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A Novel Approach to Monitor Health condition Using Android Application

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Abstract: ***The spontaneous and accurate decisions in the care of patients are very much important for their better treatment. So in this paper, I am presenting a method of monitoring patients using an application installed on it. The sensors are kept in contact with patient's body. The output of these sensors is processed via the Arduino Uno board. These processed data are displayed on the android device using the Bluetooth module. These data are also stored in the database from the android application. The doctors' and patients' details are also stored in the database. So all the measured biological parameters of a particular patient will be stored in the database. The doctor can access the patients' history as an where required.***

Keywords: Arduino-Uno, Android studio, Bluetooth module(HC-05), Temperature sensor(LM-35), Accelerometer(ADXL-335)

1. Introduction

In hospitals usually, the doctors and nurses need to be physically present in front of patients to check them regularly, write down the patients' condition on the papers and have to store these papers. There are also some systems in which these measured parameters are sent via the SMS using GSM. But in that case, the SMS will be sent if and only if the particular value falls below the threshold value. It does not look physically reliable.

As a solution to the conventional system here, I am trying to develop more efficient, user-friendly system. The system can be divided into 3 parts.
1) Embedded part
2) Android part
3) Database part

In embedded part, I interfaced the 2 sensors with Arduino Uno board. One of it is temperature sensor LM35.It is used to measure the body temperature of the patient. For the weak patient, it is very much important to see that the patients have not fallen. To check this here I am interfacing accelerometer (ADXL335) which informs about the patients' condition i.e. whether it is fallen or normal. The output of this sensor is processed via the Arduino. The output of Arduino is serially transferred to the Bluetooth module HC-05.

The Database is created using MySQL. In this database, we added the doctors' and patients' details. The database is also used to store the measured parameters of a particular patient. So, in short, this database is used to store the data in it and to fetch the data from.

In android part, I developed the android application using the android studio. This android application is specially designed for the doctors/nurses. In android application, I developed the different UI screens. The first screen is the login screen which asks for the username and password. After login the doctors/nurses able to see the list of patients. This list is fetched from the database in which we have already stored the various information. On clicking the particular patients' id he will be able to show the previously measured parameters. On clicking the current button he will be able to see the current report of the patient. And this current report will now be stored in the database. And the database will be kept at the server side.

2. Hardware Requirement

- Arduino Uno
- Temperature Sensor(LM-35)
- Accelerometer(ADXL-335)
- Bluetooth Module-(HC-05)

2.1 Arduino Uno

Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.[5]

2.2 Temperature Sensor (LM-35)

The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly proportional to the Centigrade temperature. The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 device does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full −55°C to 150°C temperature range. Lower cost is assured by trimming and calibration at the wafer level. The low-output impedance, linear output, and precise inherent calibration of the LM35 device make interfacing to readout or control circuitry especially easy.

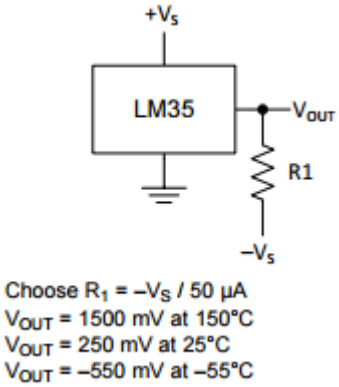

Figure 1: Testing Full range Centigrde Temperature Sensor

The device is used with single power supplies, or with plus and minus supplies. As the LM35 device draws only 60 µA from the supply, it has very low self-heating of less than 0.1°C in still air. The LM35 device is rated to operate over a −55°C to 150°C temperature range, while the LM35C device is rated for a −40°C to 110°C range (−10° with improved accuracy). The LM35-series devices are available packaged in hermetic TO transistor packages, while the LM35C, LM35CA, and LM35D devices are available in the plastic TO-92 transistor package. The LM35D device is available in an 8-lead surface-mount small-outline package and a plastic TO-220 package.[6]

2.3 Accelerometer (ADXL-335)

ADXL335 is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs. The product measures acceleration with a minimum full-scale range of ±3 g. It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration.

The user selects the bandwidth of the accelerometer using the CX, CY, and CZ capacitors at the XOUT, YOUT, and ZOUT pins. Bandwidths can be selected to suit the application, with a range of 0.5 Hz to 1600 Hz for the X and Y axes, and a range of 0.5 Hz to 550 Hz for the Z axis.

