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A Modular approach to diabetic examination with alert system based on IoT

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Abstract- Diabetes is a chronic disease which when not monitored from time to time can be life threatening disease. Diabetes can be controlled only if the blood glucose level of the affected person is constantly monitored and proper care is given from professionals. The roles in our system include patients, physicians and home care assistants. Each of the roles uses a mobile device with GSM module or a mobile phone to communicate with the server so that there are no boundaries or restrictions for the patient. Our system uses a non invasive method i.e., there is no need oh any needle's or pricking for checking sugar level in the body. For mobiles with Bluetooth and Wi-Fi communication capabilities used by the patients, an algorithm is developed to recognize physiological signal that were built-in in the mobile phone without affecting its original purpose. Our system provides alert management by using an automatic urgency strategy through GSM module. The alert message is sent in severe cases when the patient requires immediate attention. The alert message is sent to the close relatives like guardians of the patient and to an ambulance in worst case scenarios. The alert messages are done to improve the patient's experience. Our system not only provides alert messages but can also provide dietary plans for the patients, amount of insulin to be taken. The tests have shown that our system can provide a better assistance to the patients suffering from diabetes.

Keywords – Non Invasive,Insulin, GSM Module.

I. INTRODUCTION

According to the statistics, the diabetes mellitus, or diabetes, has become the fifth among the top ten causes of death in Taiwan. Diabetes not only can cause death, but also can cause various acute and chronic complications such as hypoglycemia, infections, and major pathological changes in nerve, retina, and kidney systems[1]. It has caused the uprising of expense of medical treatment and the decreasing quality of life of the patients[4]. To effectively prevent and control diabetes which is such a complicated chronic disease, good blood glucose monitoring and control, and the support of health education and professional medical care is needed.

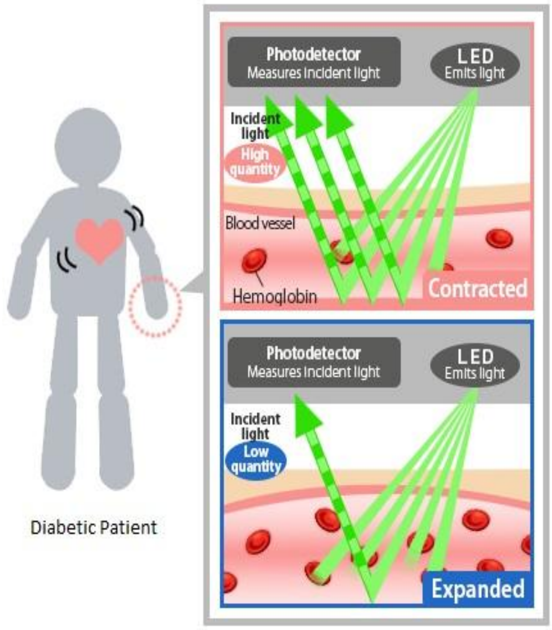
If the patient isn't hospitalized, then the sugar level of the patient isn't constantly monitored which may lead to not so effective treatments[2][3]. The communication interchange between the doctor and patient is not sufficient as the patient may forget some important problems to mention and indirectly adding up to ineffective treatment. This is where the telecare system comes in handy it utilize information and communication technology, thus proper care can be given to remote patients[5]. It is important to patients who need not be hospitalized but should be monitored over a long period of time. With the development of technology in the field of communication, mobile communication devices can now provide more efficient and convenient services such as remote information interchange and resource can be accessed from anyplace and at anytime with ease[7]. Our system uses a non-invasive method to detect body glucose level. Non Invasive method does not use any sort of syringes to check glucose level in blood. Our method of non-invasive uses Body Mass Index and received light intensity to calculate the amount of glucose present in blood[8].

II.METHODOLOGY

With the help of internet, it is easy to share files over a longer distance, the files can be accessed from any part of the world without complexion. Internet of things is thus helpful for us in many ways as mentioned above. In this paper, the monitoring of sugar level is made easy so that the patient does not have to suffer. The front end of our system include a mobile phone or and communication device with Bluetooth connectivity and GSM module.

In this paper, the system we use doesn't involve any sort of pricking or needles that is the is no blood involved like in most of the cases, the blood is taken to check the sugar level in blood but in this case we do not have to do so. We use light and Body Mass Index to detect the sugar level in blood hence there is no needles involved hence the experience of patient is increased.

Firstly we create a electronic nose like the IR pulse detector used in hospitals for the detection of pulse instead what build is used to detect sugar level in blood. Both work on the same principle that is the amount of light transmitted and the amount of light received. The IR pulse detector is put on the tip of index finger or the middle finger. The electronic nose we create put in the gap between the thumb finger and the index finger of the patient whose sugar level must be tested. We the thumb and index finger webbing because is the thinnest muscle in the body and we can also transmit and receive the IR radiation easily without and losses.

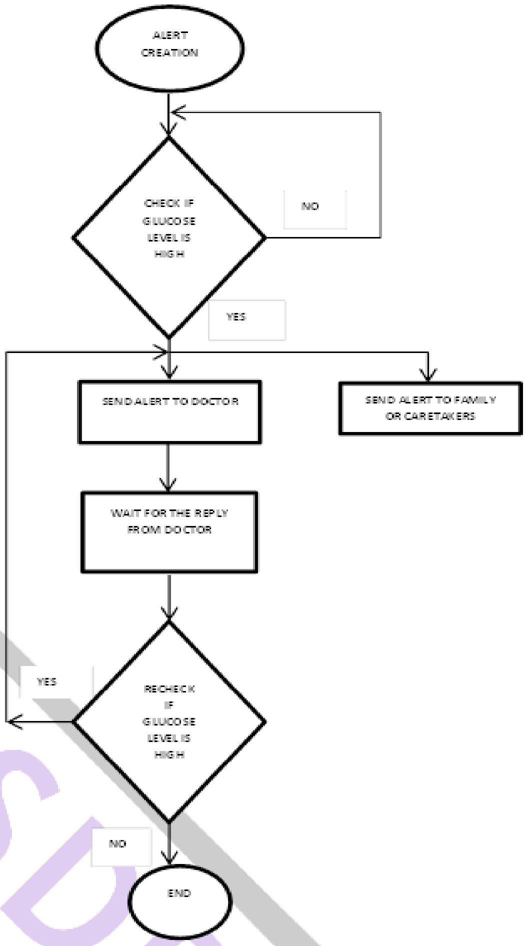


III. WORKING OF ELECTRONIC NOSE

The electronic nose consists of two parts the transmitting end and the receiving end. The transmitting end consists of a IR transmitter which emits IR radiations into thumb and index finger webbing and the receiving part consists of a photo diode that detects the wavelength of IR radiation received. The wavelength and the amount of IR received along with the body mass index will give us the sugar level of the patient. When the IR radiations is passed into the webbing, amount of radiations get absorbed inside the body and the wavelength of the IR transmitted is not equal to the wavelength of that of the received when matched with BMI, the sugar level is found.

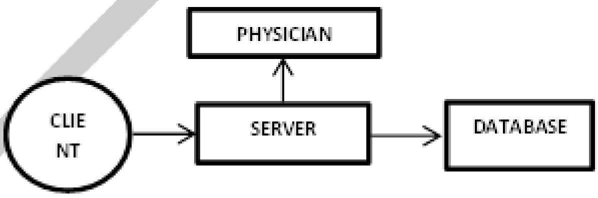
IV. ALERT MECHANISM

After the sugar level is detected in electronic nose, the data is transmitted to mobile through Bluetooth. After the value is transmitted to the app mobile, based on the value of the sugar level the dietary plan is given through the application. The dietary plan for a particular sugar level is given based on the algorithm. All the data is stored in cloud or the server through the application in mobile so that the data can be useful in the future when required.
If the glucose level of the patient is severely high, then another algorithm is triggered and a alert message along with the sugar level sent to physician and to the family people or the care givers through GSM module telling that there is an emergency.



V. BLOCK DIAGRAM

The methodology for the system is detailed in this paper now, the block diagram shows that a server is required to send the necessary details from the application created. The application gets the information about the blood sugar level from the electronic nose put in the thumb and index finger webbing through Bluetooth connectivity.



A database is created so that all the data from the patient gets saved so that it can be used in further so that the physician can use it in the case of emergency. The serve is the most important part in our system because it sends the alert message to the physician when the glucose level in blood is high so that the patient can follow the instructions of the physician. A alert message is sent to the caregivers also that they can be prepared for any emergencies.

VI.CONCLUSION

It is important to monitor and record the parameters such as blood pressure, heart rate of the patient as the base data and to check if the patient is sick or is recovering from illness and also to check if the patient is responding for the given treatment. It is usually the case when the patients go for a self-healthcare or go to the hospital after feeling uncomfortable that often greatly increases the possibility of accidents. In addition, currently, most healthcare devices are of large form factor and are for limited healthcare area, which would reduce the desire of usage and quality of everyday life of the patient. The concept of mobile care service is, thus, to overcome the foregoing restrictions to reduce the volume of healthcare devices and to prevent interfering with patients' daily life and still be able to provide long-term monitoring healthcare services. We thus propose to use a commercial mobile phone as the processing core for symptom recognition and alert message generation in collaboration of physiological signal extraction devices with wireless transmission capability and back-end healthcare center as a platform for message processing and data storage to construct an intelligent mobile care system with alert mechanism.

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