ATRIO VENTRICULAR ARTIFICIAL ELECTRICAL PULSE GENERATOR FOR DETECTION AND DELAY OF STROKE

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ABSTRACT

To the existence and influence, health related parameters and issues are of utmost importance to man. Various systems have been developed that are able to capture and monitor changes in health parameters. A real time remote monitoring and controlling of heart functionality and epilepsy is presented in this system. A cost efficient and flexible heart rate detection and alert system using wireless module has been implemented in this system. If system detects any abrupt changes in patient heartbeat, body functionality the system automatically alerts the doctor and respective relatives about the patient's status through IOT and also stores the patient details in the cloud for future use. In addition, this system sends an accurate amount of electrical impulse such that the heart keeps pumping at a regular rate and thus prevents heart attack or epilepsy and further complications (Death). We have heard of the first aid of heart attack as CPR-Cardio Pulmonary Resuscitation. It majorly involves applying external pressure over the chest area to make the heart pump continuously when it is about to stop. After CPR, the defibrillator (mostly external) is used by the doctor to create the external shock to enhance the pumping rate of the heart and ensures the normal pumping rhythm. This paves the base for this project. Thus this project's main aim is to monitor various factors and in case of abnormality electrical pulse generated keeps the patient's heart pumping and simultaneously alert is sent to patients family and doctor and the stored periodic data is also sent for analysis of the doctor.

Keyword: - *Continuous Sensing and monitoring of temperature, Heart beat rate & resistance ,external artificial Electric pulse Generation, Galvanic skin response, delay of attack, alert the family, send reports*

1. INTRODUCTION

IOT-Internet of Things in simple terms is objects connected via internet that could collect and transfer data over a wireless network without any human intervention. IOT is used in several fields like Smart home, elder care, Medical and Healthcare, transportation, visual communication, building and home automation, manufacturing, agriculture, etc. There are many IOT devices successfully developed and implemented in the society. These devices help in making society a better quality and sophisticated place for better living. Though application engineering and industrial application of IOT are huge, the medical field is major one that uses IOT at the maximum and the most required one. There are a lot of IOT devices for health care specifically for heart and its functional monitoring.

These devices generally include monitoring and constant data collection and analysis. The device that we have proposed is a constant heart monitoring system and produces electrical signal if heart attack or epilepsy is encountered by the person.

2. OVERVIEW

The most apt statement for current life is Health is Wealth. Many systems have been developed for monitoring health related parameters. A real time remote monitoring and controlling of heart functionality and epilepsy is presented in this system. A cost efficient and flexible heart rate detection and alert system using wireless module has been implemented in this system. If system detects any abrupt changes in patient heartbeat, body functionality the system automatically alerts the doctor and respective relatives about the patient's status through IOT and also stores the patient details using cloud. In addition, this system sends an accurate amount of electrical impulse such that the heart keeps pumping at a regular rate and thus prevents heart attack and further complications (Death)
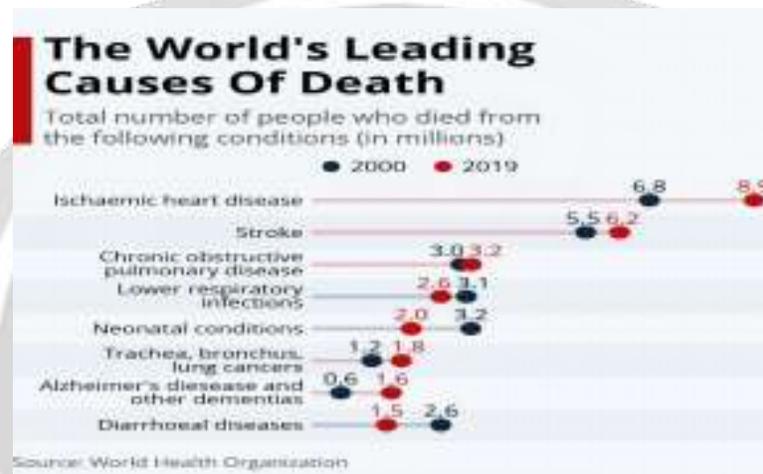

Fig 1 Statistics of death rate contributing factors

3. ANALYSIS

Cardiac arrest in general terms is low availability of blood for heart pumping and unable to supply blood required for the entire body. Some people may experience shortness of breath, palpitations, before cardiac arrest. Sudden cardiac arrest leads to immediate death. Symptoms include chest pain, sweat, light headedness, palpitations. In the past few years thousands of people died due to heart stroke. There are various reasons as to why cardiac arrest occurs like due to their lifestyle, food habits, existing health issues, etc. Unlike other diseases, there isn't any time to react on. This might lead to death. Thus this sparked for this project Heart attack detection, controlling and alert which helps identifying the abnormalities and delaying the stroke for certain point of time and gives the person to act upon, it sends the status of the person to emergency contacts.

4. OBJECTIVES

While thinking about how we can go forward with the project we set various objectives like constant monitoring of heartbeat rate (HBR), body resistance &functionality and temperature. constant monitoring of the factors mentioned above helps in identifying any abnormal conditions and also taking necessary precautions which leads to early detection of cardiac arrest and epilepsy.so artificial external electrical pulse generation takes place which helps in continuous heart pumping, temporary delay of cardiac arrest and immediate alert to doctor and family about the patient's status.

The main objectives of our proposed system are as follows:

1. Continuous monitoring & collection of temperature using temperature sensor

2. Continuous monitoring & collection of heartbeat rate using rate counter sensor.

3. Continuous monitoring & collection of resistance of the body using GSR – Galvanic Skin Response Sensor

4. Continuous storage of data collected in cloud via sensors.

5. Immediate detection of any abnormality in any of the above factors

6. Electrