ATM Based Healthcare Monitoring System
Prasanth M1 Rashin Nazer2 Snobin Antony3 Sreerag Pushpan4 Visruth P S5
1Assistant Professor 2,3,4,5Final Year B Tech Students
1,2,3,4,5Department of Electronics & Communication Engineering
1,2Nehru College of Engineering and Research Centre, Thrissur, Kerala, India

Abstract— With rapid aging and economic growth, people are now more interested in their long-term health, fitness and wellness. ATM based remote health care monitoring system allows an individual to check the medical parameters such as Blood glucose level, Blood pressure, Heart beat, Body temperature, Height, Weight regularly without the need of visiting hospitals. The measurements are done using appropriate sensors that are all incorporated in an ATM center. An individual can check the medical parameters after swiping the smart card of the person in the smart card reader. After the check, the money for the particular test is transferred from the smart card. Then the health conditions are displayed on LCD display and the obtained bio signal from each sensory unit is transmitted to the person's mobile phone via GSM. The patient can carry the health smart card with him/her anywhere and anytime and present it to the doctor at the time of consultation. The proposed method of remote health care monitoring system may help to reduce the cost of the healthcare. Access to accurate health data quickly is one of the main functions of this system. Thus consumers can maintain their own health and wellness. Care givers can more quickly react to the medical emergencies of elders. It is a noninvasive approach and will provide real time monitoring.

Key words: Monitoring System, Blood pressure, Heart beat

I. INTRODUCTION

One of the emerging issues in ageing society is to take care of individual living, which requires consistent health management. The continuous monitoring of health status is a fundamental practice for patients suffering from various diseases. In a hospital either the nurse or the doctor has to move physically from one person to another for health check-up of patients, due to which it is not possible to monitor their conditions continuously. Thus, any critical condition cannot be identified easily unless the nurse or doctor checked the person’s health at that time. This may cause a strain for the doctors who have to take care of large number of people in the hospital. The opportunity for patients to have constant monitoring of their health state is now possible by means of telemedicine applications. Here the medical parameters are measured using sensors that are interfaced to the Arduino Mega, a microcontroller board based on the ATmega2560. This microcontroller have inbuilt ADC which converts the sensors input analog signals to digital signals. A smart card is given to every individual and it plays a key role in sharing patient specific information. The patient can carry the health smart card with him/her anywhere and anytime. An individual, who want to check his physical condition must swipe the smart card in the smart card reader attached to the microcontroller in the setup. The LCD displays the values of the sensors and the same is transmitted to the individual’s phone. The communication is done using GSM where the information is received by the individual as a message. The sensors used are heartbeat sensor and temperature sensor for studying the heart's function and body temperature respectively. Ultrasonic sensors are used to measure the height of the human. For the measurement of weight we are using load cell. Since there are very few facilities available to keep a record of the patient’s health after he is discharged from the hospital continuous monitoring of the patients heart rate, blood pressure, weight, etc. is very difficult. Hence this system is developed which can be effectively used by patient to keep a record of their health & can wirelessly monitor patient post his hospitalization. The rapid progress in wireless communication, sensor, and information technologies generates a new model for providing health care.

II. DESIGN OVERVIEW

The Block Diagram mainly consist of following systems

- Microcontroller
- Ultrasonic sensor
- Heart Beat Sensor
- Load Cell
- LCD Screen
- GSM Module
- Temperature Sensor
- Smart Card Unit
- Level Convertor
- Computer
- Power Supply

A. Microcontroller

The Arduino Mega is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4
UARTs (hardware serial ports), a 16 MHz crystal oscillator, 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. The Mega is compatible with most shields designed for the Arduino Due or Mega.

B. Ultrasonic Sensor

The HC-SR04 ultrasonic sensor is used to measure the human height. It operates from a 5V DC supply and the standby current is less than 2mA. The module transmits an ultrasonic signal, picks up its echo, measures the time elapsed between the two events and outputs a waveform whose high time is modulated by the measured time which is proportional to the distance. It offers excellent range accuracy and stable readings in an easy-to-use package. Ultrasonic sensors (also known as transceivers when they both send and receive) work on a principle similar to radar or sonar which evaluate attributes of a target by interpreting the echoes from radio or sound wave respectively.

C. Heart Beat Sensor

The heart’s function can be analyzed using heartbeat sensor. This sensor monitors the flow of blood through Finger. Heart beat sensor is designed to give digital output of heart beat when a finger is placed on it. It consists of a super bright red LED and light detector. The LED needs to be super bright as the maximum light must pass spread in finger and detected by detector. When the heart pumps a pulse of blood through the blood vessels, the finger becomes slightly more opaque and so less light reached the detector.

D. Load Cell

The weight measurement is done using load cells. Single Point Load Cells are usually designed for processing applications which require weight control platforms, usually on the small scale type. The advantage of this particular load cell design over others is that it is low profile, has high precision, and can be adjusted for off centre loading. This particular load cell type is generally easy to mount. Other products for similar applications such as load buttons are not as easy to mount. This load cell is also designed for high volume OEM applications and offered in a wide range of capacities from Gram ranges to 500 lbs in the same form fit function. Also due to its compact size, high precision and long Mean Time between Failures (MTBF of very well over 100 million cycles) it has been an ideal choice for many medical applications such as automated blood management system, dialysis and bag hanging applications for drug delivery application. By using this load cell we can measure the calibrated load of 2 to 3kgs the output of load cell is in current form so and I to V converter is used for converting it into voltage form. Then the precision rectifier is used.

