the software. Software Engineering life cycle is a framework used to structure, plan, Analyse, Design, Implementing and testing, implementation of the software. To develop the system "Elder Health care application" Prototype method is used. The method that used is suitable when a prototype of the system is to developed. Also the research teams have to study Arduino boards, Android applications.

A. Planning

A research has been carried out to study about the importance of using an application to monitor health parameters of elders. Population for the gathering is employed people because application is developed to monitor health parameters of elders remotely by care givers. Questionnaire was issued to the sample size of 30. People based on random sampling technique. Questionnaire was prepared and distributed to sample as Google form. Provision of care to patients with chronic diseases at their homes remains a great challenge for modern health care systems. Smartphone applications are indicated as one of the strategies that could improve care delivery to this group of elders. The aim of this study is to investigate the feasibility and usability of application with a messaging service used by a primary care team attending long-term elders mainly at their homes.

B. Analysis and requirement gathering

Many medical applications for smartphones and Wristbands have been developed and widely used by health professionals and patients. The use of smartphones and Wristbands is getting more attention in healthcare day by day. Medical applications make it useful tools in the practice of evidence-based medicine at the point of care, in addition to their use in mobile clinical communication. Also, this can play a very important role in patient's education, disease self-management, and remote monitoring of patients.

C. Design

Designing is the process of planning the software solution. Design should contain the project scope, and infrastructure detail the solution is presented in a graphical way. Operation of the software, hardware design, and Network design should be completed before starting the project.

Architecture diagram (Figure 1) consists of software component. Hardware component will detect parameters and pass the data to the android application which is in the elder's end. Hardware component will be able to detect body temperature, Heart rate and blood pressure. Application will pass the data to the server at fixed time. In case of emergency application will pass the data immediately to the server. Notification will be sent to the care giver also.

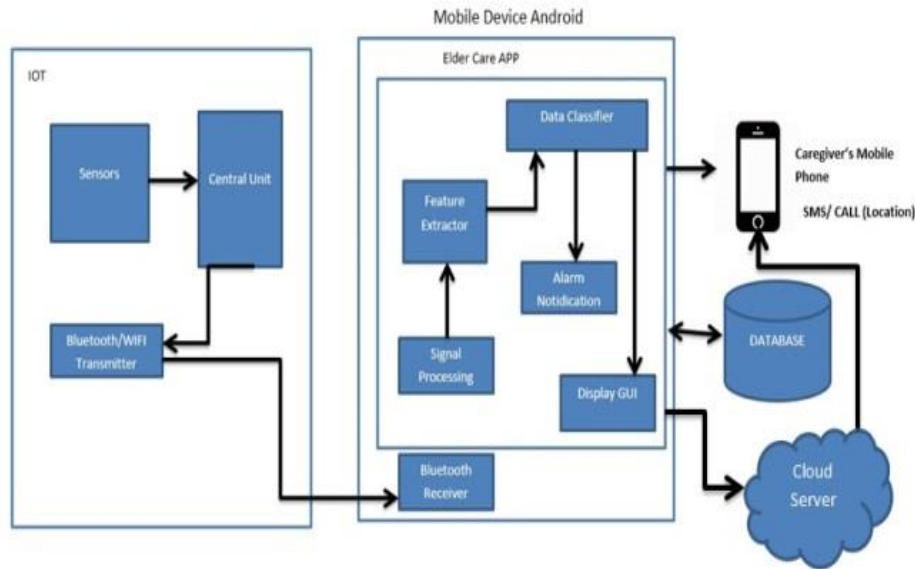


Figure 1 High-Level Architecture Diagram

Figure 2 shows software component and Hardware component consist of three sensors Heartbeat, Temperature, Pressure Sensors. This will detect parameters and pass the data to the android application which is in the elder's end. Hardware component detect body temperature,

Atmospheric Arduino) and Temperature Sensor (Digital Thermal Sensor Module Temperature Sensor Module for Arduino 3.3V-5V). All the modules will connect to the Arduino Nano Board (Arduino Mini USB Nano V3.0 ATmega328 16M 5V Micro-controller CH340G). Elder's end of the application is connected with hardware component (wristband) via Bluetooth (Wireless Serial 4 Pin Bluetooth RF Transceiver Module HC-06 RS232).

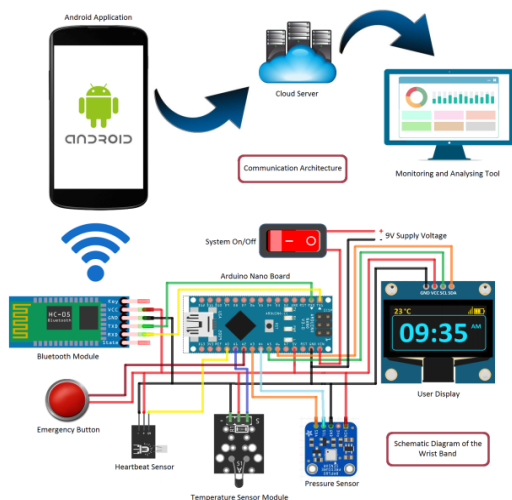


Figure 2 Circuit Diagram

Figure 3 shows a design of the wrist band. This includes a OLED display (0.96" I2C IIC Serial 128X64 128*64 Blue OLED LCD LED Display Module) to view the three parameters. Three sensors will detect the heart rate (Pulse Sensor Pulse Rate Heartbeat Detector), pressure sensor (BMP280 Pressure Sensor Module High Precision

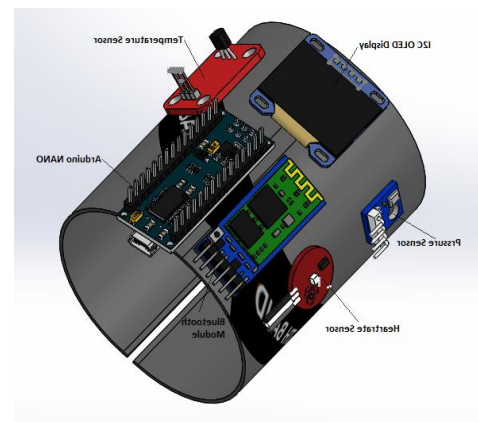


Figure 3 Hardware Model

D. Implementation

In the project implementation stage Designed project should be developed according to the diagrams that have drawn in the designing process. Implementation process consists of;

Implementing the android software, implementing the Wearable device, implementing the software for wearable device,

Using languages such as Android for mobile application, java for the desktop application, arduino for the device (Health care Band) and MySQL for the Cloud server.

When implementing the android software, it should be done for both elder's end and the care takers end. When implanting the wearable device research team should ensure to implement methods to track the status of the device such as is it connected to the android application or not.

E. Testing

Testing should be done according to the predefined test cases. Each and every test case should be passes before the system is delivered. Main two testing methods that research team use are;

Unit testing, Integration testing, System Testing, Usability Testing

III. RESULTS AND DISCUSSION

A. Results

Figure 4 Login Interface with inputs

Figure 4 shows the screenshot of login interface of Elder Health Care Android application. This login interface is common to both Caregiver and Elder. Once corresponding user login to the application by giving logging details, these details will be send to cloud server for validation. If the login is valid then user will be navigated to the next interface.

Figure 5 End-User Selection

Figure 5 shows the screenshot of Register Page. This will allow the user to create an account. User has to select the user type as Elder or Caregiver.

Figure 6 Register as an Elder

Figure 6 shows the screenshot of Elder Register Page. This will allow the Elder to create an account. Selecting the gender is enabled on if the user type is selected as "Elder". Once the account is created the details are stored in the users table. A successfully registered elder can use the username and password to login to the application next time.

Figure 7 Register as a Caregiver

Figure 7 shows the screenshot of Caregiver Register Page. Which will allow the Caregiver to create an account. Once the account is created the details are stored in the users table. A successfully registered Caregiver can use the username and password to login to the application next time.

Figure 8 Add Elder

Figure 8 shows the screenshot of Add Elder interface. Elder will be able to Input elder details at the Elders end. By providing Elders Name and the Date of Birth.

Figure 9 Search Caregiver

Figure 9 shows the screenshot of Add Caregiver interface. This will Search all the users who logged as caregivers and will allow the elder to update the Caregiver details by adding one or more caregivers to the list. Elder should enter at least 2 characters to search the caregiver.

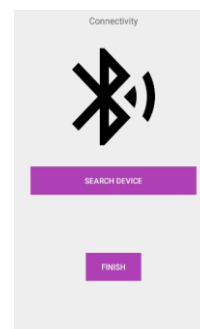


Figure 10 connectivity interface

Figure 10 shows the screenshot of Connectivity interface. Which shows the connecting with the wristband. Elder's end of the application is connected with hardware component (wristband) via Bluetooth.

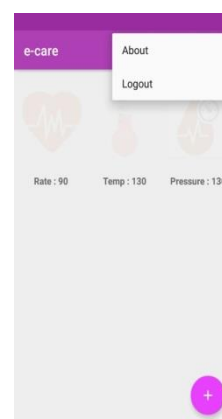


Figure 11 Option Menu

Figure 8 shows screen shot of Home page interface of Elder Health Care Application. This interface will display an option menu which allows the user logout from the system.

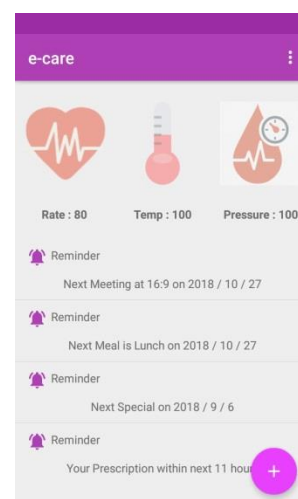


Figure 12 Image Animation and Reminders

Figure 12 shows screen shot of Home page interface of Elder Health Care Application. This interface will display the current

parameter (Heart Rate, Temperature, Pressure) value with a image Animation which detect from the wristband and all the Reminders related to schedules. By Select the Floating Action Button user will be able to see four fragments. Which consist Meeting, Meal, Special and Prescription Schedules.

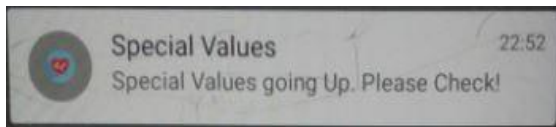


Figure 4 Alarm Notification

Table 1 Critical Levels

Parameter	Low Level	High Level
Body Temperature	Less than 120	Higher than 180
Heart Rate	60 bpm	100 bpm
Blood Pressure	120 mm	180 mm

Figure 13 shows screen shot of Alarm Notification. If the detected parameter value crossed the high and low level threshold values shows in Table 1. The User (Elder or Caregiver) will receive notification.

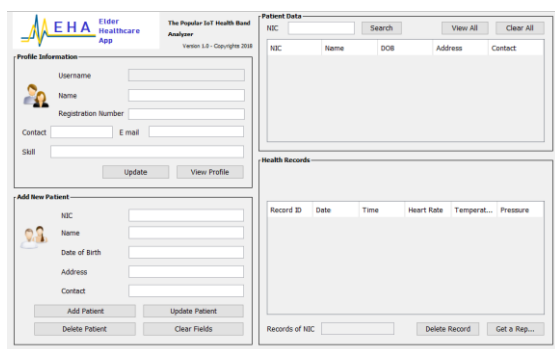


Figure 14 Elder Healthcare Desktop App

Figure 14 shows Elder health care app analyser is the desktop app for analyse health parameters of registered users. This desktop app can register users (elders/care-takers), check data through cloud server and filter data by date. This Desktop app will be more helpful for doctors and their elderly patients.

When we evaluate our research project we came up with few things that we could not get a successful result.

B. Evaluation

We have planned to get an accurate result from sensors but we could not. Because arose some technical issues in sensors.

Therefore, we got a 70% of success but we expected.

C. Discussion

Our final product we have expected to get a most accurate result from the sensors. But sensors have given a less accurate result more than we expected.

Mobile app and heath band should be always connected to each other for functioning correctly.it will be difficult and power consuming situation.

In order to get rid of this problem we thought include GSM module to heath band. But it did not show up. So far we achieved 70% of our product success.x 4

Some of main problems we faced described below.

- how to notify the care giver when the care giver is not connected to the internet.
- to solve above problem used an acknowledgement system verify whether the notification is received. If not uses GSM to communicate with the care giver.
- placing the modules in the wrist band.
- to solve above problem First we draw a sketch figure for the wrist band and design it in the most suitable way.

IV. .CONCLUSION

Many medical applications for smartphones and Wristbands have been developed and widely used by health professionals and patients. The use of smartphones and Wristbands is getting more attention in healthcare day by day. Medical applications make it useful tools in the practice of evidence-based medicine at the point of care, in addition to their use in mobile clinical communication. Also, this can play a very important role in patient's education, disease self-management, and remote monitoring of patients.

V. FUTURE WORK

In future we are planning to measure more than three parameters and trying to get 100% accurate values. Adding up more functions for Mobile app that useful for elder and care-taker both ends. Put a battery with more battery life. Increase a range of wireless connectivity.

Trying to decrease the size of wrist-band and make it more comfortable to user.

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We would also thankful for anonymous reviewers from community, although any errors are our own and should not tarnish the reputations of these esteemed persons.

REFERENCES

- [1] Thomas, V.S.; Darvesh, S.; MacKnight, C.; Rockwood, K. Estimating the prevalence of dementia in elderly People: A comparison of the Canadian Study of Health and Aging and National Population Health Survey Approaches. *Int. Psychogeriatr.* 2001, 13, 169–175. [CrossRef] [PubMed]
- [2] Kalache, A.; Gatti, A. Active ageing: A policy framework. *Adv. Gerontol. Uspekhi Gerontol. Akad. Nauk. Gerontol. Obs.* 2002, 11, 7–18.
- [3] World Health Organization (WHO). Are You ready? What You Need to Know about Ageing. Available online: <http://www.who.int/world-health-day/2012/toolkit/background/en/> (accessed on 18th February 2018).
- [4] Kulik, C.T.; Ryan, S.; Harper, S.; George, G. Aging Populations and Management. *Acad. Manag. J.* 2014, 57, 929–935. [CrossRef]
- [5] Zahran Sikkanther Lebbe, Sri Lanka's ageing population poses socio-economic challenges, [online] <http://www.lankabusinessonline.com/sri-lankas-ageing-opulation-poses-socio-economic-challenges/>
- [6] Atzori, L.; Iera, A.; Morabito, G. The internet of things: A survey. *Comput. Netw.* 2010, 54, 2787–2805. [CrossRef]
- [7] International Telecommunication Union (ITU). ITU Internet Reports 2005: The Internet of Things. Available online: <https://www.itu.int/pub/S-POL-IR.IT-2005/e> (accessed on 18th February 2018).
- [8] Bassi, A.; Horn, G. Internet of Things in 2020: A Roadmap for the Future. *Eur. Commun. Inf. Soc. Media* 2008, 22, 97–114.
- [9] Kai Guan, Minggang Shoa and Shuical Wu "A Remote Health Monitoring System for the Elderly Based on Smart Home Gateway", 24-10-2017 [online]. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5674728>. [Accessed: 16-02-2018]
- [10] Evans J, Papadopoulos A, Silvers CT, Charness N, Boot WR, Schlachta-Fairchild L, Crump C, Martinez M4, Ent CB4, "Remote Health Monitoring for Older Adults and Those with Heart Failure" [online] <https://www.ncbi.nlm.nih.gov/pubmed/26540369> [Accessed 16-02-2018]
- [11] Mohammad Ghamari, Balazs Janko, R. Simon Sherratt, William Harwin, Robert Piechockic and Cinna Soltanpur "A Survey on Wireless Body Area Networks for Healthcare Systems in Residential Environments", 12-06-2016 [online]. <http://www.mdpi.com/1424-8220/16/6/831>. [Accessed: 16-02-2018]
- [12] Kai Guan, Minggang Shoa and Shuical Wu "A Remote Health Monitoring System for the Elderly Based on Smart Home Gateway", 24-10-2017 [online]. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5674728>. [Accessed: 16-02-2018]
- [13] Marshal Linder. "A Patient Data Management System for Philips Pinnacle-3 TPS," vol. 40, pp. 40-45, Jan. 2004
- [14] Leelarathna L, English SW, Thabit H, Caldwell K, Allen JM, Kumareswaran K, Wilinska ME, Nodale M, Haidar A, Evans ML, Burnstein R, Hovorka R. Accuracy of subcutaneous continuous glucose monitoring in critically ill adults: improved sensor performance with enhanced calibrations. *Diabetes Technol Ther.* 2014;16:97–101. doi: 10.1089/dia.2013.0221. [PMC free article] [PubMed] [Cross Ref]
- [15] Maria Panou, Center for Research and Technology Hellas, I. Mesogion 357-359, Athens, 15321, Athens, Greece, mpanou@certh.gr

VIRTUAL CLINIC: Virtual Clinic System based on Artificial Intelligence

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ABSTRACT – Virtual Clinic System is a modern concept that enables patients to monitor and manage their health conditions more effectively by making more controllable on daily basis. It will also be a benefit for the patients to minimize the travels by attending a clinic to consult a specialist unless it is really necessary. Thus, the Virtual Clinic concept is an uprising area because there are not much research have been conducted in the Sri Lankan context, therefore, it embraces the team to investigate heavily on this focus area, also, this research area is based on a domain where very little information is known. Throughout the research, the data was gathered from trusted Internet sources and previous researches carried out on information systems in Sri Lanka and global context. The virtual clinic system will act as a virtual doctor to analyse symptoms and offer medical advice and aids to the patients by giving an appropriate course of action which converts this as a unique system. Further, mobile Application is also capable of reading the blood pressure of a patient and gives appropriate medical advice from the mobile application itself. Moreover, it will locate the nearest hospitals and pharmacies, to reduce the time required to find the nearest hospital. The ultimate Goal of the system is to achieve fast, safe and accurate health guidance. Further, to develop the Virtual Clinic solution, a well-known software development methodology, “Prototype method” is been followed.

