WATER INTAKE RECOGNITION SYSTEM BASED ON PRESSURE SENSORS AND BLUETOOTH TECHNOLOGY

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Abstract- Dehydration is a very common problem especially among the elderly people and patients, and monitoring daily fluid intake of a person is vital to avoid dehydration and many other diseases. When we talk about the importance of water, it is an essential element of life. Automating the fluid intake monitoring can help to avoid the risk of losing the recommended daily fluid intake. An automated system can monitor and keep tracking the daily fluid intake and send reminders to the users and guide them towards wellbeing. In this research, a system is developed to help elderly people as well as patients to monitor their fluid intake. The system is developed with a special stand using pressure sensor and Bluetooth and an android application which provides records and reminders. It was observed that the system provides accurate results and it is a low cost solution.

Keywords- Fluid intake monitoring, Pressure sensor, Bluetooth

I. INTRODUCTION

Water is the fundamental element of life. It has proven that the approximately 60 present of body weight consists of water. Our body needs water in all its cells, organs and tissues to manage the body temperature and the functions. (Jequier E, Constant F, Eur J ClinNutr. 2010). Normally, body loses water when breathing sweating and digestion. So, it is vital to get rehydrated by drinking enough water and by eating food which contains much water. The water requirement depends on many factors like, climate, age, health problems and physical activeness. This has proved that drinking water is very important and that it is also important to take a recommended daily water intake. (D. Bunn, F. Jimoh, S. H. Wilsher, and L. Hooper 2014)

(Jaehyoung Yu Harnsoo Han 2008) measured the water level in a river or a tank such as applications related to flood and farming applications. The application that has been built to measure the water level is based on main 4 types such as pressure, heat, image and the 4 supersonic waves.

According to Welch, hydration is important for a good physical health of a person. Liquid intake from drinking water and beverages are major sources of hydration. We tend to forget to drink water because of our busy schedule and that may lead to unwanted problems. In this study, we will be developing a smart system to elderly people and patients to guide them with their daily water intake. The system consists of a hardware unit (smart measure) and an android application.

Pressure sensor is used in order to measure the liquid intake of patients. Then the readings where send to an android application, which will calculate the water consumption, mange records and give alerts. This system is simple, low cost and maintenance-free. Monitoring drinking behaviours of people living at home alone is important not only to ensure that they maintain an adequate fluid intake but also to identify the drinking patterns. This system can easily have adapted to patients to monitor their fluid intake.

In recent years a review of literature regarding the application of various wireless system techniques used in the area of measuring the water level as well as Hardware Design of Wireless Sensor Platforms which have been developed using such Water level monitoring techniques. Significant developments in the area of measuring liquid intake as well as the strengths and weaknesses of existing systems are also discussed the implementing of a remote measuring station in this the remote stations are considered as simple measuring units with a communication interface so that they may be operating under the control of base station. The advantages of this paper are that there are no mechanical parts required, remarkable accuracy and resolution, and disadvantage of this system is the water level monitoring is developed slowly and it required temperature companion (Daniels 2009). According to them they present a method to spot gestures when receiving data through sensors. The method is a natural way of getting continuous signals and is based on two stages. (H. Junker, O. Amft, P. Lukowicz, and G. Troster 2018)

A Wireless system for monitor and control of water level in greenhouse. They had used ZigBee network and several sensors nodes. The advantage is low cost and high network capacity. The ZigBee network for water irrigation control monitoring system. Here they used lots of sensors to monitor the water level of a tank and it was based from the signal that is coming from the sensors. (Morley JE, Miller DK, Zdodowski C, Guitierrez B, Perry HM 1998). According to (B.Y.Lee and B.Y.park, 2008) the pressure sensor is easy to use but it has some limitations where it should be replaced because of a breakdown which may occur by the high water pressure.

