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WEB BASED SERVICE FOR DIABETES PATIENT MONITORING SENSORS

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WEB BASED SERVICE FOR DIABETES PATIENT MONITORING SENSORS

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Abstract- Diabetes mellitus is a major cause of blindness, renal failure, amputation, heart attacks and stroke. For a diabetes patient, many factors are to be considered. Change in the meal may cause unpredictable changes in blood sugar levels. The diabetes patient monitoring considers these factors and proposes a solution using the sensors like glucometer sensor, blood Pressure sensor and the RFID tag with arduino given to the individual patients. The internet of things integrates many technologies, such as Internet, Zigbee, Bluetooth, infrared, Wi-Fi, GPRS, 3G, etc., This paper provides low cost global connectivity between the patients personal device and the patient's web portal that updates the personal details, drugs remainder and the blood sugar level. When there is an increase, an automatic update is sent by a phone call or an SMS to the personal doctor.

Keywords- *Arduino-Diabetes - Internet of things – Sensors – RFID*

I. INTRODUCTION

Diabetes mellitus is a metabolic disease, more approximately a discloser of fuel metabolism. It is the third leading cause of death in many developed countries. Diabetes mellitus is broadly divided into 2 groups, namely insulin – dependent diabetes mellitus (IDDM) and non-insulin dependent diabetes (NIDDM)[4].The IDDM, also known as type I diabetes or juvenile onset diabetes, mainly occurs in childhood(particularly between 12-15 years age).IDDM accounts for about 10to 20% of the Known diabetes. This disease is characterized by almost total deficiency of insulin due to destruction of b-cells of pancreas.

The b-cell destruction may be caused by drugs, viruses or autoimmunity. The patients of IDDM require insulin therapy. NIDDM, also called type II diabetes or adult-onset diabetes, is the most common accounting to 80 to 90% of the diabetic population. NIDDM occurs in adults (usually above 35 years) and is less severe than IDDM. The patients of NIDDM may have either normal or even increased insulin levels. It is suggested that over-eating causes increased insulin receptors. This is based on the fact that weight reduction by diet control alone is often sufficient to correct NIDDM. RFID identification in order to load a patient's profile from the personal health card, using serial communication based on RS232 and IrDA to connect the glucometers from different vendors.

Now, diabetes is a major problem because many are affected by the disease. It is curable when it is diagnosed before reaching the danger zone; otherwise it becomes a serious issue. There is a need to find the blood glucose level and the sugar level in the blood. Daily meditation and regular diet will keep the disease under control. The diabetes management web portal and glycemic index database are included. Professional support is essential for the patient. Psychological help for diabetes patients is also very important. Knowing how to deal with the pressure and stress in daily life situations is very relievable for patients [1]. Advisors are available to assist members by viewing their health history and by answering their questions regarding their health condition. Also, email notification for appointments, services for rescheduling or canceling the appointments, services for requesting prescriptions, and access to other health resources [2].

This service provides members with necessary information about their disease. It is very important that patients know as much as possible about the disease. Knowledgeable patients tend to adapt easier to effective measures of disease control and prevent complications. The frequently asked questions module provides answers to various questions patients usually ask. Dietary guidance is the most often topic of interest. Proposal of daily meals are also suggested. It is very important for information to be well organized and easily accessed in order to achieve its value.

II. SENSORS SUPPORT IN DIABETES PATIENT MONITORING

This service facilitates registration of new members, people with diabetes, their family members, or anyone else with an interest in the disease. The user has to fill the registration form with their private information and choose the account's username and password. Once the information is conformed and the registration is successful, the user can login and use the opportunities that other services offer. Management of the user profile entered during the registration is mandatory .It is important to enroll their sensor reading automatically.

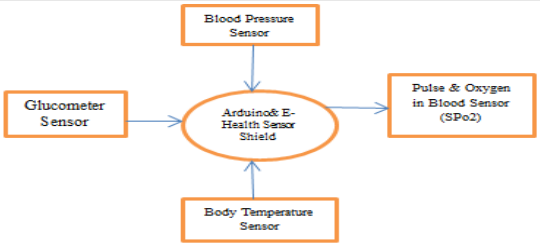

Figure 1: Sensors to be deployed on Diabetes patients

Fig 2.1 describes the sensors that have to be attached with the diabetes patient and the RFID tag that has to be connected with the patient's hand. The patient must be in their home or in a hospital that has to be monitored wirelessly with the internet of things

