Doctors Assistive System Using Augmented Reality for Critical Analysis

Abstract- **Recent advances in Augmented Reality (AR) have shown great opportunities to boost patients and clinicians' experience in telemedicine. However most existing AR technologies target medical procedural training and thus have low compliancy to patient uptake thanks to low portability and high cost. In this paper, using the emerging AR technologies on mobile devices, we developed an AR clinical consultation system through an iPad and a Kinect sensor. This low-cost and highly portable AR consultation system can be easily arranged in patient home and clinician office with minimum burden on their normal daily activities. This may not only provides an excellent and immersive telemonitoring consultation experience for patients, but also enable clinicians to simply explain complex medical conditions to patients through simulation and visualization.**

Index Terms- augumented reality, AR consultation, zigbee protocol, arduino.

I. INTRODUCTION

Recent advances in virtual reality and augmented reality (AR) show enormous potential to enhance video consultations to create 3D telepresence for patient experience. While most of these AR technologies, such as the Microsoft HoloLens, are head-mounted wearable devices, and research activities have focused mainly on medical procedural training such technologies will have minimum potencial to patient due to weight of wear on their head.

Augmented Reality (AR), defined as a field in which 3D virtual objects are integrated into a 3-D real environment in real time , has been extensively studied from 1980s. Basic enabling technologies such as tracking, displays and input devices were developed from 1990s with some early prototypes, tools and applications such as AR used in military aircraft to superimpose useful information on the pilot's view of the real world .AR is used in many industrial applications such as navigation ,gaming, marketing, medicine, manufacturing, healthcare and education.This augumentation is help inn health professionals in view of laproscopic surgery, and analyzing images by Computed Tomography, Magnetic Resonance(MR) .

In this we are using AR consultation system it includes Apple's ARKit and Microsoft Kinect sensor. It is a compact and low-cost system. Assuming both the doctor and patient have iOS devices. The ARKit tool combines visual and motion data from the iOS device's camera and accelerometer to create a correspondence between the real-world and virtual space. The Kinect sensor captures every movement of the doctor and the ARKit projects these movements in a virtual world via this avatar, giving an immersive communication experience of the patients that the virtual doctor is presented in front of them in a sameroom.

The doctor module is responsible for the data acquisition and interaction at the doctor end. shows the dashboard of this module, where doctors will be able to configure their system settings, and preview their avatar to be projected to the patients. Motion data is converted and compressed before sending to the Unity networking system. These data are used to transfer the user motion to the humanoid avatar model to project doctor's gesture commands. Along with this model, any medical information reports the doctor would want to inform the patient, can be triggered by the doctor's gesture, and represented in the virtual digital environment.

The module receives the Kinect-captured user motion data reconstructed in a 3D dynamic doctor avatar for the patient's telepresence environment. It will also load various medical information through doctor's gesture remotely via the Doctor module.This system would have the capacity to significantly improve patient and clinician uptake of telehealth monitoring.It supports undeserved community and aging population that are hindered by age related conditions such as mobility and also reduces the expenditure of healthcare.

II. SYSTEM REPRESENTATION

Overall system consist of mainly two parts i.e. hardware and software. Whereas hardware part consist of two sections i.e. transmitter and receiver, in which transmitter developed by three sensors, ie. temperature, heartbeat and Respiratory sensor. The controller ATmega328 provided will give the output on the LCD and also on doctor's AR via Zigbee transmitter, whereas there is a Zigbee receiver model at doctor's AR Glass.