Keywords: Artificial Intelligence, Android Application, GPS System, Blood Pressure, Smart Phone / Devices, Diseases, Virtual clinic, Hospital

I. INTRODUCTION

In the modern world, as human beings, scheduling an appointment and visiting a doctor will be performed unless if it is a serious health condition. However, the above scenario is common in Sri Lanka and any other country. Therefore, as a solution, most of the countries have practised several manners, for instance, some countries dispatch mobile medical teams to certain urban areas as a service. Thus, when considering the practical side of it, the solution is costlier and this action is not practical to be performed by the developing countries like Sri Lanka, due to the fact of financial concerns. To overcome this complication our team conducted a research which enables patients to meet a doctor virtually anywhere around the world via login to a PC or through a Smartphone. To conduct the research, firstly literature has been gathered, which are been demonstrated in chapter two literature review. Secondly, initiate the development of the research project according to literature been gathered. Finally, the team proposed a solution, which enables patients to meet a doctor virtually anywhere around the world with a single click of a button. Consequently, one of the predominant features is patients can collect their diagnosis virtually in a more convenient way.

People will encounter diseases. Hence, which is unavoidable and the best remedy is to find a doctor who can cure the illness.

Most of the researches been carried out in the Health Care field are primarily focused only on the Diseases. There is a smaller number of clinic applications to keep track of patients' health condition. However, currently, there is no such a system in Sri Lanka to address the above-mentioned problems and to overcome this problem using a Mobile Application or Desktop Application.

Objectives of this research project are:

To analyse symptoms and offer medical advice to the patients using Artificial Intelligence and also to reduce unnecessary clinical visits and monitor Blood pressure for 24/7. Increase the healthy level of patients around the country who are affected by Blood Pressure. Design a user-friendly mobile application to give an effective navigation plan to the patients. Deduct unnecessary costs and travel expenses for patients. Provide convenience to the doctor and reduce the clinical time of the doctors and patients

Virtual clinic will act as a virtual doctor to analyse symptoms and offer medical advice and aid the patients by giving an appropriate course of action and the Mobile Application will read the blood pressure of the patient and gives appropriate medical advice in the mobile app itself and also it will locate the nearest hospitals and pharmacies, to reduce the time required to find the nearest hospital.

The rest of the paper is organized as follows. Section 2 has provided the background through the Literature Review. Section 3 describes the methodology of this system. The discussion of the developed system has described in Section 4. Section 5 contains results of this research. Finally, the conclusion is discussed in section 6.

II. .LITERATURE REVIEW

The literature review is done based on several components. Namely, they are Artificial Intelligence, Android Mobile application related to blood pressure, GPS technology, Use of Smartphone / devices, Medical self-consultation.

According to [1] World Health Organization definition for Virtual Clinic has to be the pedal of ICT to linkage doctors and patients; to instruct and notify health care professionals, managers and consumers; to inspire innovation in caring delivery and health system management; and, to improve the current healthcare system". Hoque et.al stated that, Virtual Clinic is a revolutionize concept that brings the technology to patients' doorsteps. It's a combine of commerce and technology together with human health [2]. The Virtual Clinic system can be a web-based or mobile based application runs by using the internet as a convenience factor, that patients can access the system anywhere around the world to improve their health status. The Directorate General of Health Services explains the term Virtual Clinic as a delivery facility for health services to citizens through the use of ICT. Traditionally, Virtual Clinic is the delivery of healthcare with the support of different types of communication technologies, such as telemedicine, the Internet, electronic health records, mobile technology and clinical decision support. It is a service that is provided by using health information technology, computer, the internet and related component.

In many reports published by Asian Commission, is stated that lack of theories about the concept of Virtual Clinic Systems. It's due to the reason of latest innovative approaches for past 10 years. Virtual Clinic concept is driven by modern e-Business. This has been a proof that virtual Clinic is still new to the current context via lack of theories.

Parsa is the founder and CEO of Babylon, a U.K.-based subscription health service that launched an AI-based app designed to improve doctors' hit rate. It analyses each test result and determine the right treatment. Babylon's purpose is to democratize healthcare by putting an accessible and affordable health service into the hands of every person on earth. Babylon technology is designed to work alongside doctors, providing efficiencies and increasing diagnostic accuracy [3].

It allows patients to book their doctor appointments online, putting patients quickly in contact with doctors via video or voice consultation, providing prescriptions and referrals into appropriate services where required, ensuring quick delivery of medication via the app to pharmacies selected by the patient OR delivered directly to their home or office and much more.

Adrian Carrera and the team have proposed a system to provide home-based blood pressure checker (BP control) which allows the patients to read the blood pressure at home and registering these using a digital device. Then, the patients send the readings to a health professional who is responsible for taking appropriate action. BP control communicates with a server,

called SHUITE (Simple Health Universal and Integral Treatment Environment), responsible for managing patient and clinical information [4]. Patients can send their measurements via BP control to their clinicians. Clinicians thus have electronic medical records for their patients, automatically control of their blood pressures, and can visualize useful data in a user-friendly way and check their statistical evolution in a web-based environment. The main objective of BP control is to extend the SHUITE services, adding the ones most widely used in smart phones, such as instant messaging (chat).

Leigh-Ann Toper have proposed a Locator device that uses GPS (global positioning system) are assistive technologies that can help to promote safe walking by alerting caregivers when a person with dementia wanders outside of a designated area and providing the geographic coordinates of that person so they can be found more easily [5]. Because locator devices are a form of surveillance, using those raises ethical and legal issues regarding privacy and autonomy, but people with dementia and their caregivers believe the potential benefits outweigh potential harms. Locator devices may reduce the time required to find missing individuals with dementia and the costs associated with search and rescue operations. Locator devices may increase the independence, autonomy, and freedom of some people with early- to moderate-stage dementia, and reduce caregiver anxiety and stress. Evidence on the cost-effectiveness of locator devices is still needed.

Marko Maslakovic have invented Koogeeek wrist BPM which reads the blood pressure automatically. To take a measurement, simply press the on button on the device. The cuff will automatically start to inflate. The unit can record up to 99 reading on the device itself. To get an accurate readings arm and wrist must be at heart level. The other option is to take a measurement with the help of the Smartphone app. The red heart in the app will begin to pulse as turn the monitor on, indicating that a connection has been made. Both the blood pressure monitor and Smartphone app will show the measurement results and save the data [6].

Table 1 below shows list of similar research products/research areas referred in order to understand the availability of similar systems.

Table 1: Existing Similar Systems

Existing Systems	Features						
	Video conferencing	AI component	Android Application	Text /Image Chat	Online Treatments	Counseling/ Self care	GPS Tracking
1. Insight Optics	✓	✗	✓	✗	✓	✓	✗
2. Everlywell	✗	✗	✓	✗	✓	✓	✗
3. Doctorondemand	✓	✗	✓	✗	✗		✗
4. Healthtap	✓	✗	✗	✓	✗	✓	✗
5. HelloMD	✓	✗	✗	✓		✓	✗
6. Microsoft Healthvault	✗	✗	✓	✓	✓		
7. PingMD	✗	✗	✗	✓	✗	✓	✗
8. Revup By Md Revolution	✗	✗	✓	✓	✗	✓	✗
9. Text4baby	✗	✗	✓	✓	✓	✓	✗
10. Deepmind	✗	✓	✗	✓	✗	✓	✗
11. Streams	✓	✗	✓	✗	✓	✓	✗
12. Sensely	✗	✓	✓	✓	✓	✓	✗
13. Babylon	✗	✓	✗	✓	✗	✓	✗
14. oDoc	✓	✓	✓	✓	✗	✓	✗
Our System (VCSBP)	✗	✓	✓	✗	✓	✓	✓

III. METHODOLOGY

The prototype methodology is used as the software development methodology. Therefore, within the methodology the three phases analysis, design, and implementation are performed concurrently, and they repeat until the development get completed. Hence, firstly prototype was built with minimal number of features and the rest of the features were added to each phases in the prototype.

A. Planning

The research problem identification and finalizing the scope of the project was decided at this phase. Further, defining the business values and the purpose of development of this research is concluded at the planning stage. Finally, the project charter was created including a brief description of the proposed system to get the approval for the project. Once the need for the system and its basic functionality has been clearly identified a feasibility analysis was carried out to determine whether the project is technically, economically and organizationally feasible.

B. Analysis and requirement gathering

Specific data were gathered and analyzed at this phase to design internal designs of the system and to decide on performance and security constraints of the project. These specific data were gathered as primary and secondary data. A conceptual framework was designed as the first step of data gathering process. Then Google online questionnaire forms were created in accordance to this conceptual frame work and distributed to the general public. Data gathered population with sample size 81 was then analyzed. This sample was selected using non-probability Quota sampling technique. Based on the analysis of questionnaire results project team found that people spending more time and money to visit the clinic in weekly basis.

Furthermore, it was found that most people do not have proper knowledge about their own diseases. Lack of proper knowledge will lead to the serious problems. and also found Sri Lankan patients have visit clinics to get treatments from a doctor in every two weeks for High Blood Pressure. This process is time-consuming and also patient's health conditions are not monitoring while they are at home. Based on the above analysis of primary data basic functional requirements of Virtual Clinic System was finalized. The mobile application providing 24/7 service to the blood pressure patients to check their condition more convenient way and they locate the nearest hospitals and pharmacies to reduce the time required to find the nearest hospital and pharmacies. And the desktop application gets the symptoms of their illness to the application and provide an appropriate course of action. So, the people will gain more knowledge about the diseases.

Secondary data was gathered using literature reviews on similar systems available and systems with technologies which were chose to build Virtual Clinic System. Major research components of, literature review and discussion on those literature materials are provided in this phase.

C. Design

The design phase defines how the system will operate and provide a brief introduction of the illustrations using diagrams about the hardware, software data stores, files, user Interfaces (UI). The logical diagrams were converted to physical diagrams during this phase. Development strategies and the methods of implementing the decided strategy was discussed during this phase. The system was designed and finalized. Component and Deployment diagram is used to illustrate the structure of the system Software as well as hardware interfaces. The databases were created using SQLite server and data stored in database. The whole system designed as very user friendly.

The high-level architecture diagram is given in figure 1.

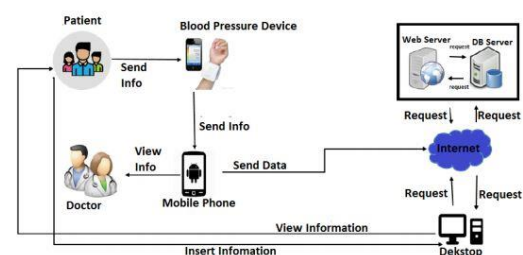


Figure 5: High level Architecture Diagram

There is only one main user as patient. Patients can login to the System and insert details. All the details will go to the database through the server.

D. Implementation

In this phase research team focused on implementing the proposed solution. The Unity development framework is been used throughout the development, and SQLite have used as the database, Jason and PHP were used to transfer data from the server to Android application. VOLLY and HTTP libraries are used for Android application to transfer and handled data. Further, JavaFX was used to develop the desktop application for Windows.

E. Testing

Testing was carried out in three stages such as unit testing, integrated testing and system testing. Individual components were tested using unit testing and results were recorded. Black box testing was carried out to test complex components of the system. Other components were tested using white box testing. Bottom Up method was used in integration testing. Each and every individual component which passed unit testing was integrated and integration testing was carried out. Finally, after integrating whole system, Functional system testing was carried out. This system was not tested in the real time.

IV. . RESULTS AND DISCUSSION

This section contains code fragments and Test cases which shows each and every result of tests performed by the group, functionalities tested and a comparison between the specified requirements and system. And also discusses about the standard of non-functional attributes of the system and how they were measured, Technical problems faced during the development of the system and finally about the changes done to the system that deviates from the originally specified functionalities.

A. Results

At the very first time of application opens it direct to registration page. Patients can register to the system by providing patients username, email, password and country. All the inputs will be validated, and wrong inputs will be result in an error message. After the registration, patient can log into the system using user name and password. Wrong inputs will be result in an error message and the user cannot logged in to the system.

Figure 3 illustrates the Home window. A logged user can will be able insert their symptoms and illness to the system. Furthermore, the user can exit from the game by clicking the exit button

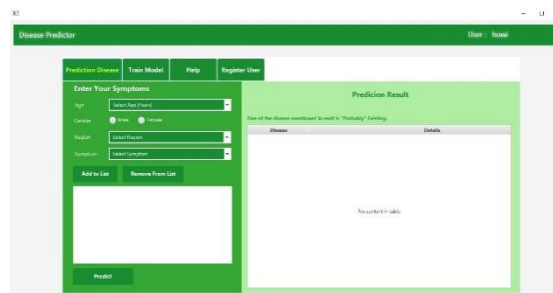


Figure 3: Home Window

Figure 4 illustrates the result page of desktop application. Patients can get appropriate course of action.

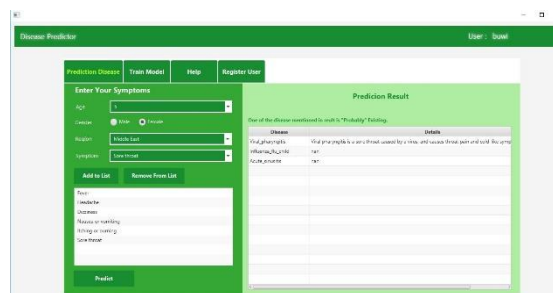


Figure 4: Results Window

Figure 5 illustrates main interface of mobile application. It will display all the services/ functionalities of the application

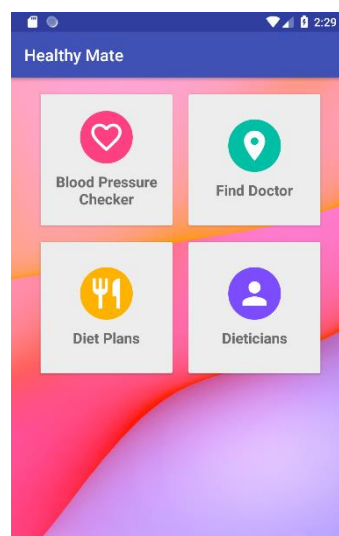


Figure 5: Mobile Application Home Page

Figure 6 illustrates Blood Pressure checker home page. The result interface of the Blood Pressure Checker. User will be Notified about their blood pressure rate.

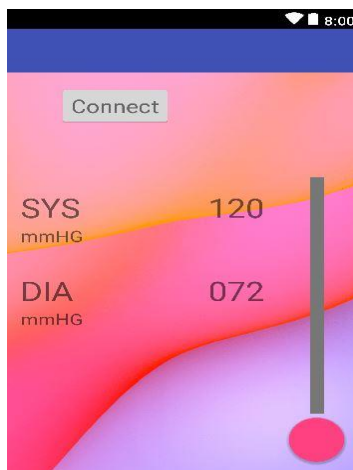


Figure 6: Blood Pressure checker home page

Figure 7 illustrates diet plansto the user. The User will be guided with the correct diet plan according to their Blood Pressure rate

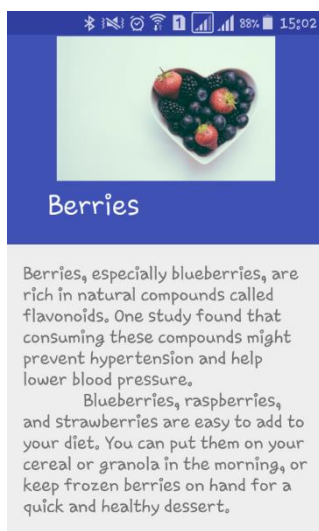


Figure 7: Diet plan Interface

Figure 8 illustrates Find the Doctor Window. Find the doctor interface will be used to find the nearest hospitals and Pharmacies

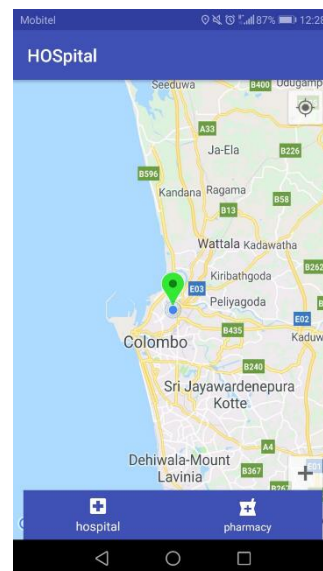


Figure 8: Find The doctor Interfaces

B. Discussion

Mobile Application suggest a way of getting blood pressure of a patient, gives appropriate medical advice in the mobile application itself and can find nearest hospitals and pharmacy nearby. GSM/GPRS shield will be used for data transmission here. Location of clinical placement will be tracked using GPS module. This system will be in active every time so the users can afford medical advises and find location of clinical places at any time.