1. Arduino –It is a microcontroller which is open source electronics to make things more flexible and more accessible to develop the multi-disciplinary projects
2. E-health Sensor Platform - It allows arduino to perform biometric and medical applications where the body monitoring is needed by using different sensors based in their needed
3. Body Temperature Sensor- Used to measure the current temperature of the body
4. Pulse and Oxygen in Blood Sensor (SPO2), - Used to measure the pulse level and amount of oxygen content available in blood
5. Glucometer sensor- It is a medical device for determining the approximate concentration of glucose in the blood. A small drop of blood, obtained by pricking the skin with a lancet, is placed on a disposable test strip that the meter reads and uses to calculate the blood glucose level.

III. PROPOSED SYSTEM

The Blood Pressure sensor, Glucometer Sensor, Pulse and Oxygen Sensor, Body temperature sensor must be connected with the body of the patient and the corresponding readings are to be monitored using the arduino and E-Health Sensor shield. Every time the user logs into the web page, it has to verify the login id and password using RFID tag. Then the measurements are automatically updated. The readings are measured by the sensors that are fixed on the body which communicates with the concept of internet of things.

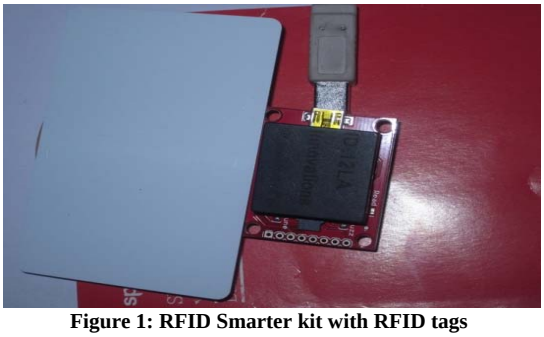

Figure 1: RFID Smarter kit with RFID tags

The Figure 1 displays the RFID smarter kit this is only allows the user to get login into the web portal. The RFID tag ID number is entered in the database every time the user login to the web page the corresponding ID valve available in the database will be verified and then allow them to login to the web portal for updation of sensor readings .

In that the sensor are deployed in the diabetes patient by using the arduino and E-health sensor shield the measurements to be taken from the diabetes patient and then compared with the database finally the observed reading is normal then update it otherwise the sensor readings above the normal level then automatically it will send a message and the phone call to the personal doctor to the patient.

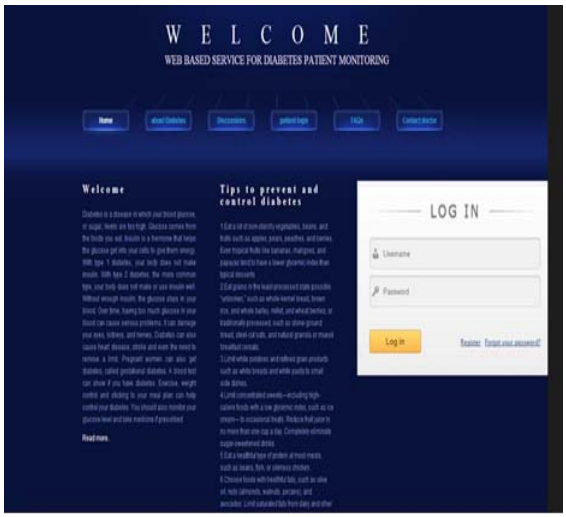

Figure 2.Welcome page with user login

Then the collected information is updated into the website for Diabetes patient management. If the glucose level increases, then automatically a message and mail are sent to the allocated personal doctor [3]. Only in case of emergency, the mail and message are sent from the web portal.

