

DYNAMIC REMOTELY OPERATED NAVIGATION EQUIPMENT WITH MEDICAL PARAMETERS

Submitted in partial fulfillment of the requirements for the award of

Bachelor of Technology degree in

Biomedical Engineering.

By

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**DEPARTMENT OF BIOMEDICAL ENGINEERING
SCHOOL OF BIO AND CHEMICAL ENGINEERING**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

**Accredited with Grade "A" by NAAC | 12B Status by UGC | Approved by AICTE
JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119**

MARCH -2021



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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **Dhelip D (37240021)**, **Jones Leo Raj P (37240038)** who have done the project work as a team who carried out the project entitled "**Dynamic Remotely Operated Navigation Equipment with Medical Parameters**" under my supervision from **October 2020** to **March 2021**

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DECLARATION

We, **Dhelip D (37240021)** and **Jones Leo Raj P (37240038)** hereby declare that the Project Report entitled “**Dynamic Remotely Operated Navigation Equipment with Medical Parameters**” done by us under the guidance of **Dr. J. Bethanny Janney**, Department of Biomedical Engineering at Sathyabama Institute of Science and Technology is submitted in partial fulfillment of the requirements for the award of Bachelor of Technology degree in Biomedical Engineering.

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ACKNOWLEDGEMENT

We are pleased to acknowledge our sincere thanks to the **Board of Management of SATHYABAMA** for their kind encouragement in doing this project and for completing it successfully. We are grateful to them.

We are very much indebted to **Dr. Wilson Aruni, PhD., Pro Vice Chancellor (Health Sciences)** for this continuous motivation and support.

We convey our thanks to **Dr. J. Prem Kumar M.Sc., Ph.D., T. Sudhakar M.Sc., Ph.D., Heads of the Department, Dept. of Biomedical Engineering** for providing me necessary support and details at the right time during the progressive reviews.

We would like to express our sincere and deep sense of gratitude to our Project Guide **Dr. J. Bethanne Janney, M.Tech., Ph.D., Department of Bio Medical Engineering** for his valuable guidance, suggestions and constant encouragement paving the way for the successful completion of our project work.

We wish to express our thanks to all **Teaching and Non-teaching** staff members of the **Department of Biomedical Engineering** who were helpful in many ways for the completion of the project.

ABSTRACT

Road accidents are slightly increased and lead to lots of death. So is, accidents occurring due to human error or mechanical error. When a vehicle face accident in an urban area we may need proper communication between the rescue team and the people near the accident zone for a better approach. Till now the urban cities are facing a lot of traffic congestion due to the increase in the number of vehicles and population. This traffic congestion creates difficulty for the rescue unit to reach the accident zone. The major problem faced is that the ambulance is unable to know the exact place where the accident happens until the people's intimation to the rescue unit. The idea of the research is to create an ambulance drone to overcome all these difficulties mentioned above. The drone unit has some medical sensors it'll automatically capture the patient's data. The captured data from drone to hospital and the ambulance are transmitted via the INTERNET OF THINGS, and for future reference data has been stored in the cloud.

Keywords— Air ambulance, air medical transportation, critical care, inter-hospital data transfer.

TABLE OF CONTENTS

CHAPTER NO.	TITLE	PAGE NO.
	ABSTRACT	
	LIST OF ABBREVIATIONS	
	LIST OF FIGURES	
	LIST OF TABLES	
01.	INTRODUCTION	1
	1.1 AIR POLLUTION	1
	1.2 OUTDOOR AIR POLLUTION	1
	1.3 INDOOR AIR POLLUTION	2
	1.4 HARMFUL GASES AND ITS SOURCE OF EMISSION	3
	1.5 CHRONIC OBSTRUCTIVE PULMONARY DISEASE	7
	1.6 SIGNIFICANCE OF AQI	8
02.	LITERATURE REVIEW	11
03.	AIM AND SCOPE	14
	3.1 AIM	14
	3.2 EXISTING SYSTEM	14
	3.3 PROPOSED SYSTEM	14
	3.3.1 ADVANTAGES OF PROPOSED SYSTEM	15
	3.4 APPLICATION AND SCOPE	15
04.	MATERIALS AND METHOD	16
	4.1 HARDWARE COMPONENTS	16
	4.1.1 ARDUINO UNO	16

4.1.2	NODE MCU – ESP8266	17
4.1.3	LIQUID CRYSTAL DISPLAY	18
4.1.4	LIGHT EMITTING DIODE	19
4.1.5	DHT 11 TEMPERATURE AND HUMIDITY SENSOR MODULE	20
4.1.6	PM 2.5 GP2Y1010AUOF DUST SMOKE PARTICLE SENSOR	21
4.1.7	GAS SENSOR	22
4.1.7.1	MQ – 135 (AIR QUALITY SENSOR)	22
4.1.7.2	MQ – 7 (CARBON MONOXIDE) SENSOR	23
4.2	SOFTWARE DESCRIPTION	24
4.2.1	ARDUINO IDE	24
4.2.2	THING SPEAK	25
4.2.3	RHINOCEROS 3D	26
4.3	BLOCK DIAGRAM	26
4.4	METHODOLOGY	27
05.	RESULT AND DISCUSSION	28
5.1	RESULTS	28
5.2	DISCUSSION	31
06.	SUMMARY AND CONCLUSION	34
6.1	SUMMARY AND CONCLUSION	34
6.2	FUTURE WORK	34
	REFERENCE	35
	APPENDIX	37

List of figures

Figure	Title	Page
1.1	Work flow of IOT	3
1.2	Quad prototype	6
4.1	Arduino Microcontroller	16
4.2	Battery	19
4.3	DC motor	20
4.4	Heart rate sensor	23
4.5	Node MCU with wifi module	25
4.6	Respiration sensor	26
4.7	Temperature sensor	27
4.8	Block diagram	29
4.9	Work flow of the device	30
5.1	Output of the Heart rate	31
5.2	Output of the Respiration rate	32
5.3	Output of the Body temperature	33

CHAPTER-1

INTRODUCTION

1.1 Basic Introduction

In this advanced technical world still countries with high population, road traffic jam and delay of medical attention are major problems. Recent statistics say that, every minute a life is lost due to time delay of medical care. Both the patient's family and the hospital's integrity are at stake when a life is lost. In addition to this, the time lost due to inevitable traffic congestion, result in the late arrival of ambulance at the hospital. Even more time is lost in the process of completing hospital formalities. In order to overcome this, an ambulance with an inbuilt Health Monitoring System can prove to be helpful. Accident victims, pregnant women or people suffering from severe health issues are in need of urgent medical care. There is a need for the hospital authorities to be aware of the patient's basic medical conditions, so that relevant and timely treatment can be provided to the patient which requires a wireless communication between the ambulance in charge and hospital authorities.

-Heart rate

-Respiration rate

-Body temperature

Are the main basic medical parameters taken for any type of patient admitted in a hospital or while coming in the ambulance.

1.2 HEART RATE

The heart or pulse rate is the number of times heart beats per minute. Normal range of heart rate for an adult human is between 60 to 100 beats per minute(bpm). High pulse rate is considerably more than 100bpm. During high pulse rate muscles are weakened

by virus or that forces it to beat more often to pump enough blood to rest of the body. High pulse rate are caused due to underlying diseases such as fear, anxiety, anger, stress and love. High pulse rate have symptoms such as fainting, fatigue, shortness of breath, fluttering in the chest. High pulse rate is also called as tachycardia. Slow heart rate is considerably less than 60bpm. During slow heart rate the heart beats slowly. Slow heart rate have symptom like confusion, dizziness and cardiac arrest. Slow heart rate is also known as bradypnea.

1.3 RESPIRATION RATE

Respiratory rate is the number of breaths taken per minute. A normal respiration rate for an adult is 12 to 20 breaths per minute. Respiration rate below 12 or above 25 is considered to be abnormal. The respiration rate varies by age for infants (30 -40bpm), for toddler (24-30), for preschoolers (22-34), adolescents (12-16). Respiration rate below 12 is a slow breathing rate. This is also called as bradypnea. The symptoms are feeling faint, headaches, weakness, dizziness, poor coordination. Respiration rate more than 20 is abnormal resulting in rapid breathing, this is called as Tachypnea. The symptoms are fainting, fluttering in the chest, bounding pulse, shortness of breath, fatigue.

1.4 BODY TEMPERATURE

A normal human adult body temperature is to be 37°C (98.6°F) it may vary according to individual. Body temperature is one among the four key vital signs and also being a symptom for many major illnesses it is considered as a very important basic medical parameter. High body temperature indicates fever and low body temperature indicates viral infection.

1.5 INTERNET OF THINGS

The internet of things is defined as a system of interrelated, internet-connected objects which makes it possible to collect and transfer data over a wireless network without giving

room for any errors because it does not require any human intervention. This method is proven efficient compared to other data transfer methods [1].