Disease Predictor (Desktop application) will be used by the users to report the symptoms of their illness to the application and get an appropriate course of action.

During the developing period the team had to face some technical and logical challenges. Following are some of the major challenges faced by the research group.

Build or adjusting algorithms to achieve accurate results, learning new technologies like Artificial Intelligence tools and blood pressure smart devices, Retrieving answers from logical questions. Compatibility of the software tools used i.e. Android Studio and Visual Studio

To avoid the listed problems, the team has to seek for support from other individuals who are working as Software Developers in the industry and to refer tutorials, researches, books etc. related to algorithm development. The system was originally planned for blood pressure patients where they can report the symptoms (related to blood pressure) of their illness to the application and get an appropriate course of action. However, after a research the group learned it was an impractical act due the insufficient details. After additional research the group decided it was more of a practical act to

predict all the diseases rather than focusing only blood pressure disease.

V. CONCLUSION

The Virtual Clinic System was developed with the main objective of checking the health condition of the users and finding illnesses and provide appropriate solutions for their illness. Hence, this system contributes widely in identifying the type of the syndrome the user is suffering and deciding the relevant treatments according to their illness. The solution mainly consists with a desktop and a mobile application.

As the research was limited to a specific time period the research group was able to focus only on a limited number of components. The research group should make their users more aware of the application and should provide guidelines for the users to help them with using this application accurately. Make the application compatible with IOS, Blackberry and etc. Make a device for the mobile application which is for an affordable price as any of people can easily buy from pharmacies or any other recommended places. Make the application run with a variety of language options

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REFERENCES

- [1] MNPEA, "National Survey on Self- reported Health in Sri Lanka," Department of Census and Statistics, Colombo, 2014.
- [2] "Emro.who.int," WHO EMRO | eHealth, 2013. [Online]. Available: <http://www.emro.who.int/ehealth/>. [Accessed 06 Mar 2018].
- [3] Segue Technologies, "Waterfall vs. Agile: Which Methodology is Right for Your Project?," Segue Technologies, 2014. [Online]. Available: <https://www.seguetech.com/waterfall-vs-agile-methodology>. [Accessed 06 Mar 2018].
- [4] "The Artificially Intelligent Doctor Will Hear You Now," technologyreview.com, 2016. [Online]. Available: <https://www.technologyreview.com/s/600868/the-artificially-intelligent-doctor-will-hear-you-now/>. [Accessed 06 Mar 2018].
- [5] "AI healthcare app Babylon gives you access to personalized medical advice and services," eu-startups.com, 2017. [Online]. Available: <http://www.eu-startups.com/2017/02/ai-healthcare-app-babylon-connects-you-with-great-doctors-for-personalised-medical-advice-and-services/>. [Accessed 06 Mar 2018].
- [6] "BPcontrol: A Mobile App to Monitor Hypertensive Patients," researchgate.net, 2016. [Online]. Available: https://www.researchgate.net/publication/311502963_BPcontrol_A_Mobile_App_to_Monitor_Hypertensive_Patients. [Accessed 06 Mar 2018].
- [7] "GPS Locator Devices for People with Dementia," ncbi.nlm.nih.gov, 2016. [Online]. Available: <https://www.ncbi.nlm.nih.gov/pubmed/27809428>. [Accessed 06 Mar 2018].
- [8] seguetech, "seguetech.com," 2016. [Online]. Available: <http://www.seguetech.com/waterfall-vs-agile-methodology/>. [Accessed 18 Apr 2017].
- [9] health.ccm.net, "http://ccm.net," 2016. [Online]. Available: <http://ccm.net/contents/151-networking-3-tier-client-server-architecture>. [Accessed 10 Mar 2018].
- [10] Douglas Hughey, "umsl.edu," 2009. [Online]. Available: <http://www.umsl.edu/~hugheyd/is6840/waterfall.html>. [Accessed 18 Apr 2017].

Route Pal - Crowd Sourced Bicycle Companion

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Abstract—Tourists are urging to rent more bicycles and they are interested in viewing the city by riding the bicycles in group rather than using public transports. Route Pal will provide the facility to book bicycles online from the nearby rental shops. It will also provide the cyclists with the facilities of map navigation, group member tracking and group chatting while cycling. They can also mark a flag in the map and notify the others who will pass through that way, whenever there is a road block or traffic or street event. So that, they can alter their plans accordingly. Not only cyclists, but also normal travellers can use the Route Pal. Bicycle rentals are facing the problem of losing the bicycle without the cyclists returning them. The web application of Route Pal will make that process easier by keeping track of the cyclists and the bicycles. GPS tracker, Bluetooth module, Arduino and Security locking devices will be used in the bicycle for this purpose. The mobile application will connect the cyclists together while the web application will connect the cyclists and the rental shop.

Keywords— Map Navigation, GPS Tracker, Bluetooth Module, Arduino, Android, Flag, Notification, Group Chat, Cyclists

I. INTRODUCTION

The income from tourism contributes an important part in country's local economy. For transportation they prefer bicycle more than other public transportations. By mainly targeting the tourists, this research will urge to engage many people in cycling and make them rent bicycles more and use them comfortably without any issues.

The common issues tourists always face is that they do not know much about the routes and often find it difficult to travel in bicycle in such situations. Lot of events such as accidents, road blocks and other events will happen in the route they chose to travel. Without the aware of these events they will find it difficult to adjust their plan.

A survey was conducted to get the people's opinion. There it was revealed that 69.3% out of 150 responses states that people are riding bicycles for fun and as an exercise. Then 47.3% of them stated that they have trouble with unknown routes and 36% of them have faced the problem of security issues. The responses also reveal that 44% of them need the route hazard flag notifier as well as 28.7% want a help desk facility along with it. Considering the survey this app will cover all the solutions above.

There will be two applications developed for this system. One will be a web-based application which will work in the back end and an Android mobile application (Route Pal) for the users to use. Monitoring the bicycle is the key task where few hardware parts will be implemented and integrated with back end.

Web based application will consist of all the administration parts of the rental shop. Those are managing the bookings, customer details and bicycle details. The implemented hardware parts Global Positioning System (GPS) and General

Packet Radio Service (GPRS) modules will be used to track the bicycle's location. Timer will be set when the bicycle is rented. If the returning time passes its due the tracking will be enabled automatically and also sends a message alerting the user to return the bicycle. If the users delay to return the bicycle even after alerting him, then the lock in the bicycle will be locked automatically. The lock will be created using Arduino board and servo motor.

The Route Pal will consist of map navigation along with the locations of other colleagues who will be travelling together. There will also be a group chat facility to communicate with the colleague travellers. The application also will have a feature of flagging the events and road disturbance to notify and aware others. There will be a help desk to guide the user whenever an emergency situation arises.

Remainder of the research paper are structured as follows. Different literature papers studied and respective advantages and disadvantages of each researches have been explained in section 2 of this paper. Section 3 briefly describes the processes carried out at each phase of system development life cycle. All the results of this extensive research have been discussed in section 4 followed by conclusion and future works in section 5.

II. BACKGROUND STUDY

Bicycles play major roles when it comes to tourists who wish to travel by bicycles. Tourists find it efficient to roam by bicycles for many reasons such as bicycles are cheap comparatively to other vehicles & the amount paid for drivers, fuel. In Sri Lanka even though tourist find some rental system which allowed their cyclists to travel on pre-defined place, there are not allowed to travel where ever they want. Tourist tend to buy bicycles for their own purpose, even though they can effort to buy a bicycle it is a waste because tourists are

using the bicycles for defined duration. Bicycles comes with no applications such as tourists can find out where have they been or else is there are any event nearby or is it efficient to travel through a road, any road blocks. The whole point of Route Pal is to provide a bicycle for cyclists with a map and to provide a group navigation with group of people who wish to travel together. There are countless benefits on using a Route Pal system both the rider and renter.

The literature review is done based on several components related to our proposed Route Pal system. Namely they are tracking vehicles, locking using protocols, notification, map & map navigation, global system for mobile (GSM) Modules, GPS technology, Android Mobile application and desktop application for rental bicycle system and payment methods.

C. Tracking vehicles

Thomas. A [1] summaries main aspects of public transport providers are utilizing GPS tracking that includes real time maps

This feature allows commuters to view the real-time location of the buses and the estimated time of arrival. Traffic conditions can also be viewed on the map, allowing to reroute the bus in case it's needed.

Real-Time alerts it will help the management ensure the bus and the passenger's safety. For instance, geo-fencing automatic alert will notify Management if bus deviates from its preassigned route. Speed alert will tell that driver is traveling above the speed limit.

Fleet Analytics [2] In addition to real-time tracking updates, GPS trackers can also keep records of the fleet's past activities including where it went to, at what time, at what speed did it travel, and how long it traveled or stayed at certain locations. This information can be used to analyze the performance of both your bus and driver.

D. GPS, GSM Technology

Thomas. A [3] has described GPS tracking it provides services of tracking buses using GPS system which includes checking for dispatch times, security. The system has managed to provide real-time vehicle monitoring and reporting, cloudbased information management, global coverage and instant alerts.

Sabawi M.F.B[4] has described design and implementation of GPS and GSM technology for tracking.

Raman and Valaramathy. S [5] have described Vehicle Tracking and Locking System based on GSM and GPS and Tracking using Adriano.

Pooja. S [6] have described vehicle tracking system using GPS for complete surveillance. Tracking

Allows the base station to continuously track the vehicle without any interference of the driver or the method of continuously collecting the co-ordinates of moving vehicle that is getting from GPS receiver.

Abdulwahabe. O et.al [7] described about Using Arduino, GPRS and GPS hardware components for real time tracking.

E. Notification

Tucker .C et.al [8] described stop sign awareness mobile application which was developed on top of Google maps to provide a useful notifying system for people who often miss sign awareness. The system is named as stop watcher which is designed to alert a driver when they are approaching a stop sign using a voice notification system. Stop Watcher application is a real-time an android application developed to make drivers more aware of stop signs, even if they are hidden, obscured or damaged. It is also helpful when general visibility conditions are poor due to darkness or inclement weather. It uses the GPS and Compass features provided by smartphones. The Google Maps is used to provide the mapping and road matching functions for the GPS data. It uses a MySQL

Database to store and retrieve information about intersections with stop signs.

F. Map and Map Navigation

Sahu P.K et.al [9] have described detail about collision warning, lane change assistance, intelligent navigation and road traffic control using Maps.

Wang D.Y and Hsu C.K[10] have described about new Map navigation system is designed to provide users with regional navigation services. Map is a visualized product using symbols, lines.

G. Web Application for Rental Bicycle System

Krage K.M[11] has described about The TravTek driver information system which provide navigation, route selection and guidance, real-time traffic information, local information and cellular phone service.

Chen. E and Yi. S [12] [13] have introduced an O Bike is a bicycle sharing system. The bicycle has a built-in Bluetooth lock and users use a smart phone application to locate and hire bicycles.

Srivastava .M and Srivastava. P [14] have introduced a bicycle rental system which was developed using android and web. The application is Wheel Street which provide users to select rental duration, choose a bicycle and booking.

H. Help Desk

Chan .C et.al [15] have described about development of an intelligent case-based system for help desk operations. Which will provide process of system development, including knowledge acquisition, knowledge representation, system implementation, and verification are discussed. The study of above research papers tells us that there's no such systems with all the above functionalities composed together. Therefore, Route Pal will be unique system which will be handled easily by all.

III. METHODOLOGY

Prototype methodology was selected as the methodology in order to implement "Route Pal" system Analysis, Designing and Implementation phases are executed concurrently and iteratively until all requirements are gathered and implemented in such manner where system fulfills all the functional and nonfunctional requirements of the system. The initial prototype was built with a smaller number of features, where it was developed and features were added in every prototype. This procedure helped the research group to be more accurate about requirements and was also helpful to figure out the defects and fine tune the functions which was developed. Each phase of

System Development Life Cycle (SDLC) are as follows,

1) Planning

Planning phase was started at the initiation of the project where the research group understood the developed system and how it can be built. Scope, problems regarding implementing the project and the objectives were discussed among group members to identify accurately. When planning, end product was in mind so that each and every step was clear to the team. With the acceptance of the project charter further planning processes were initiated. Project team carried out feasibility analysis to identify potential risks associated with the development and deployment of Route Pal System. A rough budget for development of "Route Pal" Crowd Source System was prepared as part of this feasibility analysis.

Above processes of planning phase ensured the need and the feasibility of the project. Real planning of project was initiated with the development of work breakdown structure (WBS)

Where tasks associated with each and every phases of development were identified and tabulated. Ultimately project team prepared Gantt chart with associate time estimates, staffing and resourcing for each task tabulated in the WBS. This Gantt chart was used by the project leader to track the tasks and refine estimates during the lifetime of project development.

2) Analysis

In this phase project team began to understand the user requirement by analyzing the data gathered using various techniques. Initially data necessary for Analysis is collected as Primary data and secondary data. A questionnaire was distributed among the audience and a random sample of 150 responses were collected. Based on the statics we have come to know those who like to travel around Sri Lanka in bicycles have problems such as no bicycle, unknown routes. In future with the increase of tourism in Sri Lanka there will be a need of Route pal system which provide rental and maintain of bicycles. So, there should be a route pal system for current needs and also for future needs. The team members had a discussion with bicycle rental shop keepers to find out what are the difficulties they face during rental of bicycles.

As the secondary data literature view analysis was done to know about the existing systems and from there the team got a clear picture on what to be implemented. Project team initiated the process modelling and the data modelling by analyzing the gathered information. Use case diagram was created as a result of process modelling and data modelling.

3) Designing

A proper design leads to flexible, secure and efficient system. More effort in designing phase makes implementation easy. Project team worked on various designing techniques with great concern to make sure that the targeted audience's requirements that are finalized from analysis phase has been met as accurately as possible. Designing techniques used by the project team are as follows,

The below Figure 1 Architecture diagram shows us the smart bicycle with the implemented hardware which will transfer the location related details to the web server using GPS and GSM/GPRS modules. Admin will be able to monitor the bicycles with the location and notification data retrieved from the web server. Users are the ones who is directly connected with the bicycles. They will have the mobile app which will send and retrieve data from the web server such as flagged notifications, fellow riders' location, help desk notifications etc.

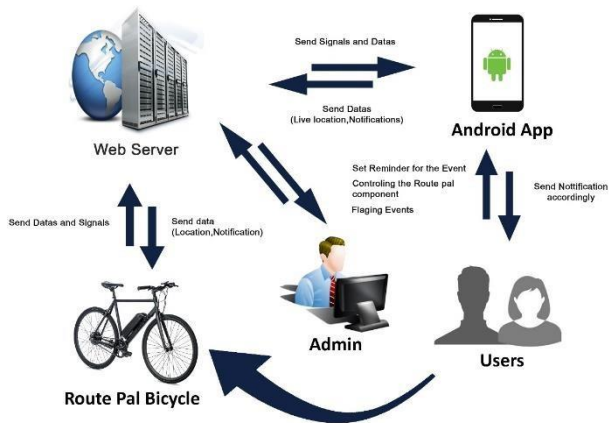


Figure 1: High Level Architecture Diagram

Figure 2 shows the hardware circuit diagram of the hardware part implemented.