Block Diagram

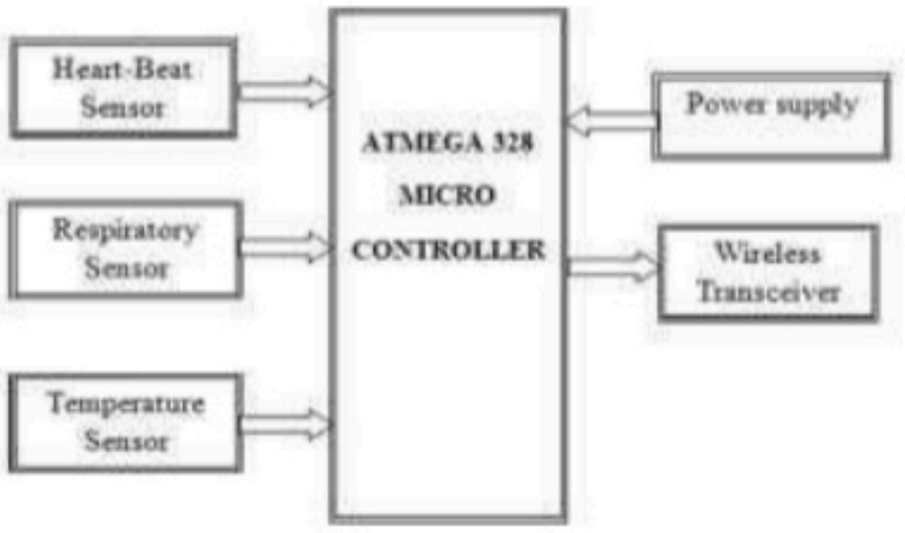

Fig- Main Block Diagram

Zigbee is that the name of a specification for a collection of high level communication protocols using small, low-power supported the IEEE 802.15.4 Standard for wireless personal area networks. ZigBee provides specifications for devices that have low data rates, consume very low power and are thus characterized by having a very long battery life and security features.

ZigBee operates within the industrial, scientific and medical (ISM) radio bands; 868 MHz in Europe, 915 MHz within the USA and Australia, and 2.4 GHz in most jurisdictions worldwide with ZigBee designed to enable two-way communications, but also feed it to ADPS for data analysis. ZigBee is targeted at radio-frequency (RF) applications which require an occational rate, long battery life, and secure networking. The ZigBee Standard has evolved standardized sets of solutions, called 'layers'. These layers facilitate the features that make ZigBee very attractive: low cost, easy implementation, reliable data transfer, very low power consumption and adequate safety features

III. COMPONENTS SPECIFICATION

A. Controller (ATMEGA328)

Controller is the major part of our system. ATmega328 is a singlechip microcontroller.It has modified Harvard architecture 8-bit RISC processor core.This controller following features: 32Kbytes of in-system programmable flash with read-while-write capabilities,1KB EEPROM, 2 KB SRAM with internal oscillator, 23 programmable I/O Lines, and operating Voltage is 1.8 - 5.5V,6 channel 10 bit A/D converter, Temperature Range -50°C to 105°C, three flexible Timer/Counters. Pin configuration of ATmega328 IC consists of 28 pins.It is popularly used in Arduino development platform such as Arduino Uno and Arduino Nano models.

B. Heart Beat Sensor

The pulse rate sensor is largely used to keep track on the heart beat of the person. Heart beat sensor is intended to allow digital output of warmth beat when a finger is placed thereon. When the guts beat detector is functioning, the beat LED flashes in unison with each heart beat. Sensing is that the first stage of any process within the instrumentation system. Sensors are required to sense the variations within the physical quantities. The digital output may be connected to microcontroller on to measure the Beats Per Minute (BPM) rate. It works on the principle of sunshine modulation by blood flow through finger at each pulse. The working voltage of temperature sensor are +5V DC. It is helps in various applications like digital rate monitoring, patient monitoring system, and bio feedback control of robotics.

Fig- Heartbeat Sensor

C. Temperature Sensor

Temperature sensor senses the temperature of body. The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Centigrade temperature. It can sense the temperature of physique. The LM35 doesn't require any external temperature range. Low cost is assured by trimming and calibration at the wafer level. It's an analog sensor and gives the output into kind of analog signal. This signal is feed to ARM controller and ADC will convert it into digital form. It is suitable for remote applications. It has low impedence output of 0.1Ω for 1 mA load, also that it's not suffering from air temperature.

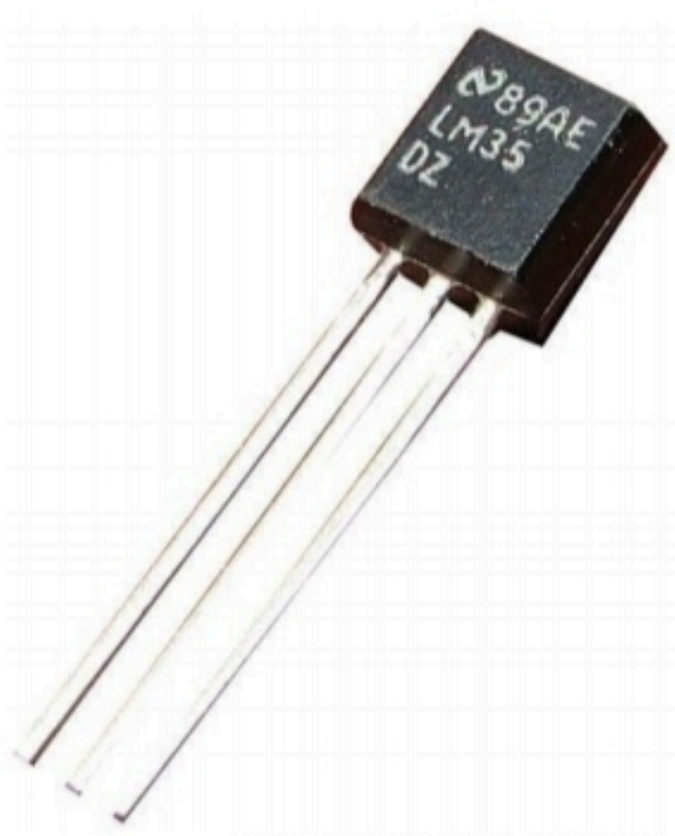

Fig- Temparature Sensor

The LM35 is applied easily within the same way as other integrated-circuit temperature sensors. It is glued or cemented to a surface and its temperature are within about 0.01˚C of the surface temperature.It has but 60 µA current drain.