According to Zhou when we have to monitor and control the conditions of the environment such as temperature and humidity the main techniques used is WSN. This technique reduces the time when we have to monitor the environmental conditions. Also, the network technology that will be used is called ZigBee. This can be used in mining industry. (Zhou Yiming 2017). Here they use RFID Tags as a wearable sensor device to measure the liquid intake. Also, they use sliding window-based techniques to measure the activities (R. L. Shinmoto Torres, D. C. Ranasinghe, and Q. Shi 2013). In this review we provide the need for water and its importance for humans. Also, there are diseases related to dehydration, and how to monitor the amount of water consumed. (Bar-David Y, Landau D, Bar-David Z, Pilpel D, Philip M. U 1998).

According to Gender when the data has been measured and collected by the sensor the computer then takes the data from the database and monitor to see if the data is accurate, and if it is ready for communication. For this purpose, the computer chip is monitored by a micro controller which can measure the data that is being stored in the random-access memory and the Read only memory and other data monitoring software.

II DESIGN AND IMPLEMENTATION

A. The High-level Architecture of The System

The system is consisting of two parts. The first we design a hardware measuring stand, which is embedded with a pressure sensor, Bluetooth module and Arduino Microcontroller. Then we have developed and android application. The application takes the data from the hardware unit, calculate the measurements and provide user interface. Application is providing information to the users regarding the daily water intake and send them alerts of reminds to take water during the day to meet their requirements. Application also keep the past record to generate reports.

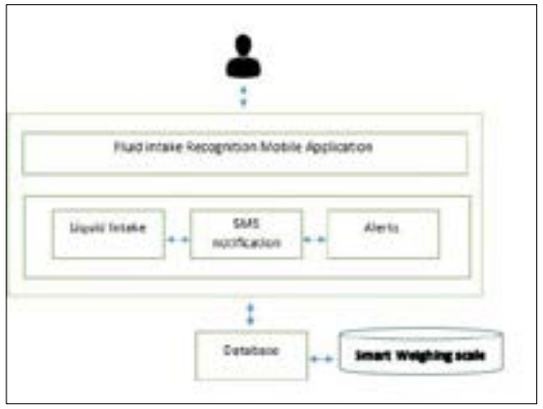

Figure 1. Overall System Architecture

Implementing android application will have the communicating media of a Bluetooth service. Only the registered users will be able to do the Measuring of liquid intake through implemented android application in the media of Weight Sensors.