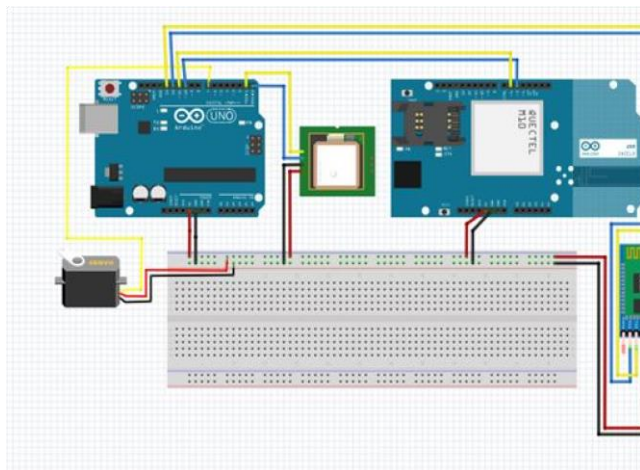


Figure 2: Circuit Diagram

4) Implementation

Route pal System was developed according to the designs produced at designing phase. Both hardware and software components of Route pal System were developed in parallel. All the hardware components were connected to Arduino MEGA 2560 and relevant instruction for Servo motor and GSM/GPRS Shield were coded and installed using Arduino IDE. Initially components were developed to work independently without connecting to common database. Meanwhile, Android mobile application was developed using Android Studio and Website was developed using PHP, Bootstrap framework and JQuery framework in PHP Storm. Initially, website was hosted locally in WAMP server and MySQL database in phpMyAdmin was used for website. Soon after the Development of individual components, website and database were hosted and relevant PHP pages were also coded

for integration with hardware components. Firebase services was used for android application. Google map android API and Google map JavaScript API were used to relevant bicycle locations. Overall, HTML, CSS, PHP, JAVA, Micro C and

JavaScript were used for the development of Route Pal System.

5) Testing

Component testing, Integration Testing and performance testing were ensuring reliability of Route Pal System. after the development of individual components were finished unit testing was carried out by using both black box and white box testing. Then Hardware components were integrated one after another and integrated testing was carried out. Finally, system testing was carried out after integrating hardware and all software components.

IV. RESULTS AND DISCUSSION

Section 4 discusses the results and their discussions that the research team achieved from the research project. The important implications of the research findings, regardless of the statistical significance of this research are discussed below. Further, identifying the defect and limitations of this project can be useful for future researchers in order to continue their research.

Route Pal system consists of three major components which are Web application, Android application and Hardware implementation.

Primarily the hardware is implemented in order to get the current location coordinates of the device and transfer to the database server for the tracking purposes and to enable the auto locking facility through the mobile application. Figure 3 below shows the design of the integrated hardware component.

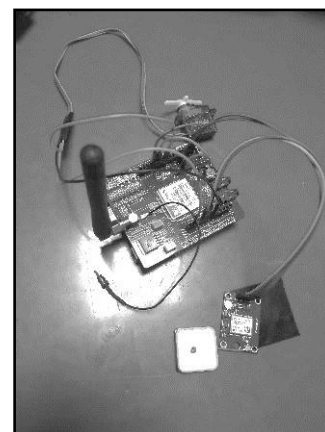


Figure 3: Route Pal Arduino setup

Figure 4 shows the android interface where flagged notifications are displayed.



Figure 4:Android Flag Interface

Figure 5 shows the android interface of the help desk feature which enables the user to select the emergency type and send emergency notification to admin.

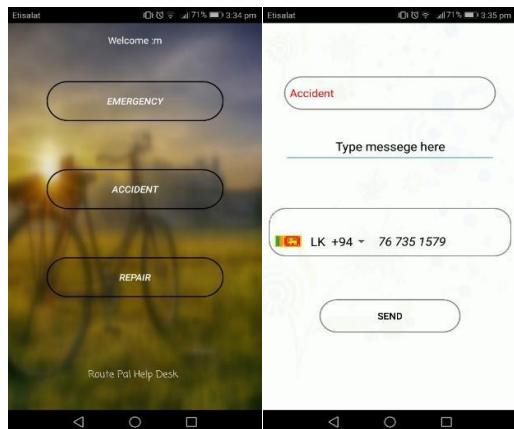


Figure 5:Help Desk Interface

Figure 6 below shows the screenshot of User Information page, which includes Insert model. Admin be able to insert details, which will be stored in the data base for retrieval of information.

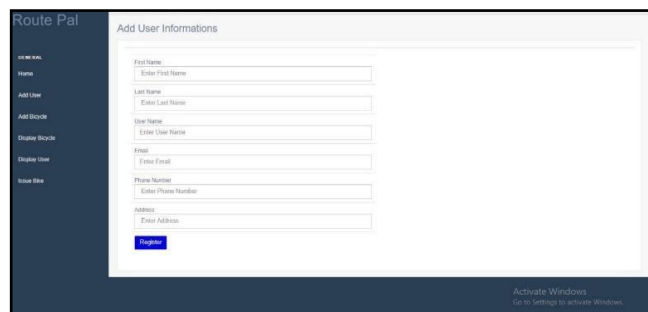


Figure 6: Customer Registration Interface

Figure 7 below shows the screenshot of Issue Bike page. Which includes searching for a given user name, which update the relevant values to text boxes from the values in data base. After this step admin will be able to issue the bike to relevant user. This is developed with html, php and JavaScript with bootstrap frame work. The database was developed by using MySQL. After performing this function his will be stored in the database.

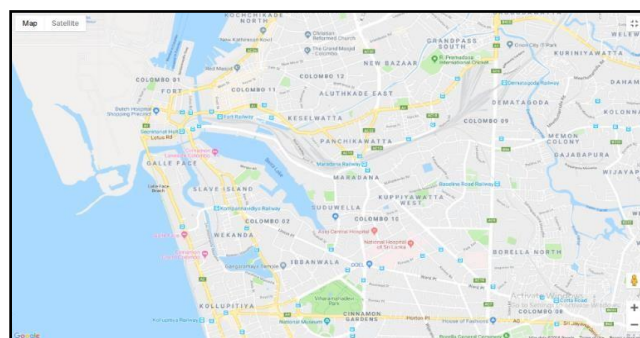


Figure 7:Bicycle Reservation Interface

Figure 8 below shows the screenshot of Map. Which includes tracking the user according to values which is in the database, Longitude and latitude retrieved from hardware (GPS, GSM Module) which is connected to the bicycle.

V. CONCLUSION

As a developing country tourism is one of the main incomes for the country. Most of the tourists enjoy bicycle riding. For the benefits of the tourists, the people living here and the bicycle renters, this system is developed. The objective of this system is to provide a well secured and featured service to the cyclists and the renters to make the rental and ride easier and time saving. This system will make an opportunity to increase the bicycle usage among all kind of age groups.



Many rental shops are expected to be installed with this system, mainly focusing the tourist attraction areas. The web system will monitor the bicycles' accurate location details which are retrieved from the Arduino system. So the web

system's and the mobile application's functions are 85% highly accurate and reliable. The half functionalities of the mobile system can be used by all people, while the other half functionalities related to the renting are used by the registered cyclists. This system helps to minimize the difficulties usually faced by cyclists and renters. Route Pal system provides instructions in a user-friendly manner as this would encourage more peoples to rent and ride bicycles and also urge them to notify about the current situations in their routes. The notifications are validated in a way it is highly reliable. This system would help to make the life of many travellers easier.

During the development of this project, the following limitations were identified:

Arduino parts' failure.

As bicycles will be travelled through many smooth and rough, dry and wet areas, there is a chance of hardware parts failure. The vibration caused while riding might affect in the functioning of the parts which might lead to short circuits. And also, long time exposure to the water might affect the parts. If failure occurs there is no other way to notify the admin unless the rider himself/herself use the helpdesk option in the mobile application.

Non-accurate GPS location readings.

There are places in country where you cannot get the exact GPS signals. To get an accurate location there should be at least 3 satellite connections closer to that area circumstance. When the satellite connection accuracy is low, it affects the GPS location. The places where people might get low satellite signals are mostly deep into the forests or caves.

Redundant and inaccurate flagged notifications. While anyone can put a flag and notify other people, there are chances of redundant or fake flag notifications. Too many of redundant flags at same place might hide the other important flags. Purpose of fooling other people some might put unnecessary flags for fun.

This system mainly considers about the ease use of the bicycle renting system and travel. This system can be further modified with other new extra features and with few limitations. For that development this system is open for future research. This sphere would be refreshed according to new modern developments. Project team has identified few areas which might attract potential researches in near future.

Predicting the places where traffic and events occurs during which season from the data collected from flags. Modify the system to rent bicycles where there are no bicycle shops but people those who have can rent them. Developing mobile application with multi-platform support. Gamify the mobile

application in a way to get points for each valid flags and rate other's flag as true flag or report and blog others' flags if not true. Make the web application and mobile application a commercial one.

REFERENCES

- [1] Thomas and P. Thomas, "Container tracking and locating systems, methods, and computer program products", US20110017693A1, 2011.
- [2] Yi-Chung Hu, Yu-Jing Chiu, Chung-Sheng Hsu, and Yu-Ying Chang,
- [3] "Identifying Key Factors for Introducing GPS-Based Fleet Management Systems to the Logistics Industry," *Mathematical Problems in Engineering*, vol. 2015, Article ID 413203, 14 pages, 2015.
- [4] 2015, Article ID 413203, 14 pages, 2015.
- [5] "How Public Buses Are Utilizing GPS Tracking". [Online]. Available: <http://www.usfleettracking.com/blog/2015/10/14/how-public-buses-areutilizing-gps-tracking/>. [Accessed: 09- May- 2018]
- [6] S. M.F.B, "GPS and GSM technology for tracking", pp. 1-5, 2018.
- [7] R. R and V. s, "GSM and GPS and Tracking using Adriano", pp. 10-19, 2015.
- [8] S. pooja, "Vehicle Tracking System Using GPS", *International Journal of Science and Research*, vol. 2, no. 2319-7064, pp. 126-130, 2013.
- [9] Abdulwahabe, O. and Talal, R. (2016). Design and Implementation of Real Time Tracking System Based on Arduino Intel Galileo. *ECAI 2016*, pp.33,34.
- [10] O. Mohamad and R. Hameed, "Design and Implementation of Real Time Tracking System Based on Arduino Intel Galileo", *International Conference – 8th Edition*, 2016.
- [11] TUCKER, C., TUCKER, R. AND ZHENG, J, s. p. k, "navigation and road traffic control using Maps.", no. 15-19, 2015.
- [12] D. Wang and C. Hsu, "An e-Map Navigation System Provide Region Search and Visualize Landmark Information", *Advances in Electrical and Electronics Engineering - IAENG Special Edition of the World Congress on Engineering and Computer Science*, pp. 219-222, 2008.
- [13] M. Krage, "The TravTek Driver Information System", *General Motors Research Labs.*, pp. 739-743, 2018.
- [14] "O Bike", *En.wikipedia.org*, 2018. [Online]. Available: <https://en.wikipedia.org/wiki/OBike>. [Accessed: 01- May- 2018].
- [15] "Cite a Website - Cite This for Me", *Play.google.com*, 2018. [Online]. Available: <https://play.google.com/store/apps/details?id=com.obike&hl=en>. [Accessed: 09- May- 2018].
- [16] "ONN", *En.wikipedia.org*, 2018. [Online]. Available: <https://en.wikipedia.org/wiki/ONN>. [Accessed: 09- May- 2018].
- [17] Chan, L. Geng and L. Chen, "Development of an Intelligent Case-Based System for Help Desk Operations", *Proceedings of the 1999 IEEE Canadian Conference on Electrical and Computer Engineering Shaw Conference Center, Edmonton, Alberta, Canada*, pp. 1062-1067, 1999.

The Amphiator: A Rescue Vehicle Concept

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Abstract - The report is based on a concept to design and produce a future car which not only accomplish the tasks of a regular vehicle but also to provide the user with irregular yet essential features while maintaining Eco-friendly regulations. To support this ideology the team has envisioned the project to create a concept that is applicable in the future to organizations with special requirements in military and fire engine applications. Extensive literature review has been used as a method to maintain the originality of the concept. Moreover, to the point calculations have been applied to the design to justify the suggested functionalities of the vehicle's applications with its on-land and in-water features. The model and the components of the Amphiator needed the combination of various existing technologies fused together to work effectively. The results are conclusive in holding up the objectives and suggests that a working prototype would be a possibility. Even though the Amphiator is not aimed at the general public with its wide range of applications and functionalities the Amphiator would be a valuable asset to the governing bodies and the special task organizations.

Keywords: Special purpose vehicle, submersible , concept car

I. INTRODUCTION

The current world keeps on evolving day by day, minute by minute even without our knowledge. Man keeps on inventing new technological inventions non-stop. He does whatever it takes to ease his work or to get his work done. All inventions are invented with the sole purpose of serving us. Car is one of the most useful and advancing inventions by man. A car is a wheeled motor vehicle used for transportation. The first motor car came into being in 1886 with the invention of Benz Patent-Motorwagen by the German inventor Karl Benz. Ever since the first car was introduced to the world, it has undergone a drastic change in design and technology. Today's world is seeing various unimaginable kinds of cars that are being used for various purposes. There are general purpose cars as well as special purpose cars.

Our research is based on a concept for an amphibian car titled "The Amphiator" which falls under special purpose vehicles. Amphibian vehicles became famous after 1900. They played a major role during the World War 2. Since the 1920s many diverse amphibious vehicles designs have been created for a broad range of applications including recreation, expeditions, search & rescue, and military, leading to a range of concepts [1]. There are amphibian vehicles in the market that can go on water. However, most of them plane on the surface of water. The Amphiator is distinct from other amphibious vehicles in many ways. Its significance is that it entirely submerges under water for specified purposes. It is a special purpose car and therefore will be available for certain government bodies and approved establishments [2]. Our concept will be used for retrieving things from water bodies. It also features a pair of grapples that will be used to grab on to things and pull them from water. The car will carry two persons inside a hull who will operate the car. The persons inside the car will be supplied with oxygen by the preinstalled oxygen cylinders in it. The Amphiator runs on petrol on land just the way and ordinary car does and is powered by electric motors when under water. Since it runs on electric power, it does not cause pollution under water and also minimises disturbance created to aquatic environment. As the

name implies, the car will be of use not only in water, but also on land as well. This will be used by fire engines to douse fire in suitable scenario. The grapplers at the front end of the vehicle will help the driver/operator to move obstacles on its way on both land and water. The safety measures that have been undertaken are explained in detail in the discussion section of our report.

A. Objective

Design an amphibian car that submerges underwater for intended purposes and also be environmentally friendly, very efficient and highly reliable within the given timeframe.

B. Goal

To help government bodies and approved underwater explorers, retrieval parties and fire fighters/ rescuers and present a high functioning concept for future manufacturers.

C. Scope

This paper will consist of developing a complete concept of an amphibian car based on the assignment future car. The car concept will satisfy the intended government agencies: military and fire engine. The concept car design will be able to function on multi-terrain and recover objects from hazardous and hostile environments. The research team will present prototype design and specifications within the specified twelve-week time frame.

II. REQUIREMENT GATHERING

Our process to gathering requirements was unorthodox as we didn't have an initial client to gather the requirements from and also due to the nature of our task at hand. However, having to come up with a completely new concept meant, that in-depth analysis of contemporary vehicle concepts through literature review was our way.

We had to settle to improve a certain mode of transportation to make our scope more focused.

III. LITERATURE REVIEW

To determine the research gap between existing technologies with similar features, five vehicles were reviewed. Four main objectives were identified and further research was conducted in order to come up with the Amphiator – an environmentally friendly amphibious car. Furthermore, the Amphiator's key features were laid down on a tabular display to compare the existing technologies.

A. Lotus Esprit-Wet Nellie

The Wet Nellie is a submarine built by Perry Oceanographic, Inc. of Riviera Beach, Florida, USA [4] for the James Bond Movie, *The Spy Who Loved Me*. The submarine was built using a Lotus Esprit S1 bodyshell which costed about \$100,000 at the time [5]. The Esprit was shaped like a wedge which generated downforce, so would force the submarine to dive. This meant that extensive modifications had to be made to the car; adjustable fins at each corner and four electric motors with steering vanes at the rear. And it has four electric motors which allow forward motion only.



Figure 2-Wet Nellie [3]

The interior of the submarine bears no resemblance to that of a car; just a platform for the divers, and the equipment used to operate, drive, and power the submarine [6]. The submarine requires a crew of two to operate and is a 'wet sub' as it does not maintain a dry interior and requires the passengers to put on scuba gear [7]. There were two main problems with the submarine's initial design; extremely poor visibility, and no reversing capability. The visibility issue was later overcome with the help of a mirror-system which helped the two passengers to see under the car. But the reversing issue could not be overcome. Therefore, the only way to slow the submarine down was to shut the engines off and let it settle on the sea bottom. And the submarine had to be lifted to the surface by divers.

B. Amphicar 770



Figure 1-Amphicar [40]

The Amphicar 770 is an amphibious automobile just as the name suggests, which was manufactured in West Germany by the Quandt Group and was marketed in the US. This car was mainly used for recreational purposes. The Amphicar can travel on water like a boat but cannot be used as a submarine. It is made of steel with aluminum internal bits which makes it unsuitable to be used in the sea as it is prone to corrosion [8]. The Amphicar could reach a maximum speed of 70 mph and 7 mph on land and water respectively. The initial prototypes used the Mercedes 190 SL's engine but it proved too heavy for the Amphicar. Hence, a four-cylinder, water-cooled engine was used in the back and it was connected to a four-speed manual gearbox. Water propulsion of the Amphicar is provided by twin propellers that are mounted under the rear bumper [9]. The car was built tall enough to enable it to enter and exit high shores. The Amphicar 770 uses a separate water transmission which is controlled by a simple transfer lever with both forward and reverse positions, in order to swim.