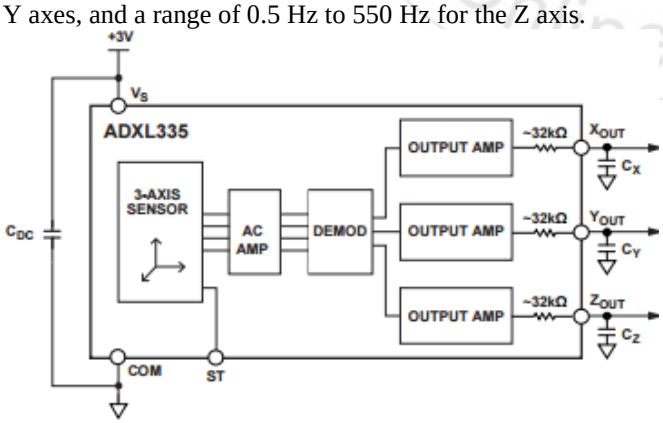

Figure 2: FUNCTIONAL BLOCK DIAGRAM

The ADXL335 is available in a small, low profile, 4 mm × 4 mm × 1.45 mm, 16-lead, plastic lead frame chip scale package (LFCSP_LQ).[7]

2.4 Bluetooth Module (HC-05)

HC-05 module is easy to use Bluetooth SPP(Serial Port Protocol)module, designed for transparent wireless serial connection setup. The HC-05 Bluetooth Module can be used in a Master or Slave configuration, making it a great solution for wireless communication. This serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR(Enhanced Data Rate)3Mbps Modulation with complete 2.4Ghz radio transceiver and baseband. It uses CSR Bluecore 04-External single chip Bluetooth system with CMOS technology and with AFH(adaptive Frequency Hopping Feature).[8]

Figure 3: Bluetooth Module

3. System Block Diagram

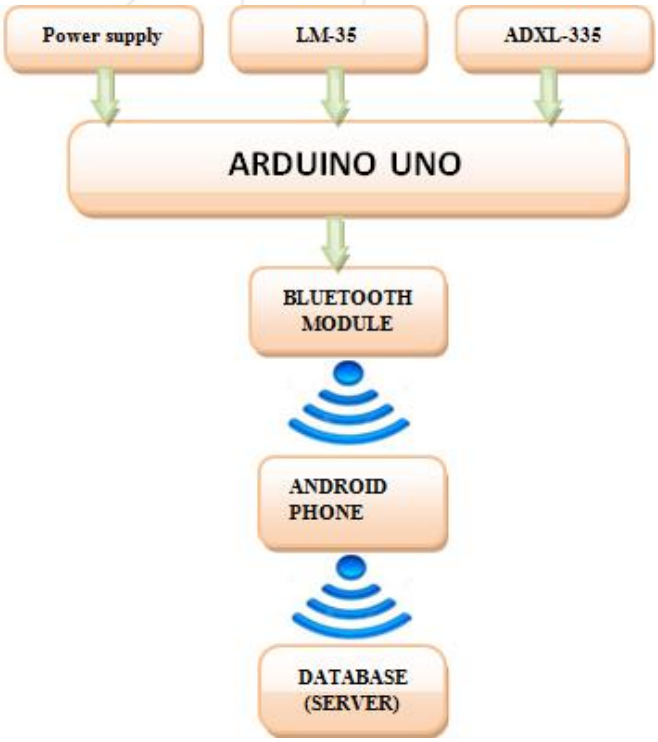

Figure 4: Block diagram

4. Software Requirement

4.1 MySQL

The MySQL is the most popular Open Source Relational SQL database management system. MySQL is one of the best RDBMS being used for developing web-based software applications. Databases are useful for storing information categorically. So, here I am creating a database for storing information of doctors' and patients' details. For example their name, contact no. ,email id, age, address, blood group etc. This database will be used for fetching and storing the data.

4.2 Android Application

I developed the application using an android studio. Android Studio is the official integrated development environment for the android platform.

