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Harnessing IOT for Personalized Respiratory Monitoring System

T. Vinodhini [1], M. Gokul kirthik [2], J. Sridhar [3], N. Gokul [4]

Assistant Professor, Department of ECE, R P Sarathy Institute of Technology, Salem, Tamil Nadu, India[1]

Student, Department of ECE, R P Sarathy Institute of Technology, Salem, Tamil Nadu, India[2 3 4]

ABSTRACT: The objective of the project is to design a smart asthma monitoring system for patient based on internet of things. In this project we are monitoring a patient full time through IOT using different parameters of patient health level. For each parameter different sensors are used to monitor patient health level in real time we are using IOT. We are using sensor like heart beat sensor for monitoring a patient heart beat level, oxygen level, pollution, temperature, humidity and dust level. Temperature is used to monitor patient body temperature. All these parameters are stored in Arduino microcontroller and then it will be uploaded in IOT server in case of emergency IOT server monitored by doctor he will prevent the treatment for the particular patient. In this way efficient to monitor patient real-time. Asthma is a chronic respiratory condition that affects millions worldwide, requiring continuous monitoring to manage effectively. Traditional methods of monitoring asthma often lack real-time data and can be cumbersome for patients. The AMS consists of wearable devices, environmental sensors, and a cloud-based platform. The wearable device, worn by the patient, collects physiological data such as heart rate, respiratory rate, and oxygen saturation levels. Environmental sensors monitor air quality and pollution levels, which are known triggers for asthma attacks. If such patterns are detected, the system can alert the patient and healthcare providers, enabling timely intervention. By providing continuous monitoring and personalized insights, the proposed AMS offers a promising approach to improving asthma management, reduom cing the frequency and severity of asthma attacks, and enhancing the quality of life for asthma patients.

I. INTRODUCTION

In recent years, the Internet of Things has revolutionized healthcare by enabling personalized monitoring and management of various medical conditions. One such area where IoT holds tremendous promise is in the field of respiratory health. Respiratory diseases, including asthma, chronic obstructive pulmonary disease (COPD), and sleep apnea, affect millions of people worldwide. Personalized respiratory monitoring systems powered by IoT offer a proactive approach to managing these conditions, providing individuals with real-time data and insights into their respiratory health. This introduction explores the potential of IoT in personalized respiratory monitoring, highlighting its benefits and the technological advancements driving this innovative approach.

1.1 BREATHING INNOVATION

Asthma is a chronic respiratory disease that affects people of all ages, characterized by inflammation and narrowing of the airways, leading to symptoms such as wheezing, coughing, chest tightness, and shortness of breath. It is a significant global health concern, with an estimated 235 million people affected worldwide. Managing asthma effectively requires continuous monitoring of symptoms and triggers to prevent exacerbation's and improve quality of life. In this 20th century, the ere is a drastic change InTechnology as well and also in the field of wireless networks and automation which seems to be huge wave before decades. Internet has grown everywhere to access the services and smart things from anywhere on anytime at anyplace. In this internet of things (IOT) is playing an immense role in the field of automation and wireless technology for a decade.

1.2 BREATHING EASY WITH IOT

The Internet of Things (IOT) can fully exploit the potential of networking and alter the device of innovative services to over-scale scenarios such as home automation, building automation, intelligent cities and healthcare. For using technology, the healthcare monitoring is important for saving patient life. For this purpose, our projects is smart to way monitor patient health. IOT is real-time technology to monitor every field. It will place important role in healthcare, monitoring patient different parameters. For that different sensors are used to sensor values are monitor real time in IOT server. It will monitor individual patient and in case of emergency the doctor alerted by IOT and required treatment is given to that patient.

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II. METHODOLOGY

The objective of the project is to design a smart asthma monitoring system for patient based on internet of things. In this project we are monitoring a patient full time through IOT using different parameters of patient health level. For each parameter different sensors are used to monitor patient health level in real time we are using IOT. In case of abnormal status of patient emergency message intimated via IOT server or android app to the doctor and its relatives. All these parameters are stored in Arduino micro-controller and then it will be uploaded in IOT server in case of emergency IOT server monitored by doctor he will prevent the treatment for the patient. In this way efficient to monitor patient real-time. Using this technology, we can monitor the patient wherever in the world we can monitor patient health level.