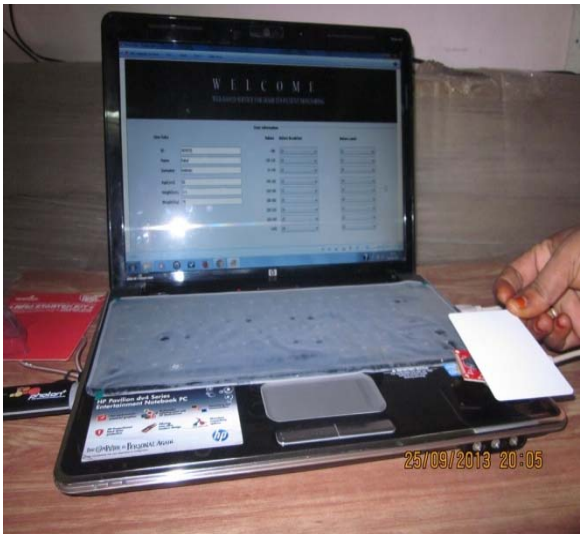

Figure 3: Read RFID tag and login

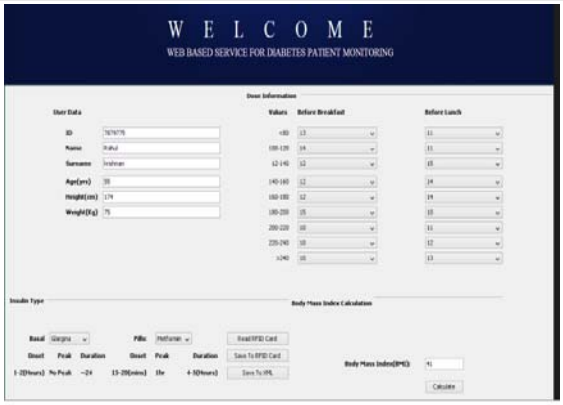

Figure 4: via RFID tag login and automatic updation of sensor details

In that web portal there is a need to enroll the information about the diabetes patient. And then the RFID tag will be given to the individual user in the hospital to continue their updates of their blood sugar level, glucose level and the body temperature by using an Arduino micro controller with the E-Health Sensor Shield available.

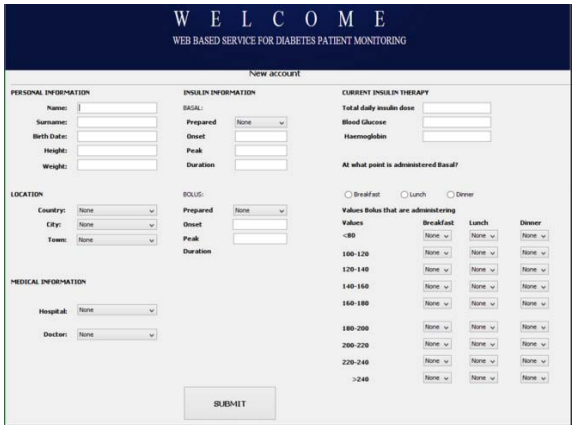

Figure5: Automatic updating of sensor data from the sensors

Finally the online web based service for diabetes patients who are registered for the online web portal and the registered using must allow login using the RFID tag that only will permit to update the sensor data information that measured from the corresponding diabetes patient.

IV. ARCHITECTURE TO SUPPORT DIABETES PATIENT MONITORING

The architecture diagram describes the overall process of the diabetes patient monitoring. First we have to deploy the sensors on the diabetes patient's body by the monitoring service. Then the measurements taken are to be updated into the database. The deployment of the mentioned sensors are to be used to monitor glucose level, pulse and oxygen in blood, blood pressure ,body temperature, and ECG of the diabetes patients, these measurements are also updated into the database[1].

After two hours from taking a meal, the sensors are to be activated and the measurements are taken. Then the RFID tag is read after which the diabetes patient can login to the web service provided The default measurements are to be entered into the database in the beginning