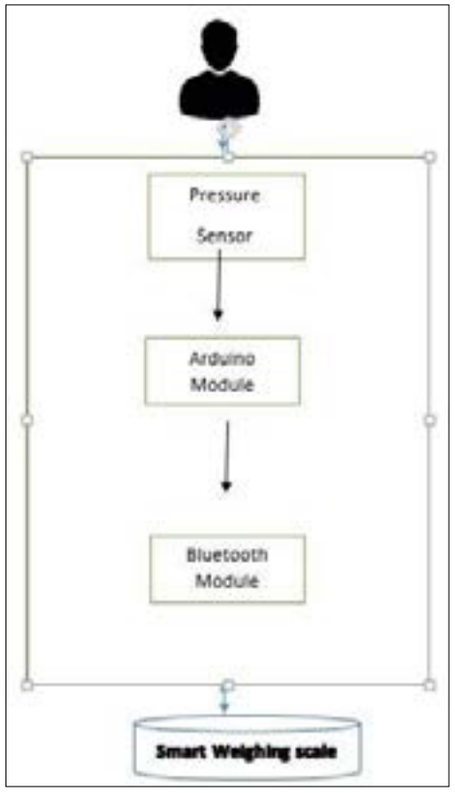

Figure 2. Identified Variables between Technologies

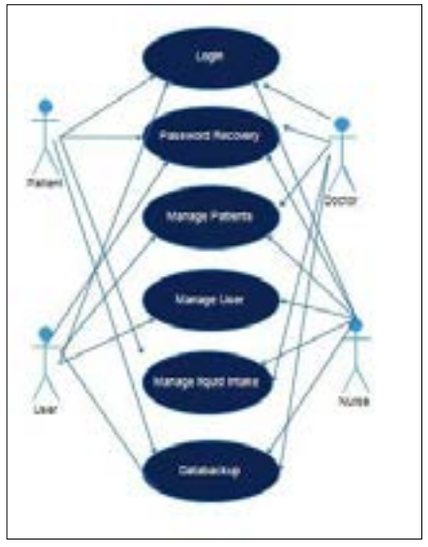

Figure 3. High Level Use Case

B. The design of the system core.

The core of the system is developed using Pressure Sensors, Arduino and Bluetooth Modules. However, the application should consist of user friendly and responsive interfaces which will allow user to access the platform on any mobile device. When we talk about the development of the mobile application, the interface module will consist of two basic Levels to input the data such as The Patient Level and the internal level.The interface will be for the patients to enter their details and check their status, and also the other interface will be for the authorized internal personal to enter the patient's records and see the status of the patients.

Figure 4. Sensor Input Data

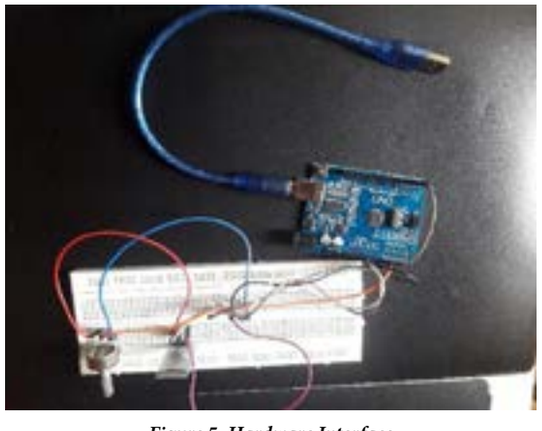

Figure 5. Hardware Interface

III. TECHNOLOGY USED

A. Use of Pressure Sensors

The reason to use the MS5837-30BA for the project is because The MS5837-30BA is because when we use a water proof pressure sensor the human interaction is limited and therefore we cannot get the accuracy of the data in a proper manner. When we talk about pressure sensors it introduces a good and accurate solution to measure the water intake of a person. Even though pressure sensor is easy to use, it also has certain limitations that has to be changed because of the pressure of the water.

B. Use of Bluetooth Module Connection

When we talk about wireless communication the first thing that comes to our mind is the Bluetooth connection. So, in order to communicate with a smart phone, and also in relation to the project we decided to use the Bluetooth module to transfer data from the pressure sensor to the mobile device. The reason to use this Bluetooth module is based on the following facts, such as Bluetooth consumes less energy than Wi-Fi and therefore it is easy to use.

Here we will be using the HC-06 is a class 2 slave Bluetooth module where it is used to transparent wireless serial communication. So, when it is connected to a Bluetooth device such as an android phone the operation will be transferred to the user, and all the data that is being received will go through a serial input and be transmitted over the air. It is easy to transfer data from multiple devices such as in this project, from the sensor you transfer all the date into one smart phone over a short distance.

C. Use of Arduino Microcontroller Technology

For the purpose of this project we used the Arduino – UNO because it can be easily used as both a hardware and software component. This consist of a circuit board and also it is built upon a readymade software called the Arduino IDE (Integrated Development Environment) which can be used to write the upload the code to the computer to the physical board. We need a microcontroller to measure the process from the pressure sensor and send it to the Bluetooth module, as well as to turn the Bluetooth module on and off when required. We use this platform because of its easy to use design development environment.

According to a study by KIipnisit is important to measure and monitor the physical conditions of a patient. When we monitor those conditions, we can get the internal data from the patient's body and get the accurate data of their health. And recognize the symptoms and help us to prevent them from dangerous body failure.