2.1 Block Diagram of Proposed System

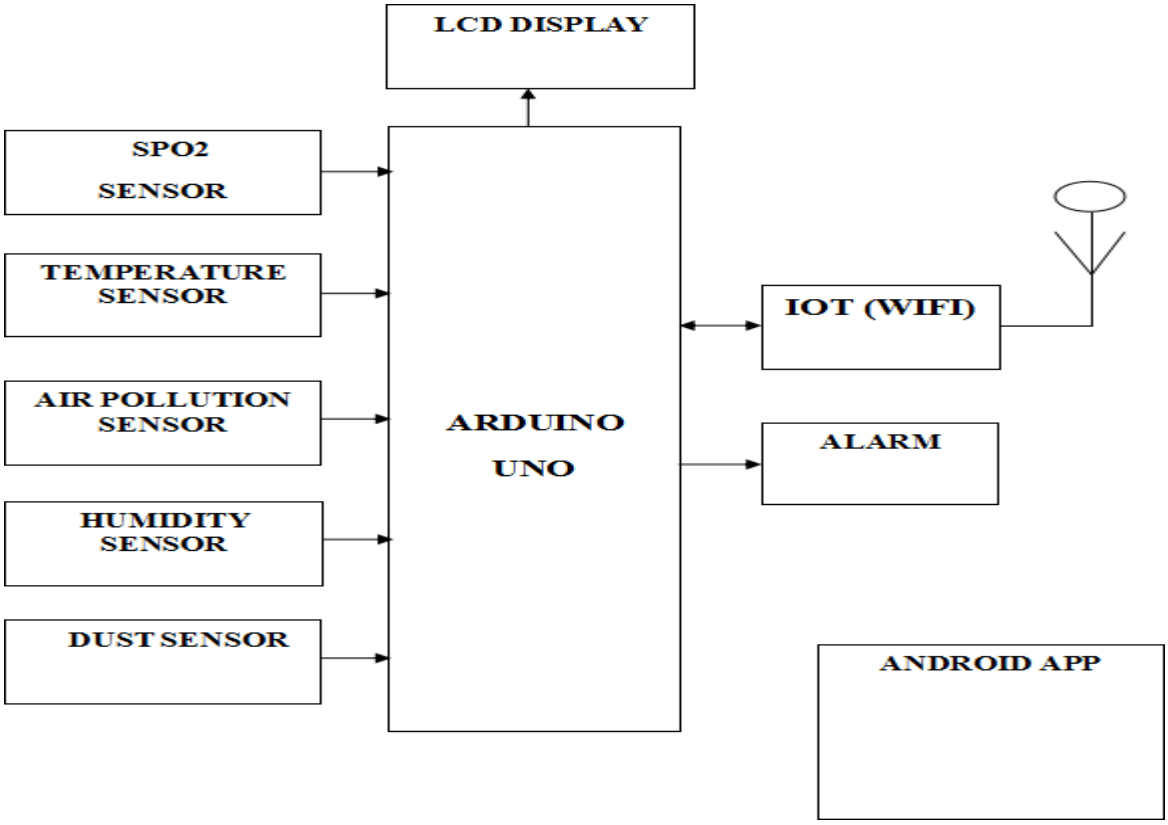

Figure.no.2.1

III. HARDWARE DESCRIPTION

POWER SUPPLY

The ac voltage, typically 220V rms, is connected to a transformer, which steps that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation.

A regulator circuit removes the ripples and also remains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units.

Transformer

The potential transformer will step down the power supply voltage (0-230V) to (0-6V) level. Then the secondary of the potential transformer will be connected to the precision rectifier, which is constructed with the help of op–amp. The advantages of using precision rectifier are it will give peak voltage output as DC; rest of the circuits will give only

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RMS output.