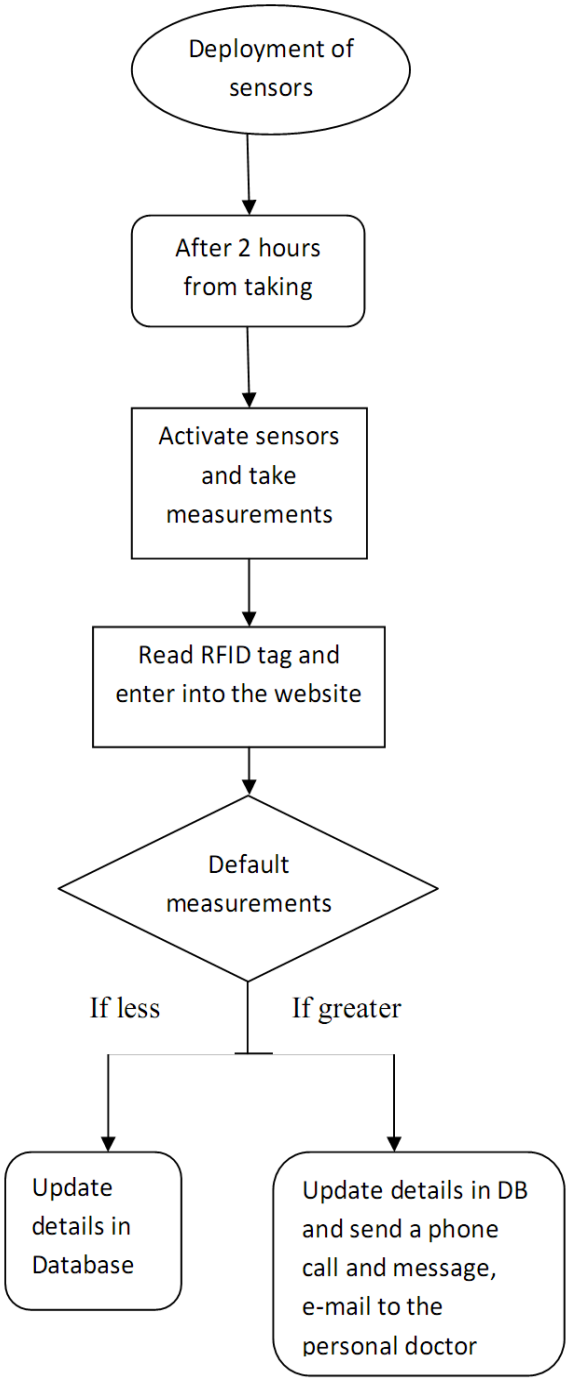

Fig 3.1 Architecture diagram for diabetes patient monitoring

Every time the measurements are updated by the diabetes patients, the calculation is done. If the measured values are greater than the normal value then the glucose level is high and an automatic phone call ,Short Message Service (SMS), and email are to be sent to the personal doctor[4].

The drugs and the general care about the patients are also to be contained in the website designed for the diabetes patient monitoring. This process is done by internet of things because it will integrate many technologies so that the time consumed to send the automatic phone call and SMS to the personal doctor is quick because of the emergency involved. The RFID tag provides the security to the individual diabetes patient. The source of blood glucose during a normal day (24 hours) is given [5].

Glucose is primarily derived from glycogenolysis between the meals. During day time, gluconeogenesis may be more or less active, depending on the frequency of consumption of snacks, coffee, tea, fruit juices etc. After testing is done, if the measured value is greater than the defined glucose level then automatically the phone call has to be generated to the personal doctor.

Daily the patient details are updated. If the user forgets to take a meal, then a message will be sent to the particular user and it updates the sensor readings in the web portal at a particular time interval, also there is a discussion about their doubts and clarifications

V. DIABETES MANAGEMENT AND HEALTHCARE

Diabetes is a disease where blood glucose levels are above normal, the Environmental factors, physical inactivity and genetic factors are the causes. A personal device has been developed to assist and

Considered factors in the insulin therapy dosage calculation.

Table 1: Difference between type1 and Type 2 character

Character	Type 1	Type2
Age at onset	Less than 20yrs	Above 30 yrs
Body weight	Normal or low	Obese
Prevalence	10-20% of diabetic population	80-90% of diabetic population
Duration of symptoms	Weeks	Months of years
Administration of insulin	Always required	Not necessary
Oral hypoglycaemic drugs	Not useful for treatment	Suitable for treatment
Diabetic complications at diagnosis	Rare	Found in 20% cases
Plasma insulin	Absent or decreased	Normal or increased

A wireless identifiable device which is used for diabetes monitoring steadily measures blood sugar levels. This is informed by the RFID tag, which is then added into the web service, when it is about to reach a critical status via a smart phone equipped with a built-in IOT communicator that allows it to connect to web service. [1]

VI. CONCLUSION

The internet of things is an interesting approach for healthcare applications and the new amalgamated concept of Internet of m-health Things (m-IOT) has been introduced. The solution is to support a patient's profile management based on personal RFID cards and provide global connectivity between the patients and the web service .The security concepts must be implemented in the future work of this paper so that the diabetes patients details are to be kept as secret. The drugs remainder and the discussion portion will be included in the design session. By this the diabetes patients can consult with a doctor and can clarify their doubts

.

FUTURE WORK:

This work is to be improved in the security aspect between the diabetes patients who access the same web portal for sharing and gathering information communicating in the wireless network interphone. Smart phone is used set as an immediate alarm. A phone call or an alert SMS is sent to the personal doctor and the GPS location of the patient in case of emergency. The nearest energy center is alerted and it dispatches an ambulance.

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