C. Rinspeed SQua



Figure 3-Rinspeed sQuba [10]

The Rinspeed sQuba is an electric amphibious car that was developed by a Swiss company, Rinspeed [11]. It uses three electric motors, one for land travel and two for water. On land, the car is powered by its electric rear-wheel drive powertrain by utilizing the rechargeable lithium-ion batteries. The submarine is powered by twin electric-powered propellers supplemented by two SeaBob water jets which allow it to reach depths up to 10 meters underwater. It has a water and salt resistant interior. Once the car enters water, it floats on the surface until the doors are opened after which the interior floods and the car submerges. The sQuba also allows autonomous operation as it comes equipped with a laser sensor system [12].

The top speed of the car on the surface of the water and underwater is 3.7 mph and 1.8 mph respectively. And on land, it can reach a maximum speed of 75mph [13]. This car is also a “wet sub” as it has an open cockpit and it can accommodate a maximum of two passengers who have to put on scuba gear. Without occupants, the sQuba surfaces automatically. It is designed to have an open cockpit in order to reduce the two tons of weight hat would be added to the car to overcome the unwanted buoyancy and for safety measures in case of an emergency [12].

D. 2s1 Gvozdika

The 2s1 Gvozdika is a Soviet self-propelled howitzer which can occupy a crew of four. It is Russian-made and entered service with the Soviet Army. It is a fully amphibious vehicle which has a traverse range of 360 degrees. The speed of the Gvozdika is 37mph, 18mph and 2.8mph on road, off-road and on water respectively [14]. The Gvozdika is propelled by its tracks in both land and water. However, the vehicle can only travel on the surface of a water body; it cannot dive in like a submarine. The tracks are available in a variety of widths in order to allow the Gvozdika to operate in either snow or swamp conditions.



Figure 5-Gvozdika [14]

The Gvozdika is NBC (Nuclear, Biological, Chemical) protected and is also fitted with a filtration protective system. It comprises of seven road wheels on each side and no return rollers. Two different widths of track can be fitted to the running gear in order to match terrain; wider tracks allow travelling over soft terrain by lowering the ground pressure. The interior of the Gvozdika consists of a driver compartment on the left front and an engine compartment on the right front along with a fighting compartment to the rear, which is topped by a rotating welded turret. The Gvozdika allows room in the fighting compartment for a commander to sit on the left, a loader on the right and a gunner to the front. The vehicle also has infrared night vision capability which can be used by the commander and driver. [15].

E. BMP-3F



Figure 4-BMP-3F [16]

The BMP-3F is a Soviet Amphibious Infantry Fighting Vehicle (IFV) which is NBC protected. The vehicle is equipped with an UTD-29M liquid cooled diesel engine which is coupled to a hydro mechanical transmission with four forward gears and one reverse gear. The driving force on the surface of water is provided by the water jet propellers mounted to the rear of the hull. This marine vehicle has a higher floatability reserve factor and stability and can be afloat at sea state three and do firing with a high level of accuracy up to sea state two. It can stay afloat for a maximum of 7 hours [16]. The vehicle requires a crew of three to operate and accommodates seven troops; the driver is seated in the front compartment along with two infantry troops and the remaining troops are accommodated in the rear compartment and are separated from the engine compartment by a bulkhead [17]. The BMP-3F is armed with a semi-automatic 100mm 2A70 gun/missile launcher, a 30mm 2A72 automatic gun and a 7.62mm PKTM coaxial machine gun. All the weapons are mounted on an all-welded aluminum hull and turret which is protected by anti-surge vanes. Furthermore, the hull and turret protect the occupants from small arms fire and shell splinters [16]. The BMP-3F has a traversing range of 360 degrees. The BMP-3F can attain a maximum speed of 43mph and 6.2mph on land and in water respectively. However, this vehicle cannot submerge like a submarine [17].

F. Literature Review Synopsis

Table 2-Literature Review Synopsis

Features	Car					
	Wet Nellie	Amphicar 770	Rinspeed sQuba	2s1 Gvozdika	BMP-3F	Amphiator
Diving Depth	N/A	N/A	10m	N/A	N/A	140m
Speed in water	N/A	7 kmh ⁻¹	3.7 kmh ⁻¹	N/A	N/A	11.5kmh ⁻¹
Dry interior	X	X	X	✓	✓	✓
Easy maintenance	N/A	X	N/A	X	N/A	✓
Safe	N/A	N/A	✓	X	✓	✓
Corrosion resistant	N/A	X	✓	✓	✓	✓
Grapplers	X	X	X	X	X	✓
Sonar	X	X	X	X	X	✓
Floats	✓	✓	✓	✓	✓	✓
Zero emission under water	✓	X	✓	X	X	✓
Bullet proof windshield	X	X	X	X	X	✓
Multi terrain vehicle	X	✓	✓	✓	✓	✓
Dual silencers	X	X	X	X	X	✓

IV. METHODOLOGY

The team was asked to pitched in a new and innovative idea as a proposal to the subject Lecturer on the same day of the project

Table 3-Logbook layout

Date	Comment	Signature

announcement to design a “Future Car”. In addition, each team was asked to forward the proposal to the project supervisor. On receiving a positive feedback from the supervisor, the team was granted the motion to proceed with the research. Each consultation with the supervisor was advised to be logged into a log book prepared by the team with the following fields.

A. Selecting an area to be improved

With a wide scope to explore the team researched on both the contemporary and the previously used vehicular designs, models, and their purposes. As a special purpose vehicle, the



Figure 6-Spherical Wheels

design included the vehicle to possess spherical wheels and its contributing applications.

The main objectives of using spherical wheels in the automobile were,

- Facilitates parallel parking.
- Facilitates the change of lanes without any front displacement.

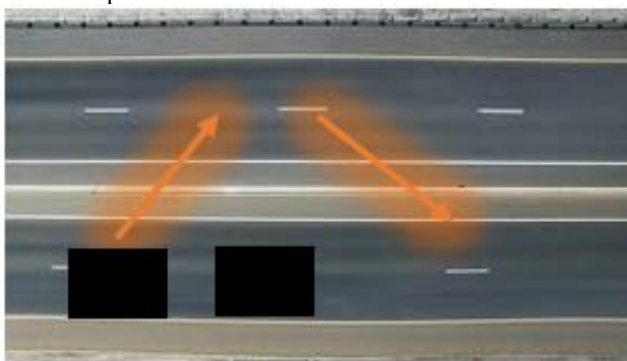


Figure 7-Lane Switching

With further investigations on the topic, main issue developed in building the design was that the technology was not sufficient and there are were multiple loop holes. Also, the existing technologies when joined together becoming complex

resulting new drawbacks in the system. Therefore, the group was forced to move into different architectural design. As a plausible backup proposal, the team pitched in the idea of a submersible automobile, again under special purpose guidelines.

B. Predicting the future automobile change

The members of the group as a whole went through various documents and websites to get a thorough knowledge about the existing technologies in the automobile market. Predicting according to the existing technologies, an underwater automobile is technically feasible. Though it's technically feasible, the usability was limited to only special task or qualified users. This underwater car, if given to the ordinary people may bring various kinds of threats to the governments and will require additional laws to restrict its maluses. This makes the proposed automobile to be a special purpose vehicle. One of the most important factors considered includes the requirement and the need to salvage and retrieve valuables from wreckages. When the vehicle is on land, as there are tanks filled with water attached to the body, it can also be used as a fire fighter. Considering these factors ‘The Amphiator’ can be introduced to fire rescue teams and underwater retrieval teams. During the designing phase, the model has to be designed specially to ease the effort of those people who are on underwater rescue missions. The designed model highlighted the specialty as to reducing the weight load including the special suits and kits of an underwater rescuer when they are on rescue missions. This is possible as the automobile does supply all the necessities of a rescuer diving underwater without his/her suit and tools. Considering the technical feasibility and the special purpose of the car a rough sketch had to be designed for the future car.

C. Suggested Models

Analyzing the techniques of mechanisms, the automobile's mechanism was build combining 2 mechanisms.

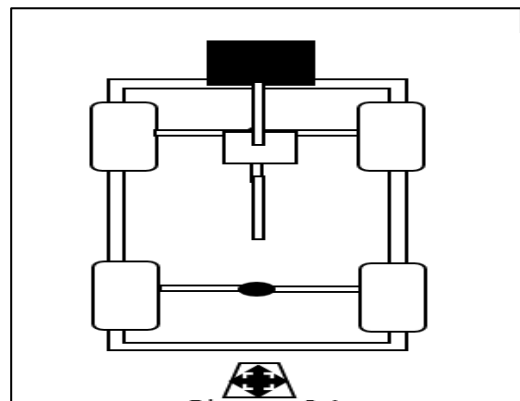


Figure 8-Model 1

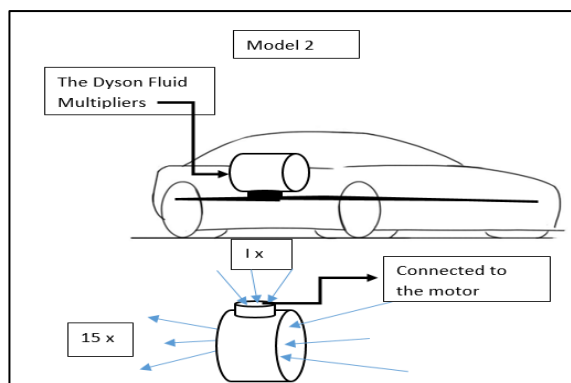


Figure 9-Model 2

The two models were combined to enhance the mechanism of the **Amphiator**, with the guidance of the team supervisor Mr. Iresh

D. Literature review on related work

The websites such as The Telegraph, Phys.org, engadget, etc. stand out in the search of various websites with the information of automobile technologies with the same concept, mechanism of techniques or both concept and mechanism. It is stated that the concept of an amphibian car was originated from the Wet Nellie – a custom-built submarine created for the 1977 James Bond film The Spy Who Loved Me, in the shape of a Lotus Esprit S1 sports car.

The other models like Amphicar, RINSPEED sQuba will also be discussed in the following literature review section

E. Developing the design to be feasible

1) Selecting a source of power for the vehicle

One of the major problems was that **Amphiator** would not be able to use the engine of the car underwater, hence, introducing a motor to the design was the solution. So, the vehicle will be powered by an engine on ground where a motor will power up once the vehicle goes inside the underwater body

2) Selecting a motor for the vehicle

Selecting a motor which will generate a high power (450 kW) and in the same time with less weight compared to the body of the vehicle was a huge task.

The motor that can be used to generate a power of 450kW weighs more than four tons, hence the source of power of the vehicle has to be altered, rather than including a four-ton battery to the design. The only option available was to reduce the speed of the vehicle underwater, therefore less power has to be generated by the motor with a less weight.

Therefore, as a result the Xinda Brushless permanent magnet 100 kW motor that weighs only 270 kg approximately which

will generate a power of 100 kW was selected by reducing the speed of the vehicle underwater to 11.5 km/h-1 (3.21 ms-1) from 25 km/h-1 (7 ms-1).

F. Doing the calculations for the design

Calculations played a major role in making the car much more technically feasible to the market. The calculations are mostly based on three key forces as listed below

- The maximum speed underwater -11.5km/h⁻¹
- The maximum diving depth 140m
- The weight of the Amphiator 4500Kg
- The volume of the Amphiator 4.5m³

First the drag of the vehicle was calculated to calculate the pull by the water body on the vehicle when the vehicle is moving through it.

Then the thrust on the vehicle was calculated to calculate the push from the water body to the vehicle.

Finally, the total thrust needed was calculated by adding the drag force and the thrust force to be put into the equation to calculate the propelled power. The calculations for the physical characteristics will be thoroughly discussed in the discussion section.

V. DISCUSSION

Table 4-Material Anodic index vs Tensile Strength [18]

Material	Anodic index	Tensile strength
Stainless Steel 300 series	-0.10	215 Mpa
Hot-dip-zinc plate; galvanized iron	-1.20	248 Mpa
Zinc, wrought; zinc-base die-casting alloys; zinc plated	-1.25	283 Mpa
magnesium-alloys, cast or wrought	-1.75	130 Mpa

A. Material Selection

Material selection of model structure depends on its strength, cost, availability and anodic index. 'Anodic Index' is a measure of the electrochemical voltage that will be developed between the metal and gold.

"To find the relative voltage of a pair of metals it is only required to subtract their Anodic Indexes. The above shows some material with their anodic index and strength. Among them Hot-dip-zinc plate; galvanized iron has anodic index difference of 1.20V and a high tensile strength of 248 Mpa" [18]. However, Hot-dip-zinc plate has a high Anodic index difference of 1.20 which is much greater than the recommended difference of 0.15V [19]. Therefore, the next best material that balances between Strength and corrosion resistance is, Stainless Steel 300 series with a Tensile strength of 215Mpa. Moreover, this material is commercially available with low cost. It also forms metallurgical bondⁱ between zinc and steel or iron,

creating a barrier to prevent itself from getting rusty easily [20]. It is a very important factor as the model will be used in the water, so corrosion prevention is a must. [20]. The barrier is an essential component of roofs and panels, HVACⁱⁱ, electric appliance and machine parts. Thus, Stainless Steel 300 series material was selected for the model structure.

B. Mechanical Infrastructure.

The mechanical infrastructure is a vital component of the Amphiator, especially for submerging, navigating and resurfacing. When the vessel is surfaced, the air level is constant in the double hull ballast tankⁱⁱⁱ [21]. The valves on the ballast tank allows water to flood into the hull displacing the air resulting in higher density which leads into creating a slight negatively buoyant^{iv} effect on the vessel. Once the vessel reaches the cruising depth, the valves are shut keeping the density of the vessel as same as the surrounding water density [22].

1) Forces and power dissipated by the Amphiator:

The study of forces acting on a waterborne vessel considers the theoretical location of the propulsive force, the direction of force, and the pressure distribution on the surface and diving depth. The fluid mechanics and aerodynamics force calculations are highly complex for a submarine than any watercraft [23]. Therefore, only the major forces acting on a submerged vessel are considered in this paper. The forces are: Drag, Thrust, Buoyancy.

- **Drag^v** force is created within the liquid (water) layers acting against the propulsion of Amphiator body. The formula for calculating the drag force in a liquid body is

$$F_d = \frac{1}{2} \times C_d \times A \times \rho \times v^2$$

Where F_d = Drag force, C_d = Drag coefficient, A =Projected front area, v =velocity, ρ =Density of water. $\rho = 1000\text{Kg}/\text{m}^3$, $v=11.5\text{kmph}^{-1}$ ($\sim 3.21\text{ms}^{-1}$) [7], $C_d=0.338$ [24]. $A= 1.4\text{m}^2$).

$$F_d = \frac{1}{2} \times 0.338 \times 1.4 \times 1000 \times 3.21^2$$

$$F_d = 2437.9\text{N} \approx 2450\text{N}$$

- **Thrust^{vi}** is created from the propeller as the vessel goes forward. The formula for thrust of a propeller is [25]:

$$T = \rho \times A \times v^2$$

Where, ρ = density of water, A = area of the propeller surface, V = velocity of the vessel. $\rho = 1000\text{Kg}/\text{m}^3$, $A=2\text{m}^2$ (assumed), to travel at 11.5kmph^{-1} ($\sim 3.21\text{ms}^{-1}$)^{vii} substituting the values in equation.

$$T = 1000 \times 2 \times 3.21^2$$

$$T = 20608\text{N}$$

However, for the thrust to overcome the drag force, the computed drag value must be accounted for. Then, the required thrust is,

$$F_d + T = 2450 + 20608 = 23058\text{N}$$

Equation for propelled power is,

$$P = T \times v$$

Therefore, the required propelled power of prototype is,

$$P = 23058 \times 3.21$$

$$P = 74016\text{ watt} \approx 74\text{kW}$$

From the approximated thrust power, it is clear that an electric motor that is capable of constantly dissipating 74Kw is required for the propulsion. As per the design, the motor is required to be an inboard electric motor^{viii}.

Among many solutions available in the market that meets the 74kW requirement, Xinda Brushless permanent magnet 100kW motor was selected due to its following features; inbuilt cooling system with noise reduction, single piece high-strength cast iron frame that provides maximum heat dissipation, brushless motor structure requires no spark and eliminates the need to change the carbon brush [26]. The Tesla 100kW electric battery pack was selected to power the Xinda motor [27].

- **Buoyancy^{ix}** is the upward force keeps the Amphiator floating due to the displacement of the hull.