D. Respiratory Sensor

The rate of respiration in humans is measured by counting the quantity of breaths for one minute through counting what percentage times the chest rises. Various other methods to live rate of respiration are commonly used, including impedance pneumography and capnography which are commonly implemented in patient monitoring. It's also been reported that factors like crying, sleeping, agitation and age have a major influence on the rate of respiration. As a results of these and similar studies the worth of rate of respiration as an indicator of great illness is restricted.

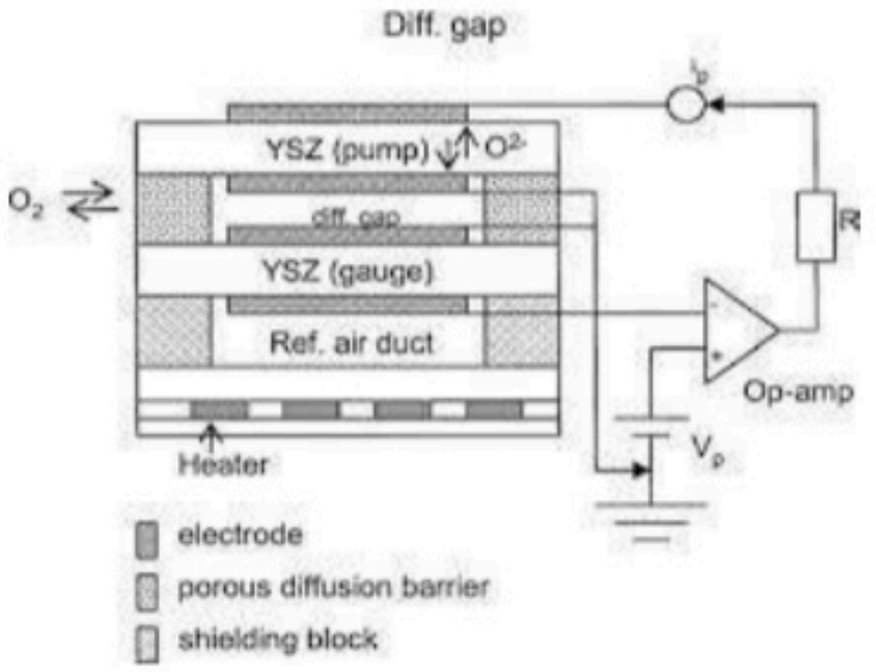

Fig. Respiratory sensor

E.LCD Display

The The 16/2 LCD display is utilized to visualize the output of the appliance . It issued to check the output of assorted modules interfaced with the microcontroller. Thus LCD plays a major role to figure out the output and to debug the system module wise just incase of system failure so as to rectify the matter display device is required only at the coordinator end. To understand whats happening the sensing node .the info must be shown on the display. This data can also be recorded and kept safe for the analysis. Health status of the human can only be known by observing the info. That's why the display is must for the presented application. For the presented work, LCD is utilized as a display device. LCD is that the short sort of the liquid display. LCD displays utilize two sheets of polarizing material with a liquid crystal Units.