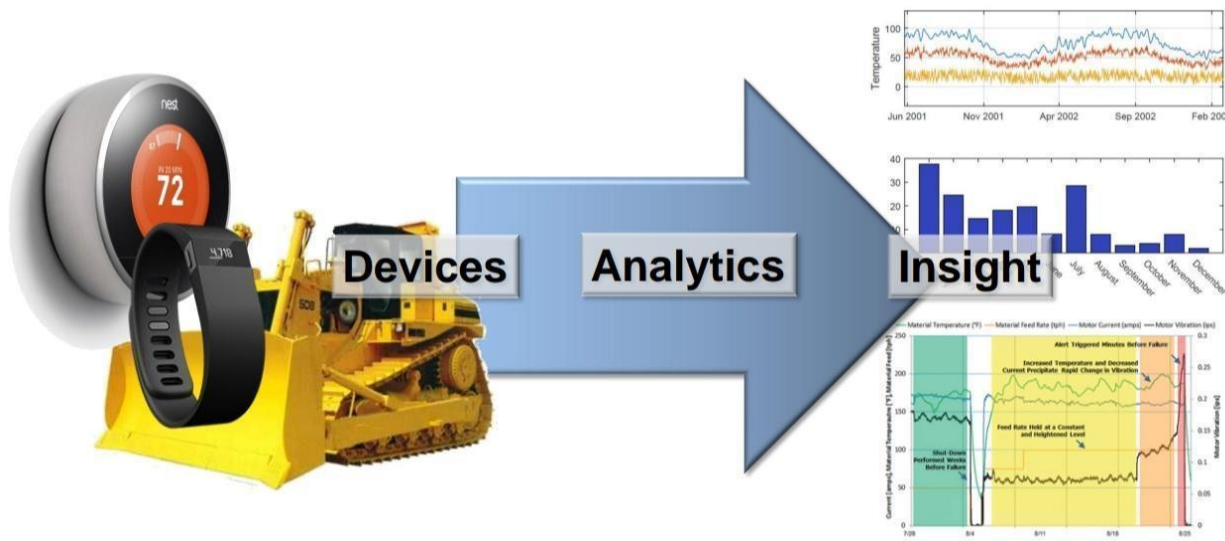


Figure 1.1 Work flow of IOT

The ‘thing’ might refer to a connected a biochip transponder, medical device, a solar panel, any object or a connected automobile with sensors that alert the driver to a myriad of possible issues like fuel, tire pressure, needed maintenance, outfitted with sensors, which makes it possible to gather and transfer data over a network. The Internet of Things has become such a big deal because it makes connected cities safer, asset tracking more cost effective, healthcare more personalized and energy consumption more efficient. Places that harness the data generated by the Internet of Things will survive and thrive in the future. They will realize a significant competitive advantage.

Patients' contacts with doctors were restricted to appointments, teleconferences, and text messages without the presence of the internet of things. There was no way for physicians or hospitals to constantly track patients' health and make appropriate recommendations.

Remote monitoring in the healthcare sector is now possible thanks to Internet of Things (IoT)-enabled devices, which have the ability to keep patients safe and secure while also inspiring physicians to provide superior treatment. As interactions with doctors have become simpler and more effective, it has also increased patient involvement and satisfaction. Furthermore, remote monitoring of a patient's well being tends to shorten hospital stays and avoid repeated admissions. IoT has a positive effect on lowering healthcare costs and improving treatment quality. The Internet of Things (IoT) is undeniably changing the healthcare industry by redefining the space of devices and human involvement in the delivery of healthcare solutions.

IoT use for patients- Patients have access to personalised attention through wearable devices such as exercise bands and other wirelessly linked devices such as blood pressure and heart rate monitoring cuffs, glucometers, and so on. These devices can be programmed to remind you of things like calorie counting, exercise, appointments, blood pressure changes, and much more. IoT has changed people's lives, particularly the lives of elderly patients, by allowing them to monitor their health conditions in real time. This has a major effect on single people and their families. An warning system sends signals to family members and concerned health professionals if a person's normal activities are disrupted or changed.

IoT use for physicians- Physicians can keep a better track of their patients' wellbeing by using wearables and other IoT-enabled home monitoring equipment. They will keep track of whether or not patients are sticking to their care plans, as well as whether or not they need urgent medical attention. IoT allows medical professionals to be more aware and involved in their interactions with patients. Data from IoT devices can assist physicians in determining the appropriate care process for their patients and achieving the desired results.

IoT use in hospitals- Apart from observing patients' health, hospitals also benefit from IoT devices in a number of ways. Medical equipment such as wheelchairs, defibrillators, nebulizers, oxygen pumps, and other monitoring equipment are tracked in real time using IoT devices with sensors. Healthcare workers deployment at multiple locations can also

be analyzed in real time. Infection transmission is a significant problem for hospital patients. IoT-enabled hygiene monitoring systems aid in the prevention of infection in patients. IoT devices also aid asset management in areas such as pharmaceutical inventory management and environmental monitoring, such as testing refrigerator temperatures and controlling humidity and temperature.

1.6 QUAD PROTOTYPE

A quad prototype is a flying drone with four propellers and four electric motors. The quad, like other multi-rotors, has the most stable platform as compared to other RC flying vehicles, thanks to its unique nature and the direction and difference between the four thrusts it produces. Quads are ideal for aerial surveillance and filming because of their stability and can also be used for agriculture and medical purpose. They are available in a variety of shapes and sizes. They range in size from small enough to fit in the palm of your hand to large enough to lift serious filming equipment and gimbals. You'd be shocked how much weight the larger drones can transport. Unlike a conventional helicopter, the quad now depends on its four rotors cooperating to produce uplifting thrust. Since each rotor lifts about a quarter of the total weight, we can use smaller, less costly motors. Changing the amount of power each motor delivers to its propellers is how you monitor the quad's movement. The quadcopter configuration has become common for small-scale unmanned aerial vehicles or drones in recent decades. Quadcopter research has risen in response to the need for aircraft with greater maneuverability and hovering ability. Quadcopters can be relatively easy in nature while still being highly reliable and manoeuvrable thanks to the four-rotor design. Quadcopter's capabilities are being enhanced by developments in multi-craft coordination, environment discovery, and manoeuvrability. Quadcopters will be capable of advanced autonomous missions that are currently not feasible with other vehicles if these emerging qualities could be combined.



Figure 1.2 Quad prototype

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

The following shows the survey did for Dynamic Remotely Operated Navigation Equipment with basic medical parameters. The most popular of the existing research has been discussed as follows.

2.2 LITERATURE SURVEY

Dr. J. Prem Kumar (March 2017) made a publication stating that Several thousands of people die day to day due to the time lag taken by the Ambulance service to reach the accident spot. This occurs as a result of traffic congestion in the area. A prototype of an emergency flying air ambulance or an ambulance drone has been developed that can reach fatal cases quicker than a traditional ambulance, saving time and measuring various health parameters. Utilizing the measuring instruments when a call is made to the emergency number, the emergency dispatcher uses a global positioning system to map the location and navigate. The ambulance drone arrives on the scene in real time, with the operator providing real-time orders. The drone is equipped with a mini patient monitoring system that includes a variety of sensors that can be easily connected to the victim's body, allowing vital parameters to be measured and automatically transmitted to an ambulance and a nearby hospital through the global positioning system and ZIGBEE. The specific outcome enables paramedics and physicians to assess the condition more quickly and make informed diagnostic and therapeutic decisions. As a result, the aim is to create an all-purpose medical toolkit that can be applied to any crisis situation and used to provide real-time situation results to the ambulance and hospital teams so that they can respond to the needs of the patients. Rather than replacing the regular ambulance, this prototype aids in its efficiency [3].

Ahmed Bitar (2017) in the 14th International Conference on Computer Systems and Applications mentioned that, many technological and industrial companies are working to keep up with the rapid advancement of technology. As a result, a variety of devices are

being developed to be user-friendly. Drones are the main topic of discussion (flight controllers). Drones, as we can see today, have a plethora of incredible future applications and will soon revolutionize entire industries. Drones are a relatively recent addition to the market, but their impressive features and capabilities are generating a lot of attention and interest. Furthermore, drones can be equipped to perform such tasks that have advantages, such as medical drones that save lives by delivering medical assistance. The concept of using medical drones is not recent, but it has been growing in popularity over the last decade. Medical drones will assist the medical team by providing services such as transporting supplies to remote and difficult-to-reach locations. They could be more effective at identifying injuries in critical areas and delivering critical supplies to stabilize the situation before a medical team arrives. With this drone on the market, it will be extremely useful and have a positive effect on the medical sector because it will provide useful services that will improve medical services.