D. Android Studio

In order to make the mobile application we will be using the Android Studio Software in order to design interfaces.

Hardware interfaces are arranged as shown in the figure 5. The Programming Sensor Input are developed using Android Bluetooth Controller integrated with Bluetooth technologies which facilitates the need of responsive interfaces. Figure 4 shows the test data inputs taken by the hardware unit.

IV. HOW SYSTEM WORKS

The prototype model of the smart measure is shown in figure 5. After that we will connecting it to the Arduino using Breadboard and Jumper Wires. Next, we will take all the signals we get from the Arduino and connect it to the Bluetooth Module in order to have the communication with the android phone.

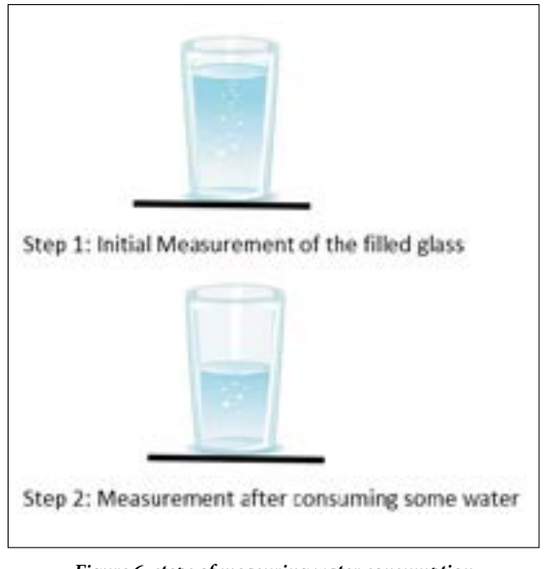

Figure 6. steps of measuring water consumption

Figure 6 shows the steps a person should follows when drinking water. First user has to fill the water and kept that on top of the measure as shown in step 1, then it will record the filled amount. After finish drinking user have to keep the glass on measure record data as in step 2. Then the system will calculate the water consumption using the difference (1 millilitre (ml) of water weighs 1 gram (g)) and keep records. This system automates the water intake, so it will be a great advantage rather than taking and keeping these records manually.

We will be recording all the data in the Database and sending all the relevant details to the mobile application so that every time the user drinks the water he/she will get the notification and the results of his behaviour. We will also be implementing a Mobile Application so that the patient can log on to the application and check the details whenever required. This system can be helped to elderly people who lives home alone, and patients need to monitor their water intakes.

- The users can log in to the system with authentication. Then the user can monitor the liquid Intake and browse the amount of water that they have consumed.
- This will also help the secondary users like gradients or medical officers to follow the records and analyze.

The system will provide the following outputs

- Daily water consumption
- Notifications regarding the remaining needs
- Water intake analysis report

V. CONCLUSION AND FURTHER WORK

When we talk about mobile applications and its development we see that it is one of the most technical future. When we talk about the future of businesses in order to win and live in the society they should always explore and come up with new ideas to improve their business and innovations. When we talk about hardware platforms it will reduce the work of the current users as well as new users and bring out a good solution.

Also, when we talk about good user experience we can use this and extend this to a wide area such as their mobile devices based on their location. Also, we can use this system in hospitals, where it would be easy for the doctors to check the amount of water consumed before being taken to the operation theater. In this study we use pressure sensors and Bluetooth modules to monitor the liquid intake of patients. Here we propose a smart weighing scale where we keep the cup to measure the amount of water consumed per day.

In conclusion we show the efficient and easy method of recognizing the amount of water intake consumed per day in order to have a good fluid balance life, based on pressure sensors and Arduino modules. We believe that this project will be very useful for patients, doctors as well as people who are interested in the medicine field. In future the system can improved to manage records on all types of fluid taken buy a person. This also can be modifying and improve to use in hospitals to monitor liquid intake and the output to create balance charts to help many patients.

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