From Archimedes principal, the formula for buoyancy is,

$$F_b = \text{Weight of liquid displaced}$$

$$\therefore \frac{F_b}{\rho \times g} = \text{Volume}$$

[28]

Where, ρ = density of water, F_b = Weight of liquid displaced, V = volume of the Amphiator. $\rho = 1000\text{Kg}/\text{m}^3$, $F_b = 23241\text{N}$ (2370Kg)^x, g is 9.8ms^{-2} .

$$V = \frac{23241}{1000 \times 9.8} = 2.37\text{m}^3$$

From this computation, it is clear that for the Amphiator to stay surfaced, the ballast must have an approximate volume of 2.37m^3 .

C. Diving Depth

To compute the feasible diving depth, hull strength, Safety factor^{xi} need to be considered. The formula to calculate the maximum allowed load is,

$$\text{Safety factor} = \frac{\text{Material Strength}}{\text{Max allowed load}}$$

Where safety factor is 1.5 [29], Strength of Stainless Steel 300 series is 215MPa. Therefore,

$$\text{Max allowed load} = \frac{215\text{MPa}}{1.5} = 143.3\text{MPa}$$

Thus, the structure of the Amphiator can withstand a pressure of 143.3MPa. This implies that the Amphiator may function at water depths where the pressure is 143.3MPa. The depth of fresh water that exert 143.3MPa [approximately 143MPa] is 140m [30]. Thus, the max diving depth of the Amphiator is 140 meters.

D. Dive Duration

The average human consumes approximately 23 Liters of pure oxygen per hour [31]. Thus, with two passengers for an estimated four hours dive the Amphiator will be equipped with four, size 300 oxygen cylinders [32] that supports up to 196 Liters.

VI. DESIGN

The Amphiator is concept vehicle which is dual natured, it functions as an underwater search and retrieve submarine and an on land multi terrain fire engine. The vehicle adopts the body type and structure of a Batmobile with a slightly streamlined exterior to fit the specific purpose of cruising through water bodies. The car supports 2 power sources with a fuel engine to be used on land and an electric motor to act as the underwater propeller. It is a two-seater with the front for the driver and the one behind for special equipment control and monitoring.

The Amphiator is equipped with four high end tires to withstand multi terrain wear and tear. A high-powered fuel engine with enough torque to push this one-ton vehicle both uphill and through coarse pathways. A highly efficient electric motor with low noise output for highly emission free underwater propulsion. A dual ballast hull water tank along the complete body to help in the submerging of the vehicle. A dual Dyson fluid multiplier to control the directional motion of the vehicle underwater. The vehicle includes a bullet proof canopy top windshield along with all-around water sealing to withstand water pressure as deep as 140 meters. As the main source of sensory aid, a sonar system is installed in the vehicle to scan for obstacles in the water body. A GPS system, to geographically locate the Amphiator's position. The vehicle's mechanical infrastructure plays key role in submerging, navigating and resurfacing [33].

The following models of the vehicle were made using an online template [34]:

A. The Mechanism

1) On land:



Figure 10-Amphiator on land

On land the vehicle works like a regular road transport with a V8 fuel engine acting as the main power source. The Dyson Fluid multipliers are retracted and inactive. The fluid chambers or the duel hulls are emptied of any fluid. The rear propeller is concealed inside the engine bay. The duel silencers work together to release the emissions and reduce the engine noise. The ABS (Anti-lock Braking System) is used as a reliable stopping mechanism for a traction free stop. The windshield had been used as the entry and exit point for this dual passenger vehicle. Similar is its mechanism to a fighter jet's canopy. On its application as a fire engine the ballast hulls are used as tanks to hold water which can later be hosed out to fight a fire. The tank can be fitted with a hose to let out the water which again is pushed out with the help of pressurized air being released into the ballast tank. However, the vehicle doesn't have an extending ladder to rescue inhabitants from building tops or windows.

2) Water Mode:



Figure 11-Amphiator in water

Once the vehicle enters a water body the fluid chambers are filled with water displacing the air increasing the vehicle's density, thus submerging the vehicle. Meanwhile keeping its density same as the surrounding water density. [22]. This whole process is done automatically by the vehicle's navigation mode sensors when the driver drives the vehicle into a water body. Meanwhile the Dyson Fluid Multipliers extend and provide the vehicle with a horizontal control by alternatively working to change direction underwater. The rear propeller is concealed in the engine bay which exits the engine bay once submerged and is powered by an electric motor. The propeller has a water inlet which it uses to push forward. The sonar system activates providing the operator with obstacles the radar detects in the nearest proximity. The vehicle can provide life support for 4

hours with the use of 4 compressed Oxygen cylinders. There will be a preemptive warning when the cylinders are at 25 % capacity to restock. In accordance when it is completely drained the vehicle has auxiliary oxygen tanks to support resurfacing along with release of the pressurized air from the capsulated seating mechanism.

A. The grapplers



Figure 12-Amphiator grapplers

This is a very minor yet necessary feature as involves a dual claw which can attach onto objects within the water bodies. Thus, retrieving materials or wreckages from underwater. The claw has a wide range of grip strength specifications that increases its uses. The weight, shape and size of the objects to be recovered are unknown and difficult to predict on a theoretical basis. Thus, in real a life instance, the Amphiator's specifications will have to be modified to handle the recovery of specific objects. The grapplers can act as tools to clear a pathway for the Amphiator among rubble if any or any obstacle in its path.

B. The Ascend



Figure 13-Amphiator Ascending

On the ascend, the fluid chamber is flushed out with the release of pressurized air into the chamber. This reduces the car's density making it rise up. Simultaneously the Dyson Fluid Multipliers tilt facing upwards to provide the vehicle with additional up thrust.

C. The Interior

The dashboard will be equipped with a controller to steer the vehicle, the controller takes the form of a joystick for precise vertical and horizontal control. The single throttle paddle will change its application for either land mode or underwater mode by switching between the electric and the fuel engine. The user

is provided with the option to manually activate the vehicle's multiple modes, as well as an auto mode where the vehicle detects it's surrounding and adapts accordingly. For monitoring the sonar readings, the user is provided with a display. The display allows the user to also monitor the fluid levels of the tank as well as the available compressed air levels. The interior is provided with many other indicators to read the fuel, battery and oxygen levels.

D. Precautionary measures

Certain precautionary measures include individual capsulation of the seats with the passenger if the outer glass is damaged. The capsule uses compressed air to rise up to the surface once abandoning the vehicle. If the motor propeller fails under water, the vehicle will use its ascension mechanism to rise up. Submersion of the vehicle underwater means the definite necessity to make the material of the car corrosion free.

VII. CONCLUSION

In this report a concept for a future car has been presented. The future car was named the Amphiator and it was designed as a special purpose vehicle that could be used to retrieve essentials from wreckage sites as well as rescue personals in instances of a fire. Making the vehicle suitable for the military and the fire engine. This vehicle is a hybrid vehicle which could travel on both ground and underwater. It is environmentally friendly due to its electric motor which powers the propeller. On ground it would travel as the usual vehicle but with the application of a fire engine but in water is where it stands out. Once it enters the water the Dual Hull Water Tanks are filled up increasing the density which helps it submerge. The Dyson Fluid Multipliers help change the direction underwater. The propeller has an electric motor and uses a water inlet to push forward. The Sonar System detects obstacles in the nearest proximity. The Two Grapples, allow to grab onto objects and retrieve them.

Components that aids the Amphiator to travel underwater:

- Dual Hall water tanks
- Dual Dyson Fluid Multipliers
- Propeller
- Bulletproof Windshield
- Electric Motor
- Sonar System
- Two Grapplers
- Oxygen cylinders
- Pressurized air capsules

With its above-mentioned components, the Amphiator provides the end user with a useful set of features and the necessary safety measures to meet its objectives efficiently. Though we have made careful calculations in the real world the variables could drastically change. This would mean that

the vehicle needs to be able to adapt or may require certain modifications to meet the changing conditions.

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REFERENCES

- [1] S. Nirala, "Encyclopedia britannica," December 2014. [Online]. Available: <https://www.britannica.com/technology/DUKW>.
- [2] "WilcoManufacturing LLC," Wilco, April 2016. [Online]. Available: <https://wilcomanufacturing.com/the-history-of-amphibious-vehicles/>.
- [3] J. Stewart, "driveTribe," June 2017. [Online]. Available: <https://drivetribe.com/p/wet-nellie-Y8fMYFGZTrCUq92xNa-h9Q?iid=RVgvYBRNTECipyVQovVYdA>.
- [4] C. Irvine, "The Telegraph," October 2013. [Online]. Available: <http://www.telegraph.co.uk/motoring/news/10390060/Billionaire-Elon-Musk-admits-he-bought-James-Bonds-submarine-car.html>.
- [5] J. Neff, "AutoBlog," June 2013. [Online]. Available: <https://www.autoblog.com/2013/06/28/james-bond-lotus-esprit-submarine-car-headed-to-auction-w-video/>.
- [6] L. Wilkinson, "The Telegraph," August 2013. [Online]. Available: <http://www.telegraph.co.uk/motoring/news/10233869/Inside-James-Bonds-Lotus-supersub.html>.
- [7] M. Gergeni, "THM Magazine," [Online]. Available: <http://magazine.thmotorsports.com/news/24-news/4520-james-bonds-wet-nellie-hits-nearly-1-million-at-auction.html>.
- [8] Chapman, "aphicars," 2017. [Online]. Available: <http://www.amphicars.com/sale/default.html>.
- [9] "ipfs.io," 2017. [Online]. Available: <https://ipfs.io/ipfs/QmXoypizjW3WknFiJnKLwHCnL72vedxjQkDDP1mXW06uco/wiki/Amphicar.html>.
- [10] "Rinspeed," [Online]. Available: http://www.rinspeed.eu/conceptcar_Rinspeed-sQuba_6.html.
- [11] L. Zyga, "Phys.org," phys.org, 2007. [Online]. Available: <https://phys.org/news/2007-12-squba-world-underwater-car.html>.
- [12] Simona, "TopSpeed," February 2008. [Online]. Available: <https://www.topspeed.com/cars/rinspeed-squba/ke3074.html>.
- [13] Ivan, "CoolPile," 2017. [Online]. Available: <http://coolpile.com/rides-magazine/rinspeed-squba-the-submersible-electric-convertible-sport-car>.
- [14] Recognition, "ArmyRecognition," 2012. [Online]. Available: https://www.armyrecognition.com/russia_russian_army_vehicles_system_artillery_uk/2s1_gvozdika_122mm_self-propelled_howitzer_technical_data_sheet_specifications_pictures_video.html.
- [15] J. Pike, "Global Security," 2012. [Online]. Available: <https://www.globalsecurity.org/military/world/russia/2s1.html>.
- [16] "Naval-Tecchnology," [Online]. Available: <http://www.naval-technology.com/projects/bmp-3f-marines-fighting-vehicle-mfv/>.
- [17] "Deagel.com," 2011. [Online]. Available: http://www.deagel.com/Armored-Vehicles/BMP-3F_a000346005.aspx.
- [18] D. Santos, H. Raminhos, M. Costa, T. Diamantino and F. Goodwin, "Performance of Conductive Pre-Primers Applied on Galvanized Steel Sheets for Automotive Bodies," vol. Advances in Coating Technology, 2007.
- [19] "zygology," 2017. [Online]. Available: http://www.zygology.com/cms/upload_area/pdf/Zyg-Anodic-Index.pdf.
- [20] P. P. N. Joubert, "Some aspects of Submarine Design Part 2. Shape of a Submarine 2026," Defence Science and Technology Organisation, Australia, 2006.
- [21] W. G. X. W. Z. W. Ying Chen, "Hovering control of submarine based on L1 adaptive theory via ballast tanks," 2017.
- [22] S. W. Hughes, "Measuring liquid density using Archimedes' principle," 2006.
- [23] M. E. T. L. CMDR D. Sc, "SUBMARINE HYBRIDPROPULSION SYSTEMS," Journal of Kones Combustion Engines, 2001.
- [24] "brighthubengineering," [Online]. Available: <http://www.brighthubengineering.com/hydraulics-civil-engineering/58434-drag-force-for-fluid-flow-past-an-immersed-object/>.
- [25] N. Hall, "NASA," 2015. [Online]. Available: <https://www.grc.nasa.gov/www/k-12/airplane/propth.html>.
- [26] "Xinda Energy," 2017. [Online]. Available: <http://www.xindaenergy.com/Brushless-permanent-magnet-vehicle--motor-50kw-100kw-p249.html>.
- [27] "electrek," 2017. [Online]. Available: <https://electrek.co/2017/01/24/tesla-teardown-100-kwh-battery-pack/>.
- [28] "physics.bu.edu," 2017. [Online]. Available: <http://physics.bu.edu/~duffy/py105/Pressure.html>.
- [29] "marinesight.com," 2017. [Online]. Available: <http://www.marineinsight.com/naval-architecture/submarine-design-structure-of-a-submarine/>.
- [30] "bluerobotics.com," 2017. [Online]. Available: <http://docs.bluerobotics.com/calc/pressure-depth/>.
- [31] "health," 2017. [Online]. Available: <http://health.howstuffworks.com/human-body/systems/respiratory/question98.htm>.
- [32] "www.mathesongas.com," 2017. [Online]. Available: <https://www.mathesongas.com/industrialgas/pdfs/Industrial-Cylinder-Dimensions.pdf>.
- [33] D. Bhattacharjee, "A Proposed Cost-benefit Analysis Model for Physical Form Analysis for a Futuristic Submarine Decision Support System," 2007.
- [34] Piotrkupsc, Starbreeze Studios, [Online]. Available: <https://piotrkupsc.weebly.com/index.html>.
- [35] P. Productions, "Petrolicious.com," Petrolicious Productions, 2014. [Online]. Available: <https://petrolicious.com/articles/amphicar-770-a-car-no-one-understands-but-everyone-loves>.
- [36] "atlanticmarinestore," [Online]. Available: <http://www.atlanticmarinestore.com/inboard-motor-inboard-outboard-inboard-boat-motors-for-sale/>.
- [37] "atlanticmarinestore," [Online]. Available: <http://www.atlanticmarinestore.com/inboard-motor-inboard-outboard-inboard-boat-motors-for-sale/>.
- [38] "mechanical360.net," 2017. [Online]. Available: <https://www.mechanical360.net/updates/factor-of-safety-and-margin-of-safety>.
- [39] "tesla," 2017. [Online]. Available: <https://www.tesla.com/support/model-s-specifications?redirect=no>.
- [40] Philip, "Unusual cars," 2016. [Online]. Available: <http://unusual-cars.com/model-of-the-car-amphicar-770-1961>.

ⁱ Metallurgical bond: Metallurgical bonding is the result of chemical bonding that occurs between a substrate and coating areas that are in close contact or diffused evenly.

ⁱⁱ HVAC: Heating, Ventilating, and Air Conditioning

ⁱⁱⁱ Ballast Tank: A ballast tank is a compartment within a boat, ship or other floating structure that holds water. The ballast tanks are able to provide submerge/emerge force by let in/out ballast tank water. [21]

^{iv} Negatively buoyant: state of being denser than the surrounding liquid.

^v Drag: The drag force acts in a direction that is opposite of the relative flow velocity. This force can be created in between fluid layers or solid surface.

^v Projected area: width of the front end=1m, slope of the screen=45 degrees, length of screen=2m, Therefore
 $A = 1 \times 2 \times \cos 45 = 1.4m^2$.

^{vi} Thrust: thrust a force made by reaction. According to the Newton's third law if any mass accelerates in any direction then equal magnitude opposite direction's force will act on that system. The force which is perpendicular to the applied force is known as thrust.

^{vii} Velocity: A minimum speed of 6.2knots($3.21ms^{-1}$) was identified through literature review so that the Amphiator would be faster than its competitors.

^{viii} Inboard Motor: An inboard motor is a marine propulsion system for boats. An inboard motor is an engine enclosed within the hull of the boat, usually connected to a propulsion screw by a driveshaft. [36]

^{viii} Buoyancy: The power of supporting a body so that it floats; upward pressure exerted by the fluid in which a body is immersed.

^{ix} Buoyancy: The power of supporting a body so that it floats; upward pressure exerted by the fluid in which a body is immersed.

^x The weight of the Amphiator was approximated to be 2370Kg. This was approximated considering the weight of the 270kg electric motor, oxygen

tanks, and Lightweight aluminum body reinforced with high strength, boron steel elements with the electric battery [39].

^{xi} Factor of safety (FoS), also known as safety factor (SF), is a term describing the structural capacity of a system beyond the expected loads or actual loads. Essentially, how much stronger the system is than it usually needs to be for an intended load. Safety factors are often calculated using detailed analysis because comprehensive testing is impractical on many projects, such as bridges and buildings, but the structure's ability to carry load must be determined to a reasonable accuracy. [38]

Augmented Reality Based Social Media (OGMEN)

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Abstract: Augmented Reality (AR) technology is one of the fastest growing areas in the computing field and it has many applications in the market including social media. However, there is a need for a survey exploring the effectiveness of augmented reality as a communication medium in current social media. This paper reviews the development of Augmented Reality as a mass communication tool in social media. The researchers introduce a social media application. It delivers the possibilities of using augmented reality in social media. With the use of augmented reality, this application will increase the user experience in social media and travel & tourism. With the idea of adding ratings for live locations such as cinemas restaurants etc. the application will increase the uses of the social media in our day today life while making the users to have their nearby places explored. So, the use of augmented reality in social media will lead to drawing out all the users that stays in homes out into the world. The application really about connecting with people not only on internet but in the actual world. The application will run on a hand-held device (smart phone) to implement the social media network and this application will be capable of saving photos/videos in live locations, rate live locations such as cinemas, restaurants etc.