Karanam Ravichandran Dayananda (2017) in his research stated that if a medical emergency, such as an out-of-hospital cardiac arrest, is not attended to immediately, a person's chances of survival decline rapidly. Modern hospitals are well prepared to handle such an emergency; however, an ambulance can get trapped in traffic, and paramedics may take time to reach areas deep inside a house. Cardiac arrest kills between 180,000 and 400,000 people every year. Drones have long been used for remote sensing and aerial imagery processing, but technology now exists to enable them to respond to medical emergencies. A system for responding to emergency situations is needed to ensure that drones can reach the victim and provide medical assistance. A system-of-systems-based architecture capable of responding to a heart attack, one of the most critical medical emergencies, is proposed in this paper. The proposed architecture consists of twelve interconnected structures that work together to ensure that the drone can fly safely and provide medical assistance. The concept of a self-contained command and control system is discussed. This device also allows for manual control of the robotic arm from elsewhere to perform complex tasks. A robotic arm that uses visual input to assist a person suffering from cardiac arrest is also part of the proposed system. The image recognition method employs depth image sensing techniques to pinpoint the best

locations for defibrillator pads to be applied. The machine must first determine if the person is suffering from ventricular fibrillation before putting defibrillator pads on their chest. A pre-examination using on-board sensors is performed by the robotic arm system to help with this. The on-board software in the automated external defibrillator unit is programmed to detect ventricular fibrillation. The route planning system uses on-board GPS to monitor its progress and arrive at its destination to enable autonomous flight. The device can be directed inside a building using video imagery to ensure that it reaches the desired spot. It avoids obstacles by using visible light imagery and ultrasonic sensor data. Motors, IMU sensors for flight stability, and the robotic arm are among the drone's hardware systems. If the drone malfunctions, an emergency response system is built in to ensure that it can land safely in a suitable location. The severity of the failure can be determined by this method. It gives the drone's control unit orders to conduct response and recovery operations. The proposed system also recognises cybersecurity requirements so that it can deal with possible attackers who may try to gain access to locally accessible route controls and reroute the UAS to achieve unauthorised goals. It has a firewall and a restricted intrusion detection system, as well as tight encryption for passwords and other credentials.

Parvathi Sanjana(2020) in her paper presentation said that countless precious lives have been lost as a result of ambulances being trapped in traffic. According to statistics, the likelihood of such scenarios is at an all-time high, especially in Indian traffic conditions. In this paper, we propose a method for expediting the distribution of first aid kits in a variety of circumstances, including I ambulances stuck in traffic, (ii) war-torn areas with insufficient medical supplies, and so on. A first aid kit will help reduce the risk of infection or the seriousness of an injury, whether it's a mild ailment or a more severe injury. Drones are changing the face of human technology, and they can be used in medicine to ensure prompt delivery of critical first aid to people in remote areas. When a user orders an ambulance for a victim, if the ambulance is stuck in traffic, automated drones will send a customized first aid kit to the user's location, allowing the victim to be diagnosed by remedy drugs with the help of a doctor via the web app before the ambulance arrives at

the victims location and transports the victim to the hospital. In the event of an emergency, users may also order urgent remedy drugs from the pharmacy.

N. Nithyavathy (2020) in her research volume gave that drones are currently in high demand due to their adaptable applications to make human life easier. They conduct activities on a regular basis at a fair cost and quality. The main goal of this project is to design and create a drone that can deliver healthcare. The delivery drone has the ability to disrupt conventional transportation infrastructure in the same way. The distribution of small products like medications, blood, vaccines, and other healthcare items that are required in areas with difficult access becomes crucial in healthcare due to inadequate transportation infrastructure or roads blocked by extreme weather, disasters, or traffic congestion. To address this problem, an autonomous drone has been designed to deliver medicines quickly to locations where they are required. The delivery drone with an ardupilot is designed in both manual and autopilot mode, allowing it to fly to the desired location. It can carry up to 2 kg of medication and has a 7-minute flight time.

Hailong Huang in his paper proposed a new parcel delivery system based on a public train and drones in this paper. The train, which is already a mobile hub in our neighborhood, transports passengers according to a predetermined route and schedule. Meanwhile, a delivery drone and several packages to be sent to customers are stored on the roof. It can also ride with the train and use an automatic battery swap mechanism to replace its battery on the roof. Since the parcel delivery system is unable to handle train movement, the train's route and timetable must be carefully planned in order to arrange deliveries. We propose two algorithms to solve an optimization problem of minimising the total delivery time of a given collection of parcels. Despite the fact that the same algorithm produces the best schedule, its computational complexity grows exponentially with the number of parcels. A suboptimal algorithm is designed to allow the proposed method to be implemented in operation. It is more effective than the exact algorithm and can achieve close performance to the exact algorithm. In addition, we suggest a clear but efficient method for dealing with the train's schedule instability. Furthermore, the proposed algorithm for a single drone case has been changed to deal with multiple drones. Computer simulations and comparisons to current approaches are used to verify the

feasibility of the proposed algorithms. The findings show that the proposed solution is less expensive than both the truck-only and truck-plus-drone approaches. Moreover, as opposed to a scheme that only uses drones, the package delivery time can be shortened and the delivery area can be expanded.

Vangara Vamsi Krishna (2018) in his research volume mentioned that the aim of this paper is to create a drone ambulance prototype that will aid ambulances in saving human lives. According to a report conducted by the Centre for Science and Environment (CSE), traffic does not exceed 30-40 km/h 92 percent of the time during peak hours. In current systems, a drone only transports the defibrillator to the emergency location. As a result, it only considers one parameter. This paper aims to create a device that can arrive at an emergency location faster than an ambulance and take into account several real-time patient health parameters such as temperature, heart rate, and heartbeat. These vital parameters values are then transferred to the ambulance .IEEE 802.15.4 Zigbee is used for this purpose. The drone ambulance has a range of around 500 meters, while Zigbee 2.4GHz range is 10-20 meters. This allows the doctor to properly assess the condition. The calculated parameters experimental effects are observed and presented.

Jeevan G Murthy (2020) in his project proposed that the use of drones for delivery is a more modernized and modified method of delivery. The aim of this paper is to make the delivery process easier for this unmanned aerial vehicle by distributing files to several customers in a specific location. Improving delivery reliability and reducing human effort. The one-time password [OTP] is used to improve security. This paper requires electronic speed control [ESC] to control the motor's speed, as well as a global positioning system [GPS] model to control the drone's longitudes, latitudes, and elevation points.

Chengathir Selvi.M International Conference on Inventive Systems and Control (ICISC-2017) presented that in the media, medical healthcare systems, communications, home automation systems, and other fields, technology plays a critical role. The Internet of Things is the most recent development in healthcare surveillance systems. IoT devices capture and exchange data directly with each other and with the cloud, allowing for quicker and more reliable data collection, recording, and analysis. Healthcare

management is one of the most exciting applications of information technology. Patients are currently monitored using a bedside monitoring station with wired sensors, which requires doctors and nurses to check on them on a regular basis. It is impractical to collect data for a larger area, and wireless network coverage is not available. This paper proposes a cooperative solution for an electronic Healthcare Monitoring System that uses wireless communications to calculate different parameters of the patient such as temperature, pulse, and body activity. The patient's condition will be tracked and saved in the cloud. This proposed device processes sensor data and offers real-time tracking information to doctors about a patient's medical conditions, allowing healthcare professionals to track and access patient data from anywhere in the world at any time. It allows care and management to be tailored to the individual.

J.V.Alamelu proposed that in all fields of study, the Internet of Things (IoT) and cloud computing are the primary subject of current research and development. The aim of this research is to improve the integration of wireless sensor networks (WSNs) in an IoT environment with cloud computing for health care systems. The Internet of Things (IoT) is a dynamic network infrastructure that links various sensor networks through the Internet, acquires sensor data/information, and transmits and receives data/information for further processing. The related sensed data/information, as well as the design and optimized parameters, will be sent for the required information exchange. This research paper focuses on incorporating WSN architecture in an energy-efficient manner in an IoT context, cloud computing for a healthcare application. Quality of Experience (QoE), trust management, decision making, and energy management will all be improved with the new architecture for the health care system. Health-care programs should be implemented to all hospitals, with insurance providers providing centralized, safe access to medical data and health-monitoring for each patient. This proposed integration appears to be useful for IoT applications where energy and QoE are needed.

CHAPTER 3

AIM AND SCOPE

3.1 AIM

The main idea of the research work is to provide an efficient health monitoring system. In this project we propose a drone with basic medical parameters such as heart rate, respiration rate and body temperature reaching the accident spot much faster than the ambulance skipping the traffic.

There are also several sub ideas in this project where this medical device can be used in military rescue missions, during a rescue mission this drone will reach the spot and derive the basic medical parameters telling whether the hostage or wounded soldiers in the battle field are alive or not, reducing unwanted risky rescue missions.