Bridge rectifier

When four diodes are connected as shown in figure, the circuit is called as bridge rectifier. The input to the circuit is applied to the diagonally opposite corners of the network, and the output is taken from the remaining two corners. Let us assume that the transformer is working properly and there is a positive potential, at point A and a negative potential at point B. the positive potential at point A will forward bias D3 and reverse bias D4. The negative potential at point B will forward bias D1 and reverse D2. At this time D3 and D1 are forward biased and will allow current flow to pass through them; D4 and D2 are reverse biased and will block current flow.The path for current flow is from point B through D1, up through RL, through D3, through the secondary of the transformer back to point B. this path is indicated by the solid arrows. Waveforms (1) and (2) can be observed across D1 and D3. One-half cycle later the polarity across the secondary of the transformer reverse, forward biasing D2 and D4 and reverse biasing D1 and D3. Current flow will now be from point A through D4, up through RL, through D2, through the secondary of T1, and back to point A. This path is indicated by the broken arrows. Waveforms (3) and (4) can be observed across D2 and D4. The current flow through RL is always in the same direction. In flowing through RL this current develops a voltage corresponding to that shown waveform (5). Since current flows through the load (RL) during both half cycles of the applied voltage, this bridge rectifier is a full-wave rectifier. One advantage of a bridge rectifier over a conventional full-wave rectifier is that with a given transformer the bridge rectifier produces a voltage output that is nearly twice that of the conventional full-wave circuit. This may be shown by assigning values to some of the components shown in views A and B. assume that the same transformer is used in both circuits

IC voltage regulators

Voltage regulators comprise a class of widely used ICs. Regulator IC units contain the circuitry for reference source, comparator amplifier, control device, and overload protection all in a single IC. IC units provide regulation of either a fixed positive voltage, a fixed negative voltage, or an adjustably set voltage. The regulators can be selected for operation with load currents from hundreds of milli amperes to tens of amperes, corresponding to power ratings from milli watts to tens of watts.

IV. HEART BEAT CIRCUIT

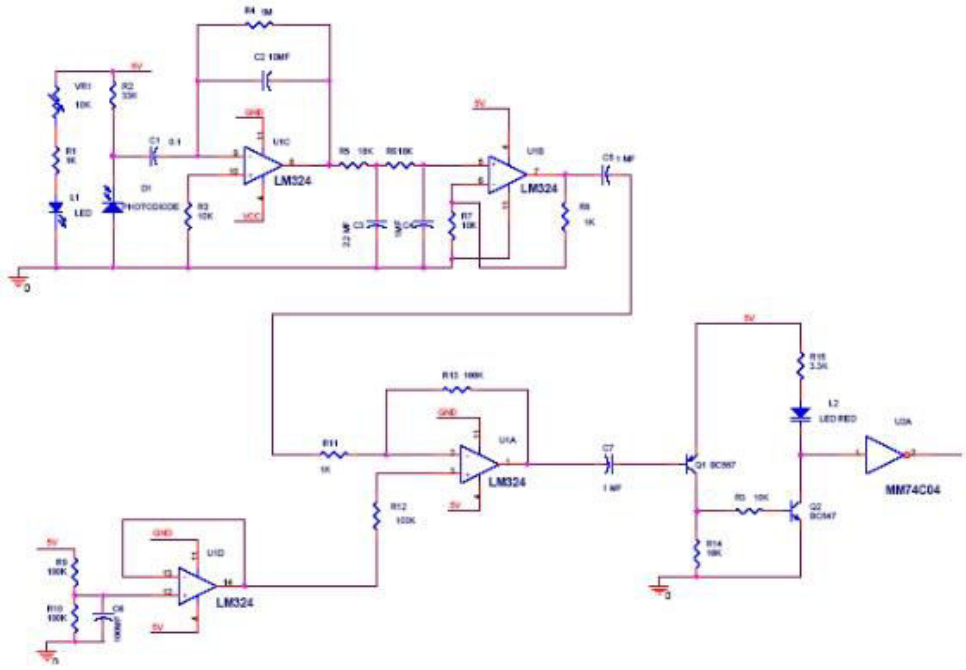

Figure.no.4.1

4.1 Heart Rate

Heart rate is a term used to describe the frequency of the cardiac cycle. It is considered one of the four vital signs.

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Usually, it is calculated as the number of contractions (heart beats) of the heart in one minute and expressed as "beats per minute" (bpm). See "Heart" for information on embryofetal heart rates. The heart beats up to 120 times per minute in childhood. When resting, the adult human heart beats at about 70 bpm (males) and 75 bpm (females), but this rate varies among people. However, the reference range is normally between 60 bpm (if less termed bradycardia) and 100 bpm (if greater, termed tachycardia). Resting heart rates can be significantly lower in athletes. The infant/neonatal rate of heartbeat is around 130-150 bpm, the toddlers about 100–130 bpm, the older child's about 90–110 bpm, and the adolescent's about 80–100 bpm.