E. RFID Tag

RFID tag works as follows: the reading unit generates an electro-magnetic field which induces a current into the tag’s antenna. The current is used to power the chip. In passive tags the current also charges a condenser which assures uninterrupted power for the chip. In active tags a battery replaces the condenser. The difference between active and passive tags is explained shortly. Once activated the tag receives commands from the reading unit and replies by sending its serial number or the requested information. In general the tag does not have enough energy to create its own electro-magnetic field, instead it uses backscattering to modulate (reflect/absorb) the field sent by the reading unit. Because most fluids absorb electromagnetic field and most metal reflect those fields the reading of tags in presence of those materials is complicated. During a reading cycle, the reader has to continuously power the tag. The created field is called continuous wave, and because the strength of the field decreases with the square of the distance the readers have to use a rather large power. That field overpowers any response a tag could give, so therefore tags reply side-channel which are located directly below and above the frequency of the continuous wave.

F. LCD

Liquid crystal display (LCD) is an electronically-modulated optical device shaped into a thin, flat panel made up of any number of colour or monochrome pixels filled with liquid crystals and arrayed in front of a light source (backlight) or reflector. It is often utilized in battery-powered electronic devices because it uses very small amounts of electric power. Each pixel of an LCD typically consists of a layer of molecules aligned between two transparent electrodes, and two polarizing filters, the axes of transmission of which are (in most of the cases) perpendicular to each other. With no actual liquid crystal between the polarizing filters, light passing through the first filter would be blocked by the second (crossed) polarizer.

G. GSM Module

GSM modem is a global system for mobile communication provides short message services. The 160 alphanumeric characters can be sent in a message. If there is a power off of subscribers v unit or the network coverage area is left, the message can be stored, retrieved and sent when entered the network. The GSM Modem supports popular “AT” command by which user can able to develop application quickly. The product SIM-100S module is used which SIM card and used with respective number for sending emergency messages about the condition of patient to doctor.
H. Temperature Sensor

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. Low cost is assured by trimming and calibration at the wafer level. The LM35’s low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy.

III. CIRCUIT DIAGRAM

Our project aims at making an inexpensive and less time consuming system to assist people to check their health conditions. The source of power supply and the components are chosen such that efficient output is obtained with minimal power input.

To measure the height of the human, we use ultrasonic sensor. The HC-SR04 ultrasonic sensor uses sonar to determine distance to an object like bats or dolphins do. Ultrasonic sensors generate high frequency sound wave and evaluate the echo which is received back by the sensor. Sensor calculates the time interval between sending the signal and receiving the echo to determine the distance to an object. The ultrasonic(sonar) system is based on two ultrasonic transducers mounted together. One emits an ultrasonic wave while the other measures the echo. By differentiation of the input and output signals, a microcontroller computes the distance to the nearest obstacle. Then this information is transmitted as a PWM signal to the driver circuitry according to the program. The distance is then displayed on LCD.

The temperature sensor used here is LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 does not need any external calibration or trimming to have accuracies. This is 3 legs IC that directly gives analog output. This unit requires +5V DC for its proper functioning. The Heart Beat Sensor provides a simple way to study the heart’s function. Heartbeat is sensed by using high intensity type LED and photodiode pair. The variety in forces caused by the pressure pulse is detected by illuminating the fingertip’s skin with the illumination from an LED using a photodiode detector. With each pulse, a deluge of blood is forced through the vascular system, expanding the capillaries in the finger, and varying the amount of light that returns to the photo detector. This signal is amplified and triggered through an amplifier which outputs +5V logic level signal. The output signal is also indicated by a LED which blinks on each heartbeat.

For the measurement of weight we are using load cell rated 5-80 kg as rated load. Single Point Load Cells are usually designed for processing applications which require weight control platforms, usually on the small scale type. They are given their name because they can be used for these platform applications supporting off center loading by utilizing only one sensor.

A RFID is used here as a smart card unit. Radio-frequency identification (RFID) is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders. The technology requires some extent of cooperation of an RFID reader and an RFID tag. An RFID tag is an object that can be applied to or incorporated into a product, animal, or person for the purpose of identification and tracking using radio waves. Some tags can be read from several meters away and beyond the line of sight of the reader. An RFID tag is an object that can be applied to or incorporated into a product, animal, or person for the purpose of identification and tracking using radio waves. Some tags can be read from several meters away and beyond the line of sight of the reader.

IV. PROJECT OUTCOME

The developed system “ATM based health care monitoring system” will serve as a useful approach to effectively reduce the time of the patients to be spent in the hospitals and allows each and every individual to maintain their own health records. It is a noninvasive approach and will provide real time monitoring. Our proposed system aims at providing a system with low power consumption capability, easy setup, high performance and time to time response.

V. CONCLUSION

Thus the idea of implementation of ATM based remote health care monitoring system was proposed and implemented. The objective of the present work is to develop a multifunctional user-friendly biomedical measurement device. The hardware of the health care monitoring system was implemented which includes the biomedical sensors and the smart card unit. The system uses smart card for personal identification and transfer of health data and provides data communication. Each device was
designed, built, tested and calibrated separately. It provides a complete e-record of the patient’s health information in place of paper record.

VI. FUTURE SCOPE
The future possibilities for an extension of this system are many. It can be used in patient’s home, at hospitals and other places like for intense care centers for old ones. In future we can introduce new sensors to determine other body parameters such as blood pressure, diabetes and also can determine ECG of the heart. Also we can reduce the size of the hardware so that it will be portable and can be carried by each person along with them. This will help everyone to measure their health parameters whenever they feel any abnormalities and could seek doctor advice by means of GSM.

REFERENCES