4.2.2 RESULTS

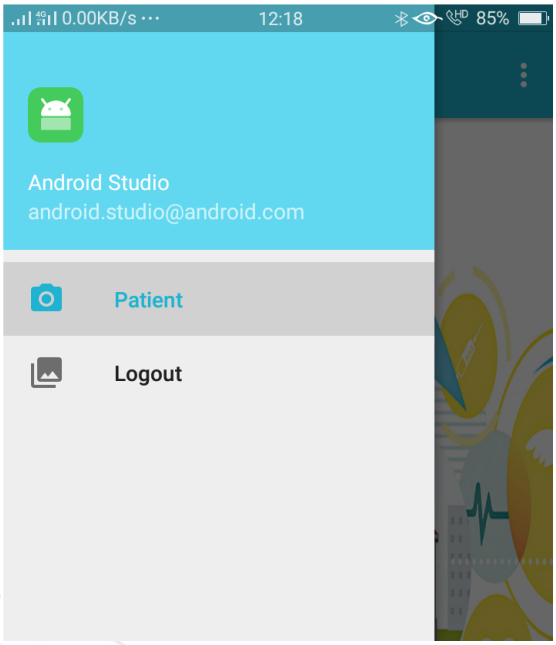

Figure 5: Navigation Drawer

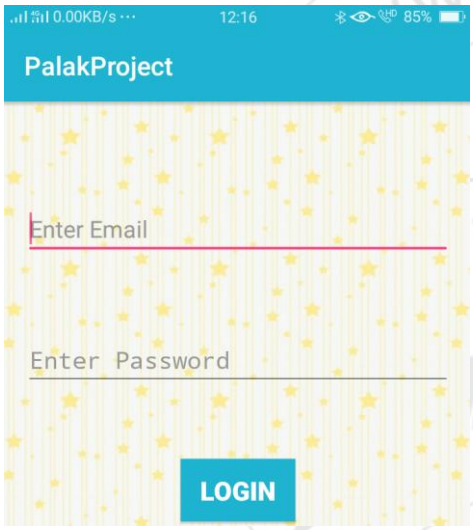

Figure 4: Login screen

Figure 5: Screen that appears after login

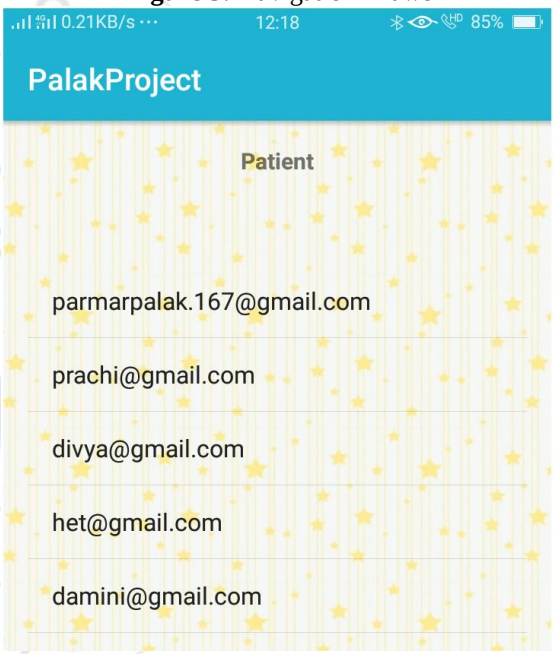

Figure 6: Patients

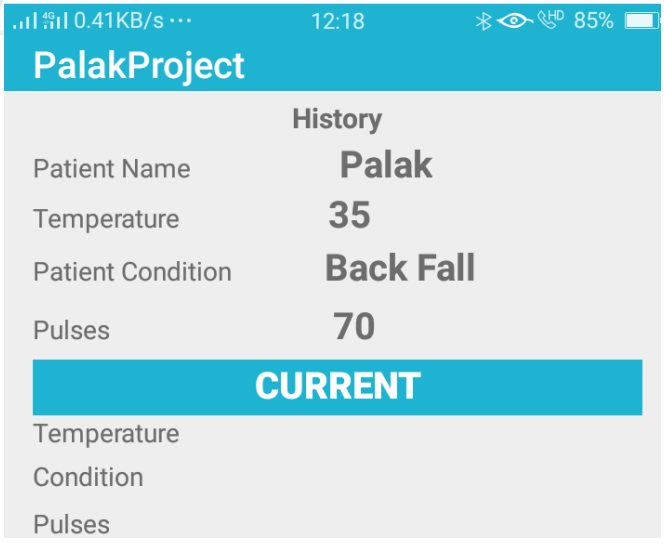

Figure 7: Patients' History

Figure 8: Patients' Current Report

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Author Profile

Palak Parmar is receiving the Post Graduation degree in Electrical Engineering from Maharaja Sayajirao University.She completed her Graduation in Electronics and Communication Engineering from Parul Institute of Engineering and Technology.