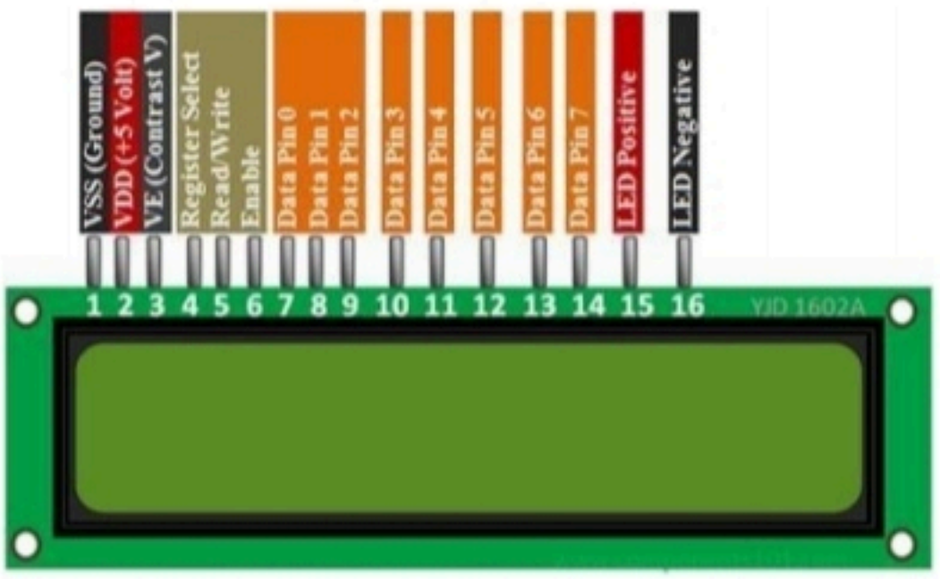

Fig- LCD Display

F. Power supply

There are several components used at the sensing node and coordinator end. These components have different operating voltage like controller operates at 3.3 – 5v. ZigBee transceiver operates at 1.8 V to

3.8 V, LM 35 and LCD display operates at 5 V To satisfy these requirements of various operating voltage ranges a correct arrangement of power supply is required.The 7805 voltage regular is employed to supply 5V regulated power supply.

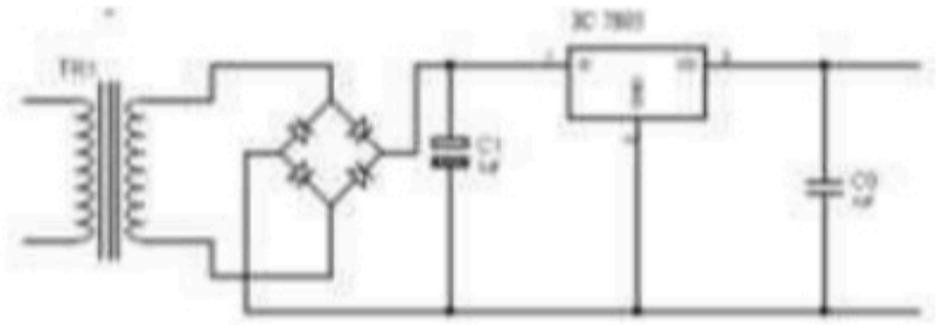

Fig-Power Supply

IV.RESULTS

The analog processing circuitry and also the sensors were assembled on PCBs which were placed within the wrist strap. The flowchart of the system & the prototype hardware. The prototype was powered with a 9 V battery. The RF transmission using Zigbee has been tested to work successfully at 30 meters range through obstacles like concrete walls. When in operative, the wrist unit consumes 20 mA of current at 3.3 V power supply

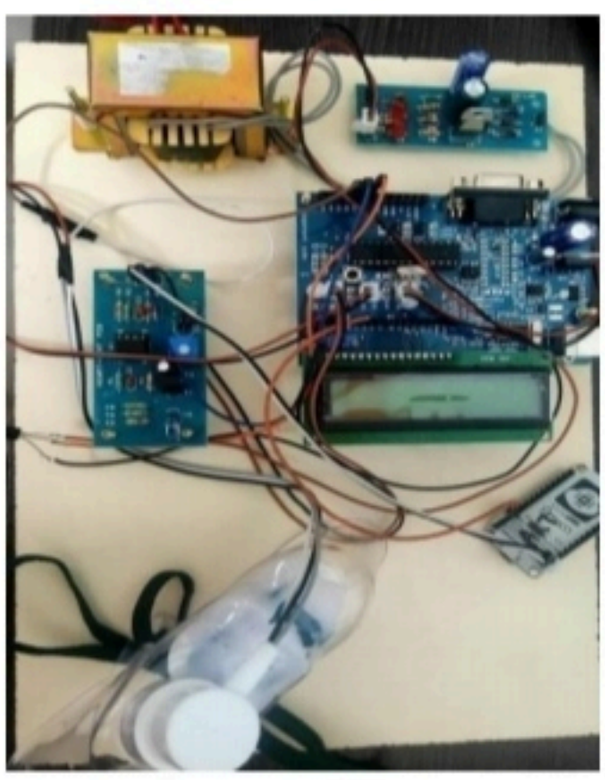

Figure: Prototype Design

Figure :AR Glass Setup

V.CONCLUSION

Thus the zigbee based wireless Heartbeat , Respiratory and Temperature monitoring system is meant and implemented using microcontroller atmega 328, during which all signals directly measured from the human body and all parameters values displayed on LCD on the transmitter side. This data is transmitted to the receiver wirelessly through ZigBee. The received signal send to pc via AR Glass window display patient's Physiological Parameters.