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IoT Based Telemetry System for Biomedicine

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Abstract :- **— This project presents the latest invention in the field of electronics, a telemetric system based on Internet of Things (IoT) which can be used to track bed-ridden patients. It provides a device which can be used to monitor the patients health. Continuous observation of the patient thus becomes possible. In todays world of automation, biomedical aspect of engineering is fast picking up. Biomedical electronics has benefited greatly due to advancements in engineering. It has made doctors more efficient and brought fast pace to delivery of service. Doctors are hence aided by the patient monitoring systems for supervision of patients. This system also helps family members to keep upto- date with patient's health. It would act as a virtual nurse by constantly updating information on cloud server. It provides information regarding Beats Per Minute (BPM) of the heart. Similar to systems used in hospital, this same system can be used by anyone, even those not under observation, to keep track of their vital signs with the use of sensors. In this project, if sensors output starts fluctuating above normal rate, then an emergency message would be sent to a doctors/family members phone. Also it constantly updates the same on a cloud platform.**

I. INTRODUCTION

One of the most important machines which is constantly connected to a patient is the vital signs monitor. A normal heart rate is checked constantly with the help of heart rate monitor. Serious diseases could be prevented by early detection of abnormal heart rate. Range of heart beat is first determined. This range of heart rate should be compatible with the normal rate to ensure perfectly healthy heart. Such digital display of a patients heart rate did not give the ease as well as convenience to the patients or the doctor.

Hence in this project, we would like to present with the latest technology, the novel biomedical way for reading heart rate of the patient. An LED display is used to show the reading of the sensor. The technology of Global System for Mobile Communication (GSM) is used incase if any abnormality is detected in the heart rate. The proposed innovation will be programmed to automatically detect about their health conditions. In this research work, we made use of sensors for measuring heart beat rate with real-time monitoring system based on WiFi network. An Analog to Digital Converter (ADC) is used to convert the readings into readable form.

A package containing ARM controller hardware and GSM module are then used to send immediate and quick feedback to doctor/family member. This system can also be used by people who are not under the continuous observation of doctor to check their health.

The main motivation behind this project is that the hospitals nowadays are filled to the brim with patients, the medical infrastructure is stressed to the limit of breakdown and the field of electronics can be used to bring about some respite in this field. Also the poor and needy people would greatly be benefited from this and the bed ridden patients would be given respite from constant hospital visits.

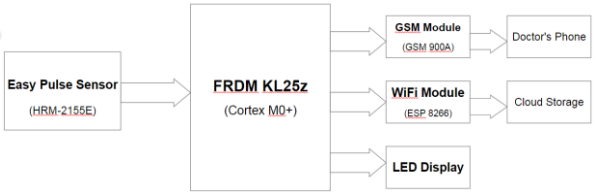

Fig. 1. Block Diagram

II. SYSTEM ARCHITECTURE

The hardware design consists of the following: Easy Pulse Heart Beat Sensor. This sensor is connected to the FRDMKL25z board (LPC2148). This controller is further connected to GSM module (SIMCom SIM900A), an LED display and a Wi-Fi Module(ESP8266) for IoT

- The sensors check for Heart Beat and Blood Pressure readings.
- The FRDM is used for interfacing and coding.
- The GSM Module is used for sending info to cell phone.
- The WiFi module is used to update the database.

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1) Diagnosis Module: Heart Beat Sensor: Easy Pulse Heartbeat sensor is used in this project. It gives output in digital format when a finger is placed inside it. The heartbeat sensor works on the principle of photoplethysmography (PPG). This technique can be used to calculate any change in blood volume as it is synchronous to heart beat. Transmittance and reflectance are two basic types of photoplethysmography. For the transmittance PPG, a light source is emitted in to the tissue and a light detector is placed in the opposite side of the tissue to measure the resultant light. There would be changes in blood volume due to beating of heart. Hence it would cause fluctuation in the detected light that is reflected from or transmitted through the body part. This output is in Analog form. It is then converted into digital output that can be connected to micro-controller directly to measure the Beats per Minute (BPM) rate. This output can be graphically presented for measuring BPM.

2) FRDM-KL25Z: The FRDM-KL25Z has been designed by Freescale in collaboration with mbed for prototyping all sorts of devices, especially those requiring the size and price point offered by Cortex-M0+ and the power of USB Host and Device. It is packaged as a development board with connectors to break out to strip board and breadboard, and includes a built-in USB FLASH programmer. It is based on the Freescale KL25Z, with a 32-bit ARM Cortex-M0+ ore running at 48MHz. It includes 128KB FLASH, 16KB RAM and lots of interfaces including USB Host, USB Device, SPI, I2C, ADC, DAC, PWM, Touch Sensor and other I/O interfaces. The FRDM-KL25Z is fully supported in the mbed platform, so it gets access to the free tools and SDK that provides experienced embedded developers with powerful and productive tools for building proof-of-concepts. For developers new to 32-bit microcontrollers, mbed provides an accessible prototyping solution to get projects built with the backing of libraries, resources and support shared in the mbed community. The C/C++ Languages can be used for programming the board.