Keywords: Augmented reality, social media, live locations, android application, communication tool

I. INTRODUCTION

Sri Lanka has a developing tourism industry since getting the freedom from British in 1948[1]. Since that time Sri Lanka began its advancement holding hands with the lodgings and eateries around and close to the special spots with significant values where the vacationers and local people visit. Travel and tourism in Sri Lanka is going up day by day, it is generating more revenue if the relevant bodies take necessary steps to develop the industry. That conveys cash inside to the nation. When doing so, there ought to be an incentive for what the people spend. But there is no guide that will assist the client to get an idea before he/she visit that lodging or the eatery. There are sites kept up by the lodgings. Additionally the clients post surveys in them. In any case, we can just observe the great and decent remarks. The page administrators usually remove the awful audits.

We can state that the entire world is in one hand. Cell phones have drawn out an enormous change in the lives of individuals. Individuals appreciate awesome solace with the headway in science and innovation. Individuals in the present day discover things substantially less demanding and see things in view of innovation. Cell phones assume a fundamental job in such manner offering clients an extraordinary stage for correspondence and access to an extensive variety of uses [2]. A portable application is a single tick and one hand worked. It is extremely smooth than a site page.

Augmented Reality in the other hand plays a major role in ICT industry these days. It is growing rapidly and does a great deal of work when combining real life data with virtual environment giving users unforgettable experiences.

Clients require an application that take a gander at the points of view of the inn from client side. It ought to have all great and awful audits. With the goal that the client who is going straightaway, can get a right thought. “Augmented Reality Based Social Media (OGMEN)” built for the clients and that is not kept up by any of lodging page administrators. It has the right criticisms and audits. The claim to fame of this versatile application is it utilizes the most recent innovation 'Augmented Reality'. This innovation encourages the clients to spare recollections of any place that they visit. Unlike giving inputs and returning and looking in to them once more, this application has got a number of activities. The next sections of this paper discusses about the background, methodology, results and discussion, conclusion and future work for this system.

II. BACKGROUND STUDY

The literature review is done based on several components related to our Augmented Reality Based Social Media Application. So that we could identify and differentiate our product among the other related products in the market. The researchers are looking to main aspect like augmented reality using social media, location based augmented reality application, augmented reality using cloud, location tracking application. The researchers have checked these existing system from 2012 onward then the literature review is carried out. The researchers have searched on research papers, journal article and books especially they have referred these articles in online and these article have been searched using google scholar, IEEE Xplore digital library, science direct. Anabel .et.al in 2017, Introduce the system “augmented reality application for tourism” Researchers dealt with and developing visual-based augmented reality systems, and a relevant amount of research discussing the utilization of other human senses

such as tactioception and audioception, both being discussed within this work. A comprehensive analysis resulted with the identification, compilation and categorization of the key factors having the most relevant impact on the success of utilization of augmented technology in tourism domain. According to this system there are some advantages such as Map and routing, good navigation, communication and Context-aware push We have found some limitation such as difficulty to use, difficulty in user comfort, difficulty in accessibility, push-only and less safety [1].

Billinghurst et.al in 2012, developed a system “The MagicBook - moving seamlessly between reality and virtually”. Researchers followed the methodology such as If a person looks at the pages through an augmented reality display, they see 3D virtual models appearing out of the pages and The models appear attached to the real page so users can see the augmented reality scene from any perspective by moving themselves or the book. There are some advantages in this system such as the person feels like living with the objects in the environment also this system not like the normal books containing pictures, this is very interesting for children Also this system has some limitation such as without the additional components the person is unable to view the objects in 3D and this system cost a lot and because of that it will be catered among the rich people [2].

Andrew et.al in 2012, developed a system “A motorized camera mount for tracking in augmented reality”. Researchers followed the methodology such as the invention is a method for displaying unseen objects and other data using augmented reality (Mixture of real view with computer generated imagery) and the method uses a camera on that mount back to a computer. The computer can precisely overlay computer-generated imagery onto the video image produced by the camera. There are some advantages in this system. This system will be used to present to a user such items as existing weather conditions, hazards or other data, and presents this information to the user by combining the computer-generated images with the user’s real environment also the system can be used to display any imagery that needs to correspond to location in the real world. This system also has some disadvantages such as portability is uneasy and operation is very hard [3].

Anmol et.al in 2014, developed a Mobile Application with Augmented Reality. Researchers did their research of Augmented Reality (AR) for development of mobile applications. They researched on the main fields in which mobile applications are developed using AR devices & systems. A mobile platform implementing the described features and collaboration between mobile and augmented reality is being demonstrated. There are some advantages in this system such as they have given an introduction to all kind of technologies, SDKs, apps, app-stores on the topic with regards to Augmented Reality, they have researched on the history of

the Augmented Reality, and they have researched on the related works, frameworks, and toolkits. The limitation their main focus is on the SLAR ToolKit on the Windows phones and those phones are no longer in manufacturing [4].

Daniel et.al in 2017, created “massively multi-user augmented reality on handheld device” Researchers present a system architecture for interactive, infrastructure-independent multiuser AR applications running on off-the-shelf handheld devices. They implemented a four-user interactive game installation as an evaluation setup to encourage playful engagement of participants in a cooperative task. The result is over the course of five weeks, more than five thousand visitors from a wide range of professional and socio-demographic backgrounds interacted with our system at four different locations. There are some advantages in this system such as the system was able to reach out to a bigger audience than with the use of traditional wearable display devices. The limitation is natural movements of the users were limited with the use of hand held devices which prevented users from moving while using the application .other disadvantage is this application does not provide real time experience to[5] .

Meenakshi et.al in 2014, developed a mobile application for location finding” The Location Based Augmented Reality App was created combination of Augmented Reality and Cloud which provide an indirect view of the objects around us by displaying a computer generated virtual object in front of user. There are some advantages in this application such as this application provides useful functions such as finding nearby places of interest and very helpful in the field of tourism and navigation. Also this application has some limitation such as it has only location finding option the users [6].

Rudiger et.al in 2017, developed a kernel that enables sophisticated location-based mobile augmented reality applications. The development of an AREA algorithm that enables track handling requires this is a new concepts that are presented in their research paper. This application has some advantages such as smart mobile device shall detect tourist attractions to provide related information to the user, this application detects predefined points of interest (POIs) within the camera view of a smart mobile device, positions them correctly, and provides additional information on the detected POIs. This additional information, in turn, is interactively provided to the user. Also it has a limitation according to the experimental results performance is not suited for IOS device [7].

Moon- Hee Park et.al in 2012, developed a system “LocationBased Recommendation System Using Bayesian User's

Preference Model in Mobile Devices” Researchers followed the methodology such as a map-based personalized

recommendation system which reflects user's preference modeled by Bayesian Networks and the structure of Bayesian Networks is built by an expert while the parameter is learned from the dataset. The proposed system collects context information, location, time, weather, and user request from the mobile device and infers the most preferred item to provide an appropriate service by displaying onto the mini map. This system has some advantages such as personalized recommendation systems recommend an item to which a user prefers by using automatic information filtering method. The system limitation is since there are lots of information and services, it is difficult to find a proper service to one's preference at proper time [8]

III. METHODOLOGY

This system developed using the prototype methodology. This methodology was selected because they may be many complex situations as we were new to the technologies. As undergraduate students engaged in the final year research project, the team had to learn about many areas such as android application development, Augmented reality technologies etc.

1) Planning

The project team has developed the system as per the Prototype Methodology. Using this methodology, the project team will perform the analysis, design and implementation phases concurrently whenever changes approached by the client. This would allow the team to make changes to the project process by repeating the relevant phases with relevant corrections to accomplish the client requirements, if in case any deliverable fails. The project team decided on the project objectives and planned to develop the system in 10 months with a team of four members.

2) Requirement Gathering and Analysis

Issuing online questionnaires and reviewing past researches published on similar topics were carried out as part of requirement gathering process. Questionnaires were issued to 120 people selected from the full population based on probability simple random sampling (SRS) techniques. 76.7% of the people responded that they use an Android phone. Therefore, the team decided to develop an android phone application. 93.3% people are like to see their or their friend's memories lively at the same place with help of the mobile phone. Therefore, the augmented reality based social media fulfill this requirement using augmented reality technology. 74.2% people like to see the hotel or restaurant rating and details by just scanning the building using mobile camera. Therefore, the application will fulfill this using augmented reality technology. 61.7% people do not have any experience in augmented reality based

Application. Because of that the team decided to develop a social media application using augmented reality technology. Additionally, literature review was carried out on similar systems available and systems with technologies that were chose to build Augmented Reality Based Social Media (OGMEN). By analyzing, those research papers drawbacks and limitations were found out. Major research gap found and solutions to those gaps in Augmented Reality Based Social Media (OGMEN) was finalized. Details about this study has been provided under section 2 of this research paper.

3) Designing

The high-level architecture diagram was sketched as the first process in the designing phase in order to determine overall operational model of Smart Health Care System. Next, use case diagrams and use case scenarios were finalized and Entity relationship diagrams were drawn accordingly. Soon after that, interface for Augmented Reality Based Social Media (OGMEN) mobile were designed. Designing suitable algorithm for location detection and augmented object detection was another important process which was carried out at this phase. Finally, Decisions on development platforms for mobile application and database servers were finalized. Figure 1 shows the High Level Architecture diagram of augmented Reality Based Social Media (OGMEN) System sketched at this phase.

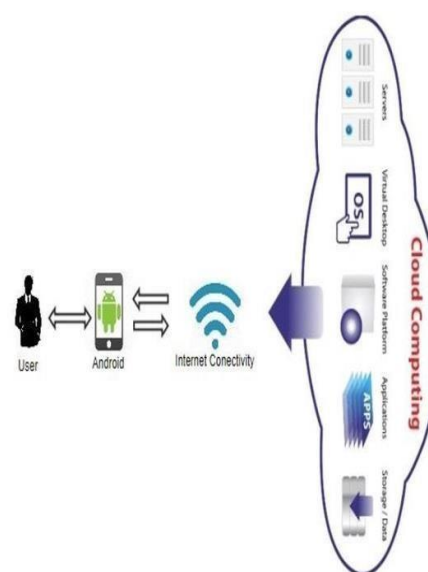


Figure 1: High level diagram

Figure 1 illustrate the software architecture diagram. According to the architecture diagram user interact with the Android mobile phone which is accessing the cloud via the Internet .Users can Share and Store the Data through the internet to the cloud. Cloud computing, in turn, refers to sharing resources,

software, and information via a network, in this case the Internet. The information is stored on physical servers maintained and controlled by a cloud computing. As a user, user can access their stored information on the cloud via the Internet.

4) Implementation

Actual augmented Reality Based Social Media (OGMEN) System was developed according to the designs produced at designing phase. In this phase, developers work on their allocated parts.

OGMEN uses a cloud storage to have a database of the users. So, developers used Open Stack to create their own cloud storage. This storage stores photos, reviews, details on places, user information. Cloud has to be real time in order to function the application properly. With a good network connection, application works smoothly.

An Application Program Interface (API) from Google Maps was used to get the users locations to the exact point. This application needs the location to function. So, instead of mapping the whole world, the best option is using the Google Maps. Google offers a service that anyone can use their google maps functions. So, the above-mentioned API was used. This application also can understand when the user is entering as well as exiting the place.

So while exiting the place the user will get a feedback form to be filled. So that, it will help the user to rate the place. Users can add new locations too. Therefore, all the other functions were created using Android Studio except Augmented Reality part.

Augmented Reality was done through UNITY engine. A 3D map of the current location was developed with the help of Unity engine. Photos taken by the user is saved using XYZ coordinates of the location and it is saved with the help of map. When viewing the same photos, previously created empty AR objects of unity engine is replaced with the saved photo. Default objects were created using Unity and they are altered when using the application to view saved photos.

In Android Studio, java is used as the programming language while the Unity uses C#. Augmented reality part and the android studio part were developed separately and they were integrated finally. .

5) Testing

Unit Testing, Integration testing, System testing and Performance testing were carried out ensure reliability of entire augmented Reality Based Social Media (OGMEN) System. Soon after the development of individual components were finished unit testing was carried out by using both black box

and white box testing. Then integrated testing was carried out. Finally, system testing was carried out after integrating all software components. Timing tests, security and concurrency tests were carried out.

IV. RESULTS AND DISCUSSION

Section 4 discusses the results and their discussion that the research team achieved from the research project. The important implications of the research findings, regardless of the statistical significance of this research are discussed below. Further, Identifying the defect and limitation of this project can be useful for future researchers in order to continue their research.

Figure 2. Below shows the login interface in order to let users to login to the system. Only after a valid login one may enter to this system. It is the only way that users have to access the system.

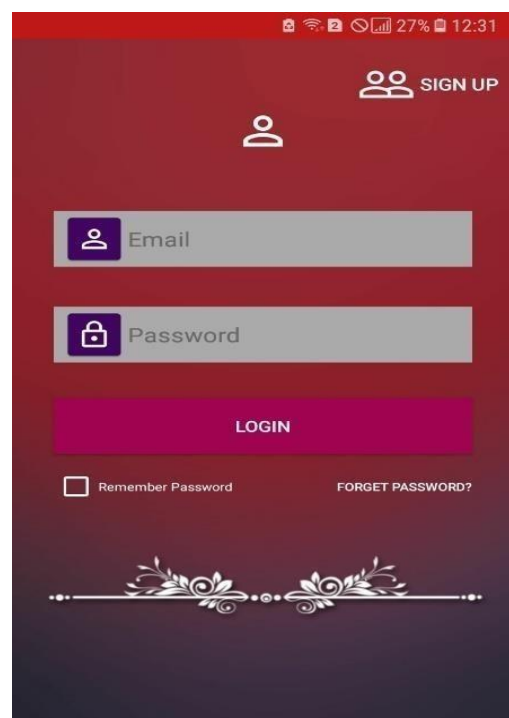


Figure 2: Login Interface

When a new user is using the system, user does not have the user credentials to login to the system. So, the user needs to sign up for the system. User has to enter email address, name, phone number and the password to register as a user. After validation, account is registered.

Figure 3. Below shows the Android mobile application interface relevant to this process.

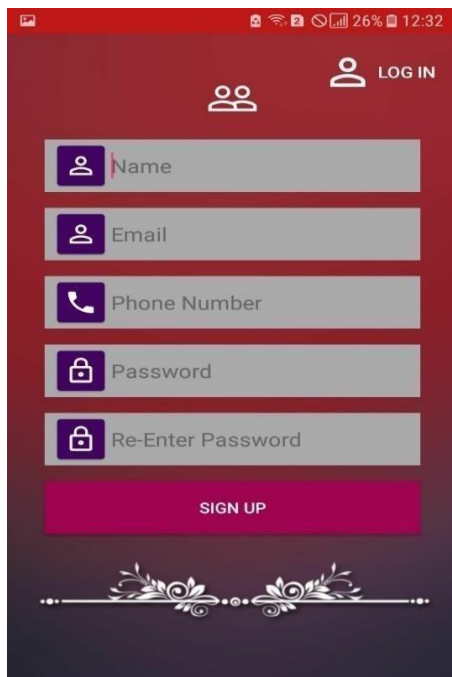


Figure 3: Signup Interface

Next, the customers details will be send to the main server and the admin can view the customer's details and he has the right to keep them or to remove them.

After registering in to the system user will be able to rate the places. Rating is the main objective of this application. Users can rate the place by filling the given questionnaire. Figure 4. Below shows the interface where user will be able to rate the places.



Interface

Figure 4: Rating

Soon after users can add locations to the system where user visits. User can add photos through the camera or phone storage. When adding the photos, application automatically gets the geolocation. Following Figure 5. Shows the add places interface.



Figure 5: Add Place Interface

Figure 6. Below "Retrieve memory" interface which shows the Memory in real location through the mobile phone camera using augmented reality.

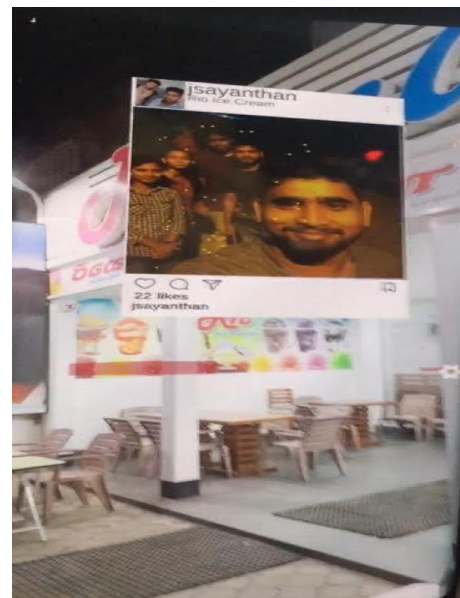


Figure 6: Retrieve Memory Interface

Figure 7. Below shows the user can easily switches to different interfaces.

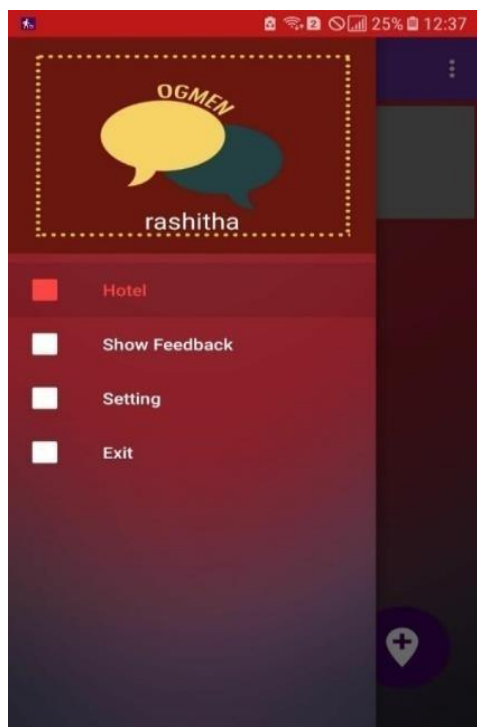


Figure 7: Dashboard Interface

Reliability and accuracy of the system are crucial factors which need to be considered in social media related applications. Moreover augmented Reality Based Social Media (OGMEN) application is a dedicated application for improve the current social media where reliability and accuracy are most important. Based on various tests carried out in various environments and conditions, augmented Reality Based Social Media (OGMEN) has showed 95% reliability and 79% accuracy.

Fault tolerance, recoverability, authentication and trustworthiness are main reliability factors which were considered when testing reliability of the system. After series of testing and error correction finally reliability of the system has been achieved by the following functionalities. User Authentication is ensured by using safe login system in mobile application. Accuracy level was calculated by testing location detection and retrieve the memory in the same location. Most testing gave successful result expect for the GPS Module. GPS Module reads no values unless it has connectivity to at least three satellites. So during rainy and cloudy seasons it failed the accuracy tests.

V. CONCLUSION

Through the “Augmented Reality Based Social Media (OGMEN)” mobile application the users will be able to rate live locations like restaurants, supermarkets, Shopping malls, Arcades and public places and save live memories in a virtual

world created by the augmented reality. This is going to be very interesting because this social media has these enormous features. The user will feel livelier. They can do useful things through this social media such as User can search interested places through this social media application then user will get the list of ratings which were given by his friends. Also when user reaches a place, user can switch on the camera and by our augmented reality application the user can see the friends social media post lively in that specific area. During the development of this project, the following limitations were identified:

- Need of a data plan enabled SIM.

GSM/GPRS uses mobile sim data to transfer real time data about OGMEN application status to the server. Therefore, a data plan should be enabled in this case and recharging is need to be maintained for uninterrupted connection with the central MC server.

- Less accuracy with GPS location readings. Location of kiosks have been read using GPS module which need at least 3 satellite connections to accurately read a location. Hence location read may be with less accuracy in case of less satellite connections.

- Only runs on android.

This system is develop for the android smart phone only other platforms does not support to run the “Augmented Reality Based Social Media (OGMEN)” application. So the user should use the smart phone with the Android OS.

- Limited battery life.

Battery should be recharged in regular intervals for reliable functioning of Smart phone

VI. FUTURE WORK

This application is a social media network where the user can share memories with the use of augmented reality. Our application is for social media users who are addicted to travelling as well, with these developments everyday activities are getting technically developed and automated. It makes people depend on technology instead of other people. In this computerized world our project “Augmented Reality Based Social Media (OGMEN)” would be great step to improve the social media. Augmented Reality Based Social Media (OGMEN) expects in the future to provide the following:

- Show the path of the Hotel, tourist place by using the GPS technology
- With the image processing, the description about the place will be displayed.
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REFERENCES

- [1] Tourism Information | Sri Lanka Tourism Development Authority. (2018). Sltta.gov.lk.
- [2] John, J., & John, J. (2018). Impact of Smartphones on the Society - Trffc Media. Trffcmedia.com. from <http://www.trffcmedia.com/topics/impact-of-smartphones-on-the-society/>
- [3] Anabel L., Keeckes , Igor T. (2017). Augmented Reality in tourism Research and Application Overview.
- [4] M. Billingham, H. Kato, I. Poupyrev (2012). The MagicBook - moving seamlessly between reality and virtuality .
- [5] Andrew W. Hobgood, John F. Ebersole, John F. Walker (2012). A motorized camera mount for tracking in augmented reality.
- [6] Anmol Agarwal, Nitish Kumar Sharma, Piyush Gupta , Prakhar Saxena, Rohit Kumar Pal, Siddharth Mehrotra, Prof. Prabha Nair and Dr. Manoj Wadhwa (2014). Mobile Application with Augmented Reality.
- [7] Daniel Wagner, Thomas Pintaric, Florian Ledermann, Dieter Schmalstieg (2017). Massively multi-user augmented reality on handheld device.
- [8] sundaram, V., Vasudevan, S., Ritesh, A., & Santhosh, C. (2015). An Innovative App with for Location Finding with Augmented Reality Using CLOUD.
- [9] Rudiger Pryssa, Marc Schickler, Johannes Schobela, Micha Weilbach, Philip Geigera, Manfred Reichert (2017). Enabling Tracks in Location-Based Smart Mobile Augmented Reality Applications.
- [10] Moon- Hee Park ET.L in 2012, Jin-Hyuk Hong, Sung-Bae Cho (2012). Location-Based Recommendation System Using Bayesian User's Preference Model in Mobile Devices

Section D – Poster Abstracts

Smart Cardio-Oximeter and Notifier system

Bavanthini K., Naseer N., Gunawardana A.P.A. and Fernando S.G.S.

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Abstract — The basis of this project is to reduce the death rate of premature babies in Sri Lankan Government Hospitals. Giving special care to babies is an important role of hospital maternity and PBU units. Especially, premature babies should be under a special care and observation. In this project, the team focuses on immediate treatment in case of emergencies in Sri Lankan government hospitals' PBU units. This research paper describes an efficient Oximeter along with desktop and android applications and to automate hospital management system based on Internet of Things (IoT). In line with that, the project team has observed the PBU unit and interviewed doctors and found that the doctors and nursing staffs are facing problems at night duty time to take care of the babies. Due to this the death rate of Premature babies has increased in Sri Lankan government hospitals compared to other Private and abroad hospitals. To prevent such danger, the project team has done a research and come up with an idea of Smart Cardio Oximeter and Notifier system which helps to give immediate notification and alerts to all users through an android mobile application, a smart oximeter and using a desktop application that controls the whole components. The oximeter development is achieved with the use of a pulse sensor, an Arduino Mega 2560 and GSM/GPRS shield for data transmission. This research paper will provide valuable information on smart Cardio Oximeter and how it will drastically increase the efficiency of giving immediate alerts to the doctors and nursing staffs and reduce the death rate of premature babies in the government hospitals by providing the cost-effective computer aided system.

Keywords — Cardio Oximeter, PBU, Arduino Mega, GPS, GSM/GPRS, Internet of Things, Android.

Dr.H2O - Potable Water Monitoring and Management System

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Abstract — Currently, many organizations of various complexities use water dispensers to provide drinking water for the employees and other stakeholders who visit their premises. The monitoring and managing of such water dispensers is currently performed with much human interference. Moreover, individuals living in a fast moving world are negligent and are not motivated to drink the required level of water recommended by medical practitioners. In order to find solutions for the above problems, a Potable Water Monitoring and Management System was developed. This system uses an Arduino Mega 2560 micro controller together with 2 load cell sensors as the major components to extract the necessary information regarding water level of water cans and employee water bottles. Barcode reader was used to extract employee details from the barcodes embedded in the employee water bottles. According to the facts collected through the literature review, it was found that there were no current systems that detect the water level of water dispensers using load cells. Moreover, there were no efficient methods to track the daily water intake of employees in an organization as well. The purpose of this Potable Water Monitoring and Management System is to provide an easy and efficient methodology to maintain the water dispensers using minimum human interference and to regulate and notify employees about their daily water intake levels. This system also enables the storage and management of details of employees and water can suppliers.

Keywords — Arduino, Water Dispenser, Load Cell, SMS Notification, Barcode Reader

Smart door locking system

L.G. A.M.De Silva, U.P.Kumarasinghe, D.N.Parami, S.M.V.Warnakulasooriya and N.Vithana

Abstract - Today we are living in 21st century where automation is playing important an role in human life. Home automation allow the people to control household appliances. It also provides security. At present Internet of things (IOT) has entered a golden era of rapid growth. It is a concept that aims to extend the benefits of the regular Internet—constant connectivity, remote control ability, data sharing, and so on—to goods in the physical world. Everyday, things are getting connected with the Internet. This concept can be used to manage the security concerned issues in a cost effective way. This paper introduces a system which is being developed to connect a door with Internet, so that the access control system can be controlled from anywhere in the world. In a case that no one is not at home and a visitor is at his door steps and when visitor press the doorbell, and it will generate the signal to Raspberry pi and then camera activate and take the snapshot of visitor and it will send to the owner to through Email. When owner authorize the visitor, he or she can lock or unlock the door using android application. PIR sensor will activate when a person comes to doorstep and detects the human motion send a signal to Raspberry pi. If the authorized person wants to give a message the visitor, it can be sent easily through the Internet and it will hear the visitor through the voice message. The door lock can be controlled through the Internet. With the help of this system an evidence of the visitor can be kept as a record if any emergency case or situation is occurred.

Keywords –Door, Home Automation and Security, Raspberry Pi, Android Application, Internet of Things (IOT), PIR Sensor, Human Detection.

Smart Driver Safety System – Driver Condition Evaluator Before and During the Journey

Rathnasiri T.D.P.L., Keshan N.C., Weerasekara S.N.M.H.N. and Siyambalapitiya S.D.G.C. and Ellepola N.

Abstract – Motor vehicles accidents are becoming a major issue in the modern world. Driving under the effects of alcohol, sleep or stress has been the root cause for the majority of motor vehicle accidents worldwide. Through this research, a compound system is introduced to evaluate a drivers' condition to control a vehicle when he/she starts the vehicle. Methods to evaluate a drivers' mental and physical conditions to drive is implemented in a single system with the aid of multiple sensors integrated through an Arduino and Raspberry Pi chipset within the same system. An output is generated to inform the driver of his/her condition to control the vehicle at that time. The blood alcohol level, Sleep deprivation, raw mental condition and speed will be the main aspects to be evaluated in this system to determine if the driver is able to drive safely. The main expected outcome of the system is to reduce vehicular accidents by determining the drivers' physical and mental conditions and notifying the driver when there are any irregularities against the pre-determined standards.

Keywords: Motor vehicle accidents, mental and physical conditions, multiple sensors, Arduino, Raspberry Pi, blood alcohol level, sleep deprivation, raw mental condition, speed.

Smart Car Safety System

Ahamath M.Z, Jayawardana W.M.K.B, Piyathilaka K.H.P.A.P, Wijesuriya C.L.E, Ellepola N

Abstract –The security of a vehicle is often uncertain, and with so much of innovation in technology, yet it is unpredictable in identifying these catastrophes, and at certain times, these accidents happen when the owner is not around the vehicle, and even if the owner is in the vehicle, most often the person is unaware of certain damages that has happened to the vehicle. Hence the motive of this research is to implement a smart car system that will ensure a level of security of the vehicle and a clear visibility of the status of the vehicle based on sensors and other hardware infrastructure and algorithms. An IOT based approach is proposed to ensure safety of the vehicle by notifying the owner of the vehicle on a real time basis on any damages occurring to the vehicle, identify if the driver is ill or drunk while driving, when unauthorized movement is detected inside the vehicle while parked and when abnormal level of temperature is detected inside the vehicle while parked. Since the process of vehicle monitoring is hardly being implemented in the world due to budgetary constraints, the system proposed by this research can be effectively used to monitor vehicle health

Keywords: Pulse-rate sensor, Conductive paint, Temperature sensor, Motion sensor, Android application, Firebase, IOT

Melodys : Musical Chat Application (Android)

Sudusinghe S.K , Piyatissa M.A.S.U , Aponsu M.R , Peiris K.G.T.S and S.G.S Fernando

Abstract – Over a period of maybe a decade, mobile phones have become the world’s dominant form of communication. The use of mobile phones has seen a vast penetration in most spheres such as education, social media, etc. The forms of communication include voice, video and text. Out of convenience, the majority of communication is done through text messages. Text messages are useful compared to any other form of communication because both users do not have to use the device at the same time when sending messages, and the message can be expressed in a short form. It is convenient to be used to merely inform. But the short form in which text messages are sent cannot sometimes express sentiment, or not enough to emphasize what the user is really feeling. Based on research done, it is clear that many users feel that text messages, even when used with emoticons, are not sufficient for emotional expression. Conversely, music the universal language has the ability to convey emotion with no words understood by everyone. Music has been shown to influence mood and also to alleviate depression when played in the workplace, in babies etc. It is therefore clear that music can be used as a means to express and influence mood even when played subtly. Our goal is to provide a prototype for integrating music with mobile communication to provide a solution to the problem of insufficient emotional expression during text messaging. ‘Melodys’ is a chat application that uses sentiment analysis to detect the user mood from text messages, and to generate a melody based on the analysis. It was developed in the hope that it would bridge the gap of emotional expression mentioned above. It is built on the Android operating system with Python handling server operations. In its form and purpose, it is the first chat application of its kind.

Keywords: Chat application, Text to Music, Sentiment analysis, Music suggestion

Smart Plug

Jayarathne S. S, K.R.A.Dayananda, Dias A.A.K.J, P.H.P.M. Ariyawansa and S. Rajapaksha

Abstract — Due to rising value of energy supplies, the need for managing electrical energy sources becomes prominent. A common home consists of some electrical loads such as lighting, laundry appliances, kitchen appliances, entertainment devices and many other appliances. Home automation allows to control household appliances and also provides security. In the present age the Internet of things (IOT) has entered into a golden era. Everyday things are getting connected with the internet. In this paper a smart plug device is presented, which provides features to switch on/off the plug using a mobile application, to measure energy consumption efficiently, temperature and humidity detection, security features and automatic suggestion as to where the plugs should be placed in any type of room. The smart plug is a power switch which can be accessed via Wi-Fi connection. It integrates a temperature and humidity sensor, a current sensor, IR-emitter, a relay module to switch the socket on/off and a RTC sensor to get the current time and date. An Android-based smartphone application employs standard operation such as Get-and-Post request that return responses to communicate between the remote user and the cloud server. The remote and controlling system use client server architecture using a cloud server to handle commands to control the device.

Smart Medical Assistant

Priyadarshana M.K.P, Dasun A.K.M, Rasanjana G.G.K, Chandrasekera W.M.N.D and S.G.S Fernando

Abstract – Over four million people all over the world suffer from common diseases like Blood pressure, Diabetes and cholesterol. People tend to be busy with their work and have no time to take care of their health, as a result these types of illnesses occur. The project starts by looking at the lack of impact of information systems in the field of healthcare. The user in this project is not a medical specialist but a real user of healthcare, a patient. Most of the elderly patients forget to take their medicine on time. The concerns are used as the basis for discussing a new way of thinking about healthcare in patient perspective answering the main issue. “Smart Medical Assistant” helps to sort this problem by providing options like notifying the patient according to a schedule, keeping track of the pill count and in case of an emergency family member is notified (SOS). As a best way of approach, prototype methodology is used in order to produce a quality product. In particular, the theme of the proposed project is to use the information system for ease of the patients.

Keywords: Information system, Healthcare, Patient, SOS, Prototype.

Akshi – Reader: Reading Device for Visually Impaired

Hettiarachchi G.A., Abeykoon M.M., Maduwanthi J.G.I. and S.G.S Fernando

Abstract – Self reading is a main challenge which visually impaired people all over the world encounter that limit them in social and educational capabilities. Even though many types of researches and products are presented today to assist the visually impaired in many aspects, most of them do not offer assistance in reading. Akshi-Reader is a wearable device; a pair of sunglasses which a camera is setup aided with a Raspberry Pi and a headset connected to it that enables the visually impaired to assist the VI in reading documents where the VI can set the instructions through finger gestures.

Keywords – Visual impaired (VI), image processing (IP), Reading, Convolution Neural Network (CNN), Internet of things (IOT)