Measuring of Pulse Rate

The pulse rate (which in most people is identical to the heart rate) can be measured at any point on the body where an artery is close to the surface. Such places are wrist (radial artery), neck (carotid artery), elbow (brachial artery), and groin (femoral artery). The pulse can also be felt directly over the heart.

V. CIRCUIT WORKING DESCRIPTION

This circuit is designed to measure the heart rate. The heart rate is measured by IR transmitter and receiver. Infrared transmitter is one type of LED which emits infrared rays generally called as IR Transmitter. Similarly, IR Receiver is used to receive the IR rays transmitted by the IR transmitter. One important point is both IR transmitter and receiver should be placed straight line to each other. The IR transmitter and receiver are placed in the pulse rate sensor. When you want measure the pulse rate, the pulse rate sensor has to be clipped in the finger. The IR receiver is connected to the Vcc through the resistor which acts as potential divider. The potential divider output is connected to amplifier section.When supply is ON the IR transmitter passes the rays to the receiver. Depending on the blood flow, the IR rays are interrupted. Due to that IR receiver conduction is interrupted so variable pulse signals are generated in the potential divider point which is given to A1 amplifier through the capacitor C1. The coupling capacitor C1 is used to block the DC component because the capacitor reactance is depending on the frequency. For DC component the frequency is zero so the reactance is infinity now capacitor acts as open circuit for DC component. The amplifier section is constructed by the LM 324 quad operational amplifier. It consists of four independent, high gains and internally frequency compensated operational amplifiers named as A1, A2, A3 and A4 amplifiers. The varying pulse from the potential divider is amplified by the A1 amplifier. In this amplifier the capacitor C2 is connected in parallel with feedback resistor to filter the any DC component in the amplified signal. If any spikes in the amplified signals, they are further filtered by the C3 and C4 capacitors. After filtration the signal is again amplified by the A2 amplifier. Then amplified signal is given to inverting input terminal of comparator. The comparator is constructed by the A4 amplifier in which the reference voltage is given to non-inverting input terminal. The reference voltage is generated by the A3 amplifier. Then the comparator compares the two signal and delivered the +12v to -12v square wave pulse at its output. Then the square wave signal is given to base of the BC 557 and BC547 switching transistors in order to convert the TTL voltage 0 to 5v level. Finally, the TTL output is given to MM 74C04 inverter to invert the square pulse. Then the final square wave signal is given to microcontroller or other interfacing circuit in order to monitor the heart rate.

VI. CONCLUSION

In this way we designed a health monitoring system using IOT for higher accuracy to monitor patient at a time. Using this project doctor can monitor his patient everywhere in the world using IOT server and required treatment or medicine is prescribed. Everyone can using this project even patient attendant also monitor patient heart beat level, oxygen level, temperature level, pollution level and humidity Interface with the microcontroller. By using the system the healthcare professionals can monitor, diagnose, and advice or patients all the time. The health parameters data are stored and published online Hance, healthcare professional can monitor their patients from a remote location at any time. Our em is simple,The Future work of the project is very essential in order to make the design system norr advanced. In the designed system the enhancement would be connecting more sensors to internet which measures various other health parameters and would be beneficial for patient menitoring i.e. connecting all the objects to internet for quick and easy access. Establishing a Wi-Fi mesh type network to increase in the communication range.In this paper, we have presented and proved the prototype for an automatic system that guarantees a constant monitoring of various health parameters and prediction of any kind of discase or disorder that prevents the patient from the pain of paying frequent visits to the hospitals. The proposed system can be set-up in the hospitals and massive amount of data can be obtained and stored in the online database. Even the results can be made to be accessed home mobile through an application.The system can be further improved further by adding artificial intelligence system components to facilitate the doctors and the patients. The data, consisting medical history of many patients parameters and corresponding results, can be explored using data mining, in search of consistent patterns and systematic relationships in the disease.

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For instance, if a patient's health parameters are changing in the same pattern as those of a previous patient in the database, the consequences can also be estimated. If the similar patterns are found repeatedly, it would be easier for the doctors and medical researchers to find a remedy for the problem.

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