3.2 EXISTING SYSTEM

There are various health monitoring systems like ambulance, two wheeler ambulance and rest of the systems are only done after hospitalization that are existing before but still, the traffic and time delay is a major issue in a country like India, to overcome that system we designed a new system.

Disadvantages in existing system

- Lot of time delay due to traffic.
- No proper communication and data transfer between ambulance and hospital.

3.3 PROPOSED SYSTEM

This proposed system Our idea is to reach the accident spot as soon as possible and monitor the patient's health condition and transmit to the ambulance and the hospital through IoT so that the ambulance and hospital they're prepared based on the patient's condition before the ambulance reaches the hospital [2].

Advantages of proposed system

- No time delay by skipping the traffic.

- Patient's health condition is transmitted efficiently and also stored in the cloud for future references.

3.4 SCOPE

In future with necessary financial aid and technical assistance further development can be provided with few more medical parameters like seizure detection, blood group detector and some other advanced diagnosis. The application of this project goes on endlessly in all fields of study like business, medical, surveillance and military. This research can also be used in several other fields requiring unmanned aerial medical assistance.

Updates like increasing the range of the drone making it fly far more distance than the existing range. The voice instructions from ambulance to the people around the device can also be added. An advanced hardware construction is also possible by including LED display, high rpm DC motors, accurate GPS tracking and a much heavy load carrying quadcopter.

Facial recognition can also be made possible by processing the image obtained from the camera and matching it with government databases which helps in finding the personnel details of the accident victim in a medical drone or accused persons in the surveillance drone [4].

CHAPTER 4

MATERIALS AND METHODS

4.1 ARDUINO MICROCONTROLLER

The Arduino microcontroller is a simple-to-use but strong single-board device that has gained a lot of popularity in the hobby and professional markets. The Arduino is open-source, which suggests hardware within reason priced and development software is free. This guide is for college students in ME 2011, or students anywhere who are confronting the Arduino for the primary time. For advanced Arduino users, prowl the web; there are plenty of resources. The Arduino project began in Italy with the aim of creating low-cost hardware for interaction design. The Wikipedia article for Arduino has a description. The Arduino hardware is available in a variety of configurations. Sparkfun could be a good source for Arduino hardware in the United States. The Arduino Uno board (Sparkfun DEV-09950) is covered in this guide, which is a good option for college students and educators. With the Arduino board, you'll be able to write programs and build interface circuits to read switches and other sensors, and to regulate motors and lights with little or no effort. Many of the images and drawings during this guide were taken from the documentation on the Arduino site, the place to show if you wish more information. The Arduino section on the ME 2011 computing device, covers more on interfacing the Arduino to the 000 world. The Duemilanove board features an Atmel ATmega328 microcontroller operating at 5 V with 2 Kb of RAM, 32 Kb of nonvolatile storage for storing programs and 1 Kb of EEPROM for storing parameters. The clock speed is 16 MHz, which translates to about executing about 300,000 lines of C ASCII text file per second. There are 14 optical I/O pins and 6 analogue input pins on the board. When running a program when not connected to the host computer, there is a USB connector for lecturing the host computer and a DC power jack for attaching an external 6-20 V power source, such as a 9 V battery. Headers are supported for connecting 22 g solid wire or header connectors to the I/O pins. It's possible that the Arduino programming language is a condensed version of C/C++. Programming the Arduino would be familiar if you are familiar with C. If you don't know C, don't worry, only a few commands are needed to perform useful tasks. A crucial feature of the Arduino is that you simply can create an impression program on the host PC, download it to the Arduino and it'll run automatically. Remove the USB cable connection to the PC, and also the program will still run from the highest every time you

push the push. Remove the battery and put the Arduino board in a very closet for 6 months. After you reconnect the battery, the last program you stored will run. this implies that you simply connect the board to the host PC to develop and debug your program, but once that is done, you now not need the PC to run the program [5].

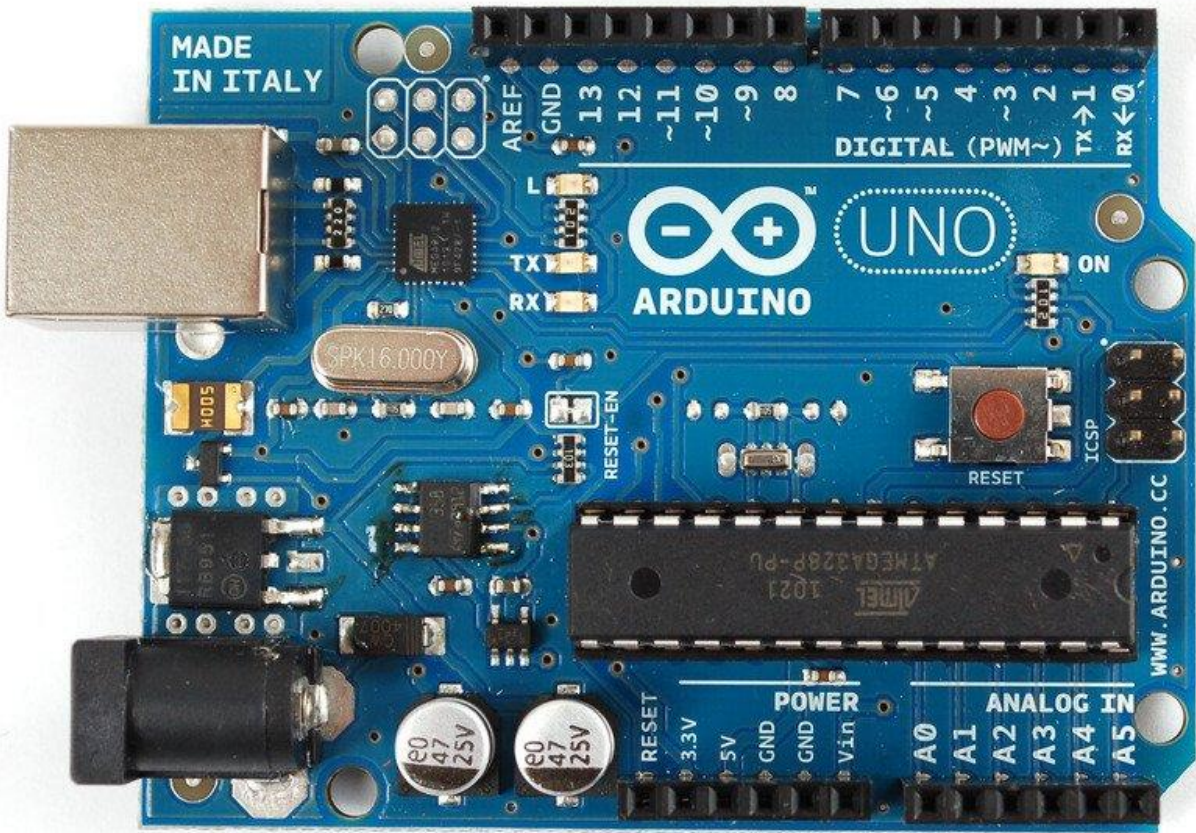


Figure 4.1 Arduino Microcontroller

4.2 BATTERY

The positive electrode (the anode) of most lead-acid batteries is made of a lead- antimony alloy with lead (IV) oxide pressed into it, while batteries engineered for full life uses a lead-calcium alloy. Both electrodes are immersed in sulphuric acid, with the negative electrode (the cathode) made of pure lead. Water is emitted when the battery is discharged, diluting

the acid and lowering its specific gravity. Sulphuric acid is formed during charging, and the electrolytes specific gravity rises. A hydrometer can be used to determine the specific gravity of a charged cell, which will be about 1.250 for a charged cell and 1.17 for a discharged cell, but these values can differ depending on the battery manufacturer. The specific gravity of a battery is often affected by the temperature of the battery and the above values, or for a battery at 15°C. A summary of the chemical reactions that occur during charging and discharging is given. Hardened lead sulphate coats the electrodes when lead-acid batteries are over discharged or left in the discharged state for an extended period of time, and can not be removed during recharging. Batteries productivity and life are harmed as a result of such accumulations. Electrolyte will escape as gases if the battery is overcharged.

4.2.1 TYPES OF BATTERIES

Lead Acid Battery

Starting Batteries – Used to start and operate motors, they have the ability to produce a significant current in a short period of time while only discharging by 2-5 percent. When deep cycled, these batteries easily degrade and fail after 30-150 cycles, but when used correctly, they can last a long time. Deep Cycle Batteries are used to store energy in self-contained power systems (such as solar and mini-hydro), as well as for emergency backup and electric vehicles. Over thousands of charging and discharging cycles, these batteries are designed to discharge up to 80% of their power. While true deep cycle batteries have solid lead plates, many batteries with non-solid plates are referred to as semi-deep cycle. Marine Batteries – Usually a mix of deep cycle and starting batteries, but some are real deep cycle batteries. Over 50% discharge of hybrid batteries is not recommended.

Deep Cycle Battery

Flooded – A traditional liquid electrolyte is used in these batteries. Standard types have removable caps that allow the electrolyte to be diluted and the specific gravity to be

determined; these batteries are shipped dry and need distilled water to fill. Standard flooded batteries are inexpensive, and they are not excessively sensitive to high charging voltages if they are held charged. Sealed batteries are pre-flooded and have fixed valves to allow gases to vent during use; however, if inverted, they will leak and the electrolyte will not be replenished, resulting in damage from overcharging.

Electrolyte Gelled – Since the electrolyte is a jelly, it will not spill. Since the electrolyte cannot be diluted, overcharging must be prevented, and these batteries can only last 2 or 3 years in hot climates, but they may last up to 5 years with proper care. The electrolyte is held between the plates absorbed in a fine boron-silicate mat in absorbed glass mat (AGM) batteries. They would not leak acid like gelled electrolyte batteries, but since they are engineered to hold vented gases, they can tolerate more reckless handling and are less vulnerable to overcharging. AGM batteries can also be recharged successfully after being completely discharged for 30 days. The most important disadvantage.

Battery Capacity

The power of a battery is usually measured in ampere-hours (Ah). When a current of one ampere is delivered for one hour, the amount of charge delivered is one ampere-hour. A discharge rate is also provided since the capacity of lead-acid batteries are determined by the rate at which they are discharged. For example, a battery with a 300Ah capacity can provide (300/10) 30A continuously when discharged over 10 hours (10 hour rate), but it will only have a 250Ah capacity .If (250/5) 50A is continuously drawn from it, it will be discharged at the 5 hour mark. In short, the slower you discharge a battery, the more power it has; deep-cycle battery capacities are typically higher.



Figure 4.2 Battery

4.3 DC MOTOR

A DC motor is a type of electrical machine that converts direct current electricity into mechanical energy. The most popular forms depend on magnetic fields to generate forces. Almost all DC motors have an internal mechanism, either electromechanical or electronic, that changes the direction of current flow in a portion of the motor on a regular basis. The majority of them generate rotary motion; a linear motor generates force and motion in a straight line. Since they could be operated by existing direct- current lighting power distribution systems, DC motors were the first kind to become widely used. The speed of a DC motor can be varied over a wide range by using either a variable supply voltage or a variable supply voltage.

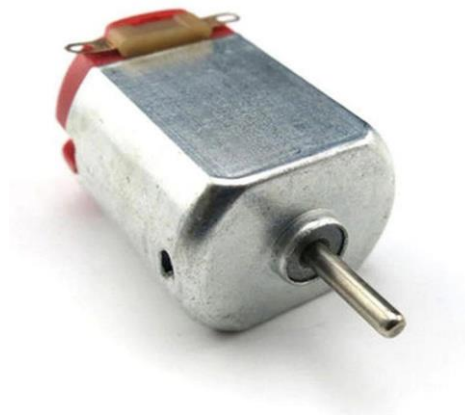


Figure 4.3 DC motor

4.3.1 Electromagnetic Motors

A current flowing through a wire coil produces an electric field associated with the coils base. The current flowing through the coil will change the direction and magnitude of the magnetic field it produces. A basic DC motor has a stator with a stationary collection of magnets and an armature with one or more insulated wire windings wrapped around a soft iron core that concentrates the magnetic field. Multiple turns are common in the windings around the hub, and large motors may have multiple parallel current paths. The wire windings ends are attached to a commutator. The commutator energizes each armature coil in turn and uses brushes to connect the rotating coils to the external power supply. (Brushless DC motors do not have brushes and use electronics to turn on and off the DC current to each coil.) The intensity of the electromagnetic field produced is determined by the total amount of current sent to the coil, the coils size, and what it's wrapped around. The order in which a coil is turned on or off determines the direction in which the effective electromagnetic fields are directed. A rotating magnetic field can be formed by sequentially turning on and off coils. These moving magnetic fields interfere with the magnetic fields of the magnets (permanent or electromagnets) in the motors stationary component (stator) to induce rotation of the armature. The stator fields of some DC motor designs use electromagnets to generate their magnetic fields, allowing for more

control over the motor. DC motors are almost always cooled with forced air at high power levels. The number of stator and armature fields, as well as how they are related, determine the speed and torque control characteristics. The voltage applied to the armature can be adjusted to regulate the speed of a DC motor. Variable resistance was introduced into the armature circuit or field circuit, allowing for speed modulation. Power electronics systems are often used to operate modern DC motors, which change the voltage by chopping the DC current into on and off cycles with a lower voltage. The series-wound DC motor is often used in traction applications such as electric locomotives and trams because it produces the most torque at low speeds. For several years, the DC motor was the norm in electric traction drives on both electric and diesel locomotives, streetcars/trams, and diesel electric drilling rigs. Starting in the 1870s, the invention of DC motors and an electrical grid system to power machines ushered in a new second Industrial Revolution. DC motors can run on rechargeable batteries, providing motive power for the first electric vehicles, as well as today's hybrid and electric vehicles and a variety of cordless equipment. DC motors are still used today in a variety of applications, from toys to disc drives to steel rolling mills and paper machines. Winder drives for mine hoists usually used large DC motors with separately excited fields for high torque and smooth speed control using thyristor drives. Large AC motors with variable frequency drives have now taken their place. A DC motor becomes a DC generator, or dynamo, when external power is applied. When a hybrid car or electric car slows down, this function is used to recharge the batteries, or to return energy to the electric grid used on a street car or electric powered train line. On hybrid and electric vehicles, this is known as regenerative braking. Diesel electric locomotives use their DC motors as generators to slow down, but the energy is dissipated in resistor stacks. To recapture some of this capacity, newer designs include large battery packs.

4.4 HEART BEAT SENSOR

GENERAL DESCRIPTION

An ear clip and a receiver module are included in heart rate ear clip kits. The heart rate measurement kit can be used to keep track of a patients or athletes heart rate. The result can be shown on a computer and saved for further study using the serial port. The device as a whole has a high sensitivity, uses little power, and is very compact. This system detects heartbeats from your earlobe and sends the information to your iOS or Android device. Connect this module to the Grove-Base shields digital port D2. Grove-LED should be linked to Digital port 4 as well. Connect the Base Shield to an Arduino board. To build a new Arduino sketch, copy and paste the code below.

Product Description

A light emitting diode and a detector, such as a light sensing resistor or a photodiode, make up a simple heartbeat sensor. The flow of blood to various parts of the body varies as the heartbeat pulses. When a tissue is illuminated by a light source, such as the light produced by a led, it either reflects (a finger tissue) or transmits the light (earlobe). The blood absorbs some of the light, and the light detector receives the emitted or reflected light. The amount of light absorbed is determined by the tissues blood volume. The output of the detector is an electrical signal that is proportional to the heart rate.

HEART BEAT – CLIP TYPE FEATURES

- Low power consumption
- Wide power supply range: DC 3~5V
- Convenient to use
- High sensitivity
- Fully RoHS compliant

APPLICATIONS

- Heart rate monitor
- Navigation systems.
- Environmental control systems.
- Augmentative communication devices.
- Emergency response systems.

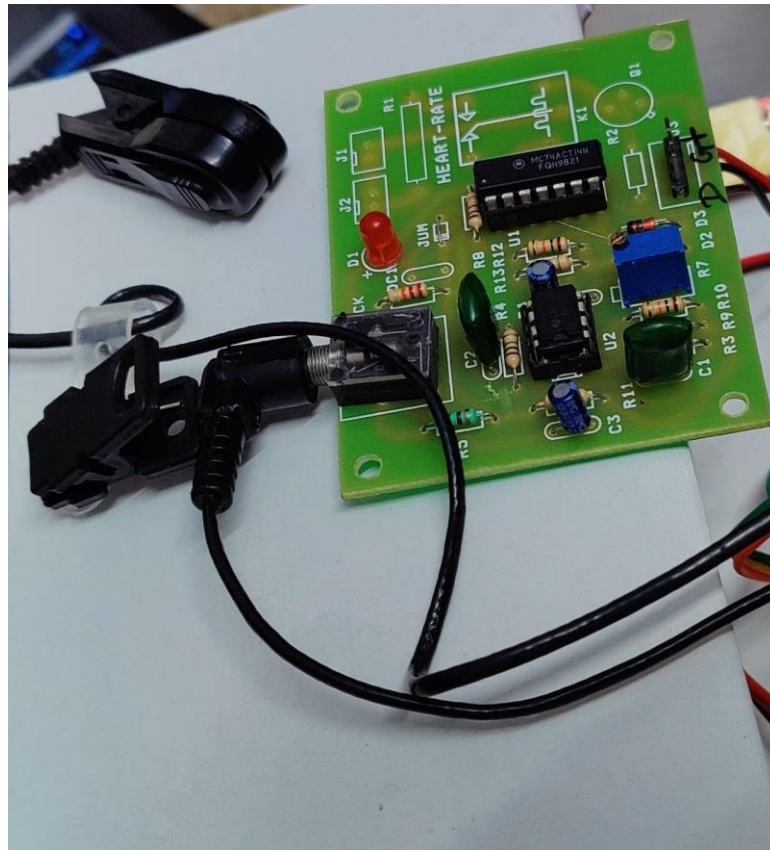


Figure 4.4 Heart rate sensor

4.5 NODE MCU

The firmware for the Node MCU is open-source. With just a few Lua script lines, you can build your Prototype IOT product.

Features:

- Open-source
- Interactive
- Programmable
- Low cost
- Simple
- Smart
- WI-FI enabled
- Arduino-like hardware IO
- Advanced hardware IO API, which can drastically reduce unnecessary hardware configuration and manipulation work. Code in Lua script, similar to arduino, but interactively.
- Node style network API
- Event-driven API for network applications that allows developers to write Node Js Code that runs on a 5mm*5mm MCU. Improve the pace at which you create IoT applications.

Specification:

- The Development Kit based on ESP8266, integrates GPIO, PWM, IIC, 1-Wire and ADC all in one board.
- Power your development in the fastest way of combination with NodeMCU Firmware.
- USB-TTL included, plug&play.
- 10 GPIO, every GPIO can be PWM, I2C, 1-wire
- FCC CERTIFIED WI-FI module(Coming soon)
- PCB antenna



Figure 4.5 Node MCU with wifi module

4.6 RESPIRATION SENSOR

Sound Detection Sensor

The sound sensor module is commonly used to detect sound intensity and provides a convenient way to detect sound. This module can be used for applications such as security, switching, and monitoring. Its precision can be easily tailored to fit your needs. It makes use of a microphone as the source of data for an amplifier, peak detector, and buffer. When a sound is detected, the sensor generates an output signal voltage, which is sent to a microcontroller, which then performs the necessary processing. The arduino sound detection sensor module determines whether or not sound has passed a threshold

value. A microphone detects sound, which is then fed into an LM393 op amp. An on-board potentiometer is used to change the sound level set point. An LED on the module illuminates when the sound level reaches the set point, and the output is turned down [6].

Specifications of sound detection sensor module:

- Working voltage: DC 3.3-5V
- Adjustable Sensitivity
- Dimensions: 32 x 17 mm
- Signal output indication
- Single channel signal output

With the retaining bolt hole, convenient installation Outputs low level and the signal light when there is sound. Output in the form of digital switching outputs (0 and 1 high and low)

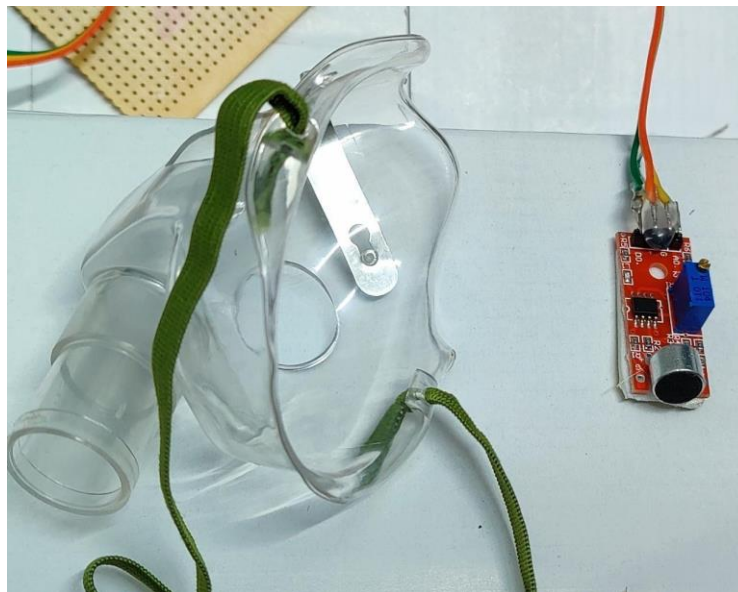


Figure 4.6 Respiration sensor

4.7 Temperature Sensor

The LM35 series are precision integrated-circuit temperature devices with a linearly proportional output voltage to the temperature in degrees Celsius. The LM35 device has a bonus over linear temperature sensors calibrated in Kelvin, because the user is not required to subtract an outsized constant voltage from the output to get convenient Centigrade scaling. The LM35 system produces standard accuracies of 14°C at temperature and 34°C over a complete 55°C to 150°C temperature range without any external calibration or trimming. Trimming and calibration at the wafer level ensure lower costs. Interfacing to readout or monitor circuitry is a breeze thanks to the LM35's low output impedance, linear output, and precise inherent calibration. The device is employed with single power supplies, or with plus and minus supplies. Because the LM35 device draws only $60\text{ }\mu\text{A}$ from the provision, it's very low self-heating of but 0.1°C in still air. The LM35 device is rated for a temperature range of 55°C to 150°C , whereas the LM35C device is rated for a temperature range of 40°C to 110°C (with increased accuracy of 10°). The LM35-series devices are available packaged in hermetic TO transistor packages, while the LM35C, LM35CA, and LM35D devices are available within the plastic TO-92 transistor package. The LM35D is available in a plastic TO-220 package and an 8-lead surface-mount small-outline package [8].



Figure 4.7 Temperature sensor

4.8 Thingspeak

ThingSpeak is a cloud-based IoT analytics application that allows you to compile, visualize and analyse live data streams. ThingSpeak provides instant visualizations of information posted by your devices to ThingSpeak. With the power to execute MATLAB® code in ThingSpeak you'll perform online analysis and processing of the information because it comes in. ThingSpeak is usually used for prototyping and proof of concept IoT systems that need analytics. ThingSpeak is a cloud-based tool for aggregating, visualising and analysing live data streams. a number of the key capabilities

of ThingSpeak include the flexibility to:

- Configure common IoT protocols to send data to ThingSpeak with ease.
- Visualize your sensor data in real-time.
- Aggregate data on-demand from third-party sources.
- Use the ability of MATLAB to create sense of your IoT data.
- Run your IoT analytics automatically supported schedules or events.
- Prototype and build IoT systems without fitting servers or developing web software.
- Use third-party applications like Twilio® or Twitter® to automatically action your data and connect [7].

4.9 BLOCK DIAGRAM

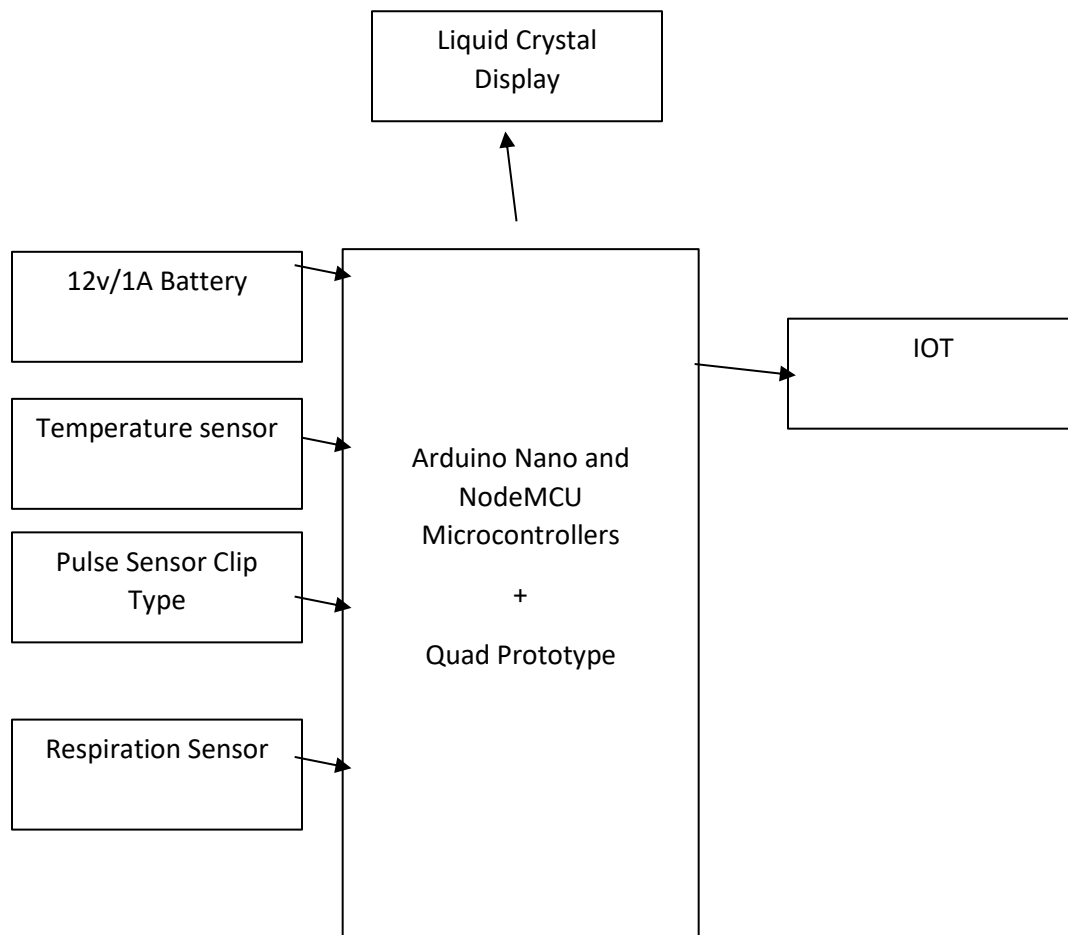


Figure 4.8 Block diagram

4.10 WORKING

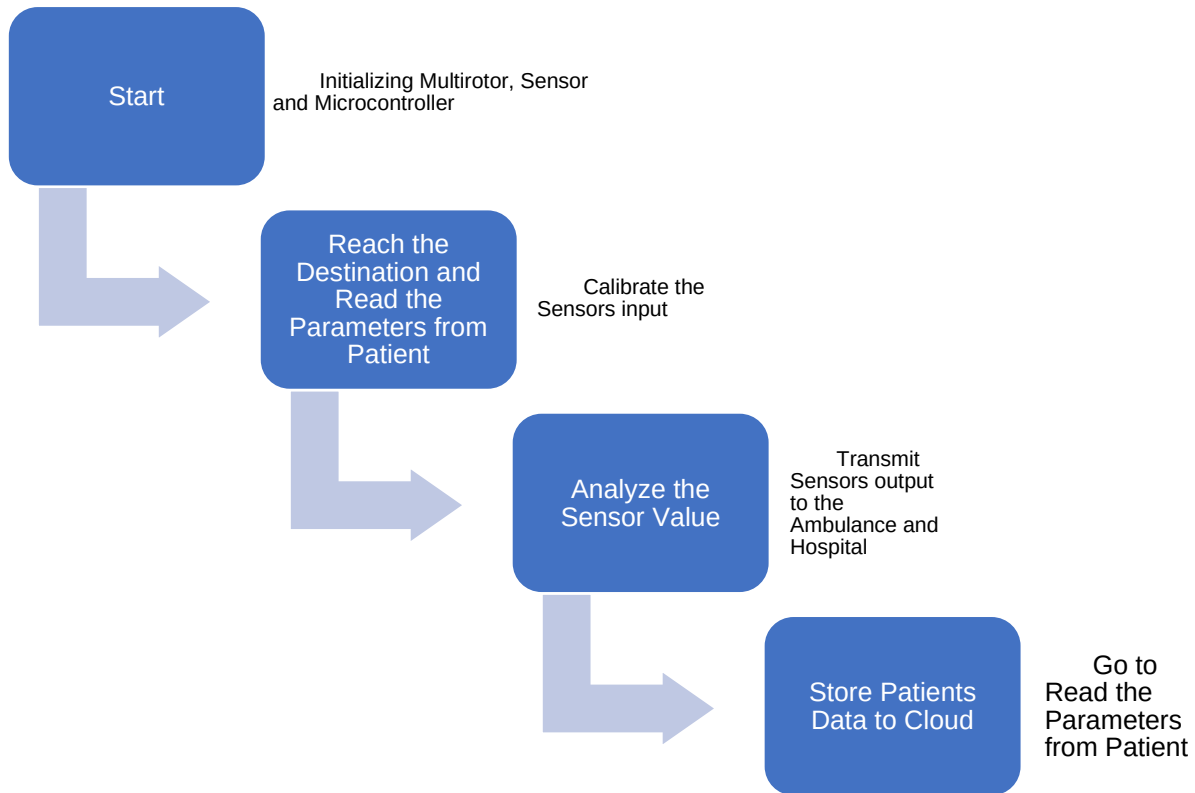


Figure 4.9 Work flow of the device

The quad prototype with the basic medical parameters after reaching the spot takes the readings of the patient through the sensors. The reading taken from the sensors is processed by the Arduino nano microcontroller and then displayed in the LCD screen. Simultaneously these values are transmitted to the hospital and ambulance systems through IoT by the node MCU wifi-module and also stored in cloud [9].

CHAPTER 5

RESULT

5.1 HEART RATE

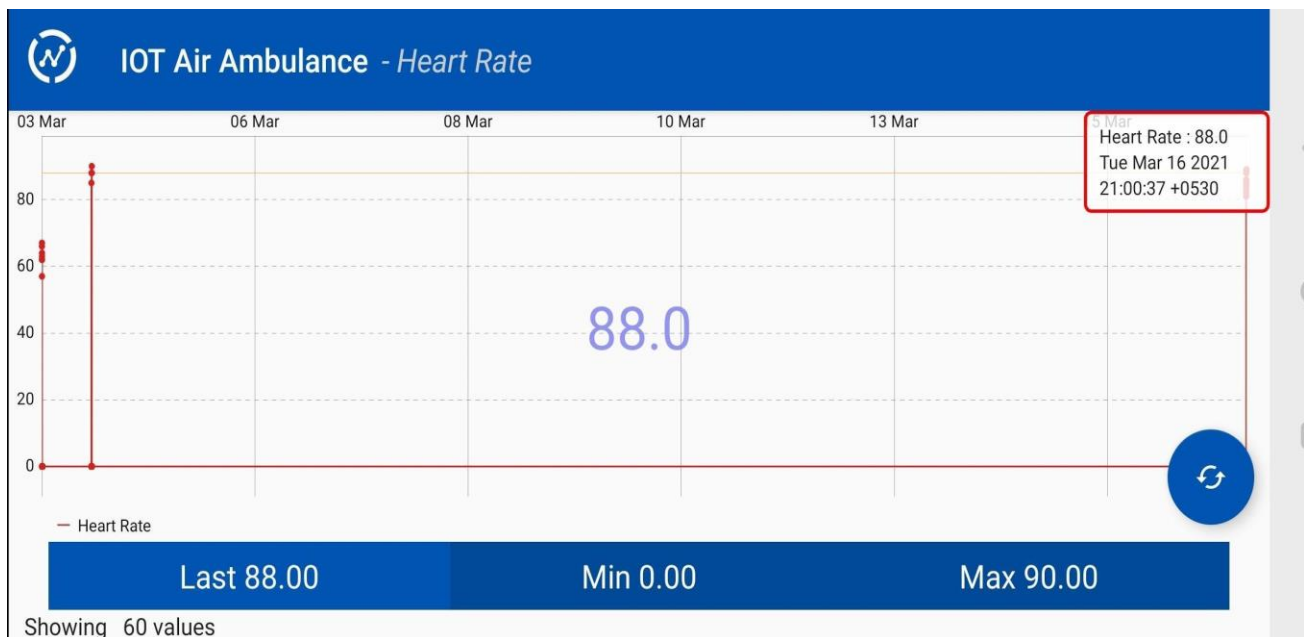


Figure 5.1 Output of Heart rate

The above figure is the output from the heart rate sensor and displayed via IOT. It is shown in a graphical form stating all the details such as day, date, time and heart rate. The normal value for an adult human is from 60-100 beats per minute. The value obtained and displayed is 88 beats per minute.

5.2 RESPIRATION RATE

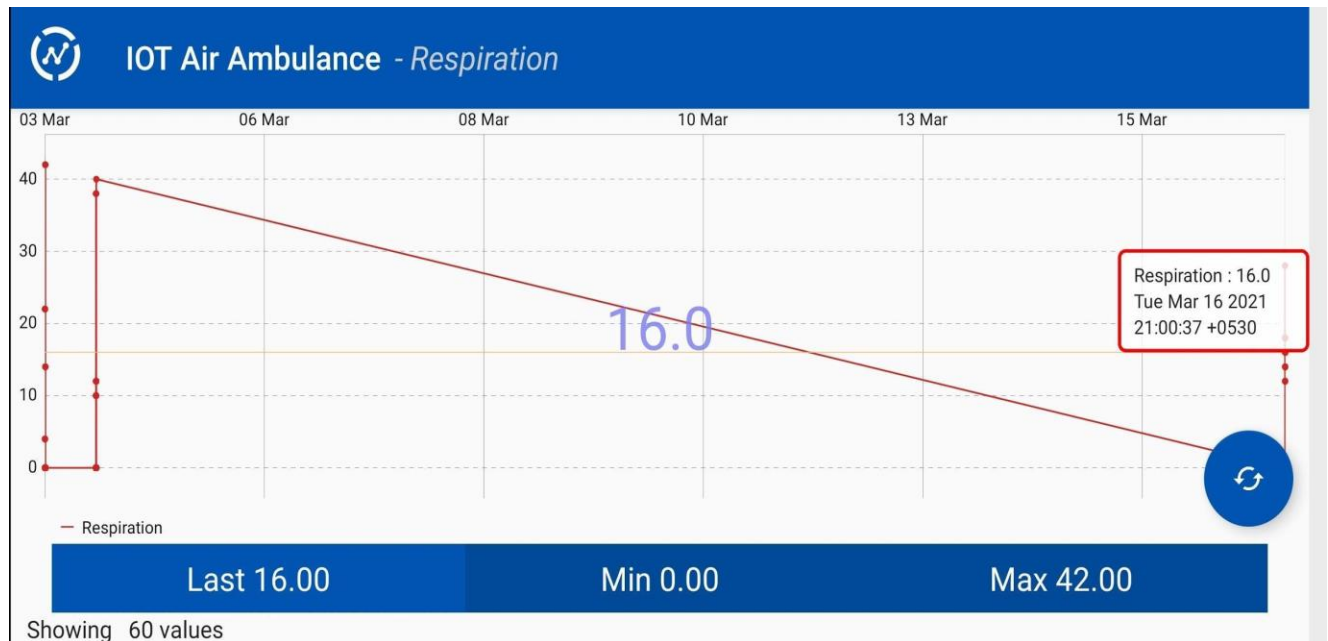


Figure 5.2 Output of Respiration rate

The above image is the output from the respiration sensor displayed by IOT. it is shown in graphical form stating all the details such as day, date, time and respiration rate. An healthy human adult respiration rate is from 12-18 breaths per minute. The value obtained and displayed is 16 breaths per minute.

5.3 BODY TEMPERATURE

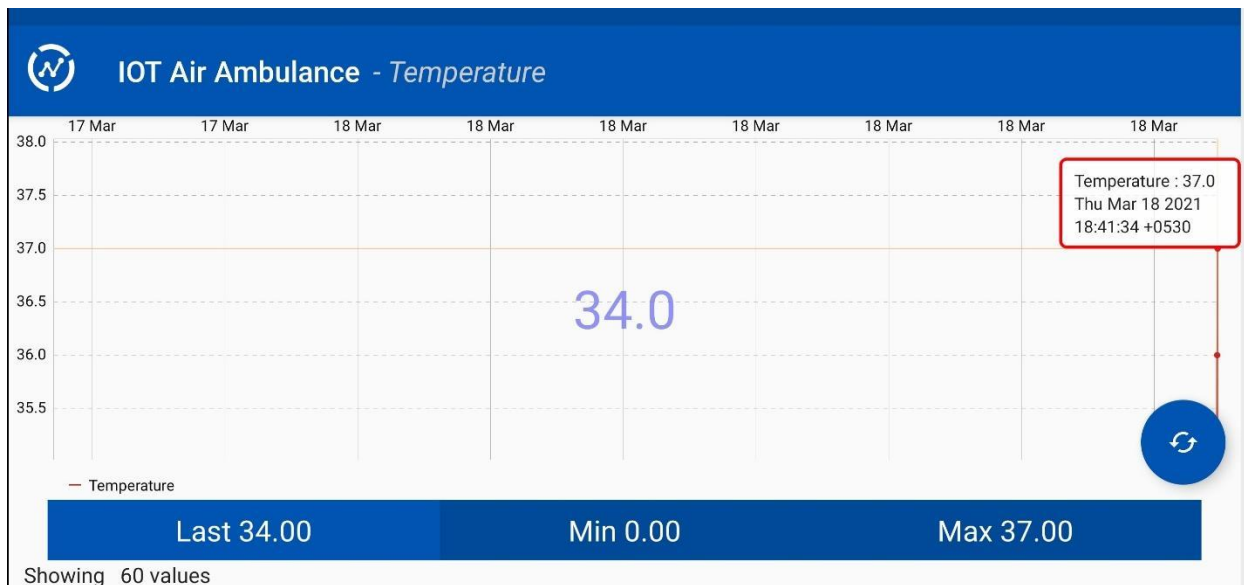


Figure 5.3 Output of Body temperature

The above image is the output from the temperature sensor displayed by IOT. It is shown in graphical form stating all the details such as day, date, and time and body temperature. An healthy human adult body temperature is 37 degree Celsius. The value obtained and displayed is 37 degree Celsius.

CHAPTER 6

CONCLUSION

6.1 CONCLUSION

In this research work we use a quadcopter which carries sensors that can detect basic medical parameters of humans such as heart rate, respiration rate and body temperature. We have also used the IoT platform to simultaneously view the data in both hospital and ambulance systems. It also stores the patient's data in the cloud for future reference. By this research we can reach the patient much faster than the ambulance by skipping the traffic, hence reducing the amount of lives lost due to time delay of medical care.

6.2 SUMMARY

The idea of the quadcopter with medical parameters is to serve as a better alternative to ambulance and other health monitoring systems and assist them. It is much more cost efficient than other current systems. Especially after this pandemic time we have learnt that we need to improve and upgrade our health infrastructure. Within the budget provided for health infrastructure which has remained between 1.2 - 1.6% of the total gdp for the past five years, so to get a quality and effective health monitoring system within the given budget this quadcopter would serve as great benefit.

In urban areas traffic congestion still prevails as a major problem because of which medical care is being delayed leading to an increase in death rate. The idea of quadcopter with basic medical parameters will be helpful in overcoming this traffic problem and provide medical care with no delay. This idea is also suitable for rural areas where there are less hospitals, so for small routine checkups this drone can be used for serving better. Since it uses IOT as a platform to transfer the data a lot of time is saved and also the obtained data is stored in the cloud for future reference.

As of real time implementation it can be operated by personnel with basic drone flying training providing job opportunities for people. The applications of a drone and the IOT serves to be endless, many more advanced parameters and diagnostic systems can be provided with lot developments by further research.

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APPENDIX

1)

```
#include <ESP8266WiFi.h>
```

```
#include <SoftwareSerial.h>
```

```
#include "ThingSpeak.h"
```

```
SoftwareSerial ard_node(D6, D5, false, 256); //red/org
```

```
int a, b;
```

```
char ssid1[] = "Project";
```

```
char password1[] = "1234567890";
```

```
unsigned long channelID = 1317941;
```

```
const char * writeAPIKey = "0B61LYYCJWJASUK6"; // write API key for your  
ThingSpeak Channel
```

```
const char* server = "api.thingspeak.com";
```

```
String th;
```

```
String modefn = "";
```

```
int tup = 20;
```

```
WiFiClient client;
```

```
int H_Bfn;
```

```
int Resp;
```

```
float tempfn;
```

```
void setup() {  
  // put your setup code here, to run once:  
  Serial.begin(115200);  
  ard_node.begin(115200);  
  
  ard_node.println("");  
  delay(200);  
  setupWifi();  
  Serial.print("Connecting to ThingSpeak");  
  ThingSpeak.begin(client);  
}
```

2)

```
#include<LiquidCrystal.h>  
#include <SoftwareSerial.h>  
  
LiquidCrystal lcd(12, 11, 10, 9, 8, 7);  
SoftwareSerial ard_node(4,5);//org4red5  
  
#define splash splash1  
  
#define hb A1  
#define res 3  
#define temp A0  
float temp_r, temp_fn;  
int hb_r, hb_fn, res_r, res_fn, res_ffn, res_rr;
```

```

int res_r_t = 40;
float res_tim = 0.0;

void setup() {
  // put your setup code here, to run once:

  Serial.begin(9600);
  LcDSet();
  ard_node.begin(115200);
  pinMode(hb, INPUT);
  pinMode(res, INPUT);
  pinMode(temp, INPUT);
  delay(1000);

}

void LcDSet() {
  lcd.begin(16, 2);
  delay(1000);
  lcd.home();

  splash(0, "IOT Based AiR");
  splash(1, "Ambulance");

  delay(2000);
  lcd.clear();

}

void loop() {

```

```

// put your main code here, to run repeatedly:

hb_r = analogRead(hb);
temp_r = analogRead(temp);

if (hb_r < 150) {
  hb_r = 0;
}

hb_fn = (hb_r) / (4.7 * 2.0);
temp_fn = (temp_r * 5 * 100 / 1023);
getres();
Serial.print("HB: ");
Serial.print(hb_fn);
Serial.print(" Temp: ");
Serial.print(temp_fn);
Serial.print(" Resp: ");
Serial.print(res_ffn);
Serial.println();
setDisplay();
String out = "";
out += String(hb_fn);
out += ",";
out += String(temp_fn);
out += ",";
out += String(res_ffn);
out += ",";
ard_node.println(out);
delay(200);
}

```

```
void getres() {
```

```
    res_tim += 0.14;
```

```
    res_r = digitalRead(res);
```