3) GSM Module (SIM900A): This is a very low cost and simple Arduino GSM and GPRS module. We use the module SIMCom SIM900A. Its cheaper than other modules. It can be used with FRDM to make calls or recieve text messages. The module supports communication in 900MHz band. It has a relatively tiny configuration of 24mm x 24mm x 3 mm, so the SIM900A would be able to fit into any space requirements in varied applications, especially for slim and compact demand of design.

4) WiFi Module: The ESP8266 WiFi Module is used here. It is a self contained SOC with integrated TCP/IP protocol stack that can give any micro-controller access to your WiFi network. Hosting an application or offloading Wi-Fi networking functions from another application processor could be done with this module. An AT command set firmware is pre-programmed into every ESP8266 module. Hence, you can simply hook this up to your ARM device and get about as much WiFi-ability as a WiFi Shield offers (and thats just out of the box)! The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.

III. SOFTWARE DESIGN

The program embedded on the micro-controller is written in Embedded C. The program contains the following: Conversion of analogue signals (heartbeat) to digital values and Indication of abnormal rate. Packetization of the collected data, and the transmission of them through the serial communication interface is also done.

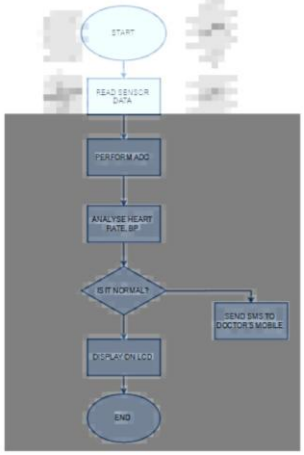

Fig. 2. Flow Chart

The Algorithm is as follows:
Step 1: Start.
Step 2: Initialize the variables.
Step 3: Enable the sensors and take heart rate and blood
pressure readings.
Step 4: Readings are checked for levels.
Step 4.1: Are the readings normal:
YES: No action taken.
NO: Activate GSM module to send SMS.
Step 5: Update data over cloud at regular intervals.
Step 6: Stop.

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IV. ADVANTAGES AND DISADVANTAGES

1) Advantages:

- Since it is made from cheap and easily available products, the easy of use is apparent.
- Could be made available to rural or low income households with next to no cost.
- Many more modules (like Temp Sensor, Alcohol detection module etc) can be added to increase its use.
- Can be easily reproduced.
- Scalability of the product is high since it uses easily available parts.

2) Disadvantages:

- Power dissipation can be decreased with use of a powerful board.
- Lack of wireless connections makes it prone to tangling and loose connections.
- Needs internet, which might not be easily available everywhere.

V. OBSERVATIONS AND RESULTS

The blood pressure module will work in the following manner:

- Module goes through a power-on reset (ROM, RAM, A/D, and Calibration Tests).
- Host system issues START BP command.
- Module begins a blood pressure measurement.
- Host system repeatedly sends the GET PRESSURE command(Module will reply with actual cuff pressure) while the BP reading is in progress.
- Module notices the Host system that the BP measurement is finished.
- Host system issues GET DATA command.
- Module responds with BP data values (systolic, diastolic, etc).

Fig. 3. IoT Output

Heart beat sensor module also works in a similar way. The output of GSM message feedback is shown in Fig. It gives the details of the Patient health periodically to the registered mobile number. After conversion of signals by the on-chip Analog to Digital Converter (ADC), the GSM module is activated if the readings are abnormal. The WiFi module transmits the data over cloud every time a reading is taken, irrespective of abnormality.

Fig. 4. GSM Output

VI. CONCLUSION

Hence the proposed system can remotely access the vital readings of a patient as well as keep track of the same from time to time. Along with being cost effective, compact and extremely handy, the chief purpose of the system, that of reducing stress on hospitals and rendering costly blood and ECG Tests redundant, is also achieved.

VII. ACKNOWLEDGMENT

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REFERENCES

[1] D.Chandana, B.Hema Latha A Tele-medicine System for Measuring Heart Rate, Blood pressure, And Drug Level Detection, CVSR College of Engineering, JNTU, Hydrabad, Aandhra Pradesh, India Volume 2, Issue 1, 2014

[2] Hofmann, Christian, Wireless medical sensor network with ZigBee, vol.5, WSEAS Transactions on Communications, no.10, October, 2006, p1991-1994R.

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[3] Kareti S., G.Manikumar N.Suresh Babu,"GSM Based intelligent wireless mobile patient monitoring system using ZIGBEE communication.", Department of Electronics and Communication Engineering, Chirala Engineering College, Chirala., 2013, 1.
[4] Swati Y.Gaikwad, Prof. Ms. Revati Shriram , "Blood pressure and ECG monitoring system" Journal of Engineering Research and Studies", JERS/Vol. II/ Issue IV/October-December, 2011/120-125.
[5] Wireless Patient Monitoring System Using GSM, BY B. Purna V. Subbarao , L. Chandarashekar V. Santhisri, 2012,V.R.S. Y.R.N. College of Eng Tech., Chirala, 2012.
[6] Mr. Sunil L. Rahane , Prof. Ramesh S. Pawase, "Human body monitoring system using WSN with GSM and GPS", Department of E TC Amrutvahini College of Engineering, Sangmaner, India, Vol.5, No.7, pp. 61-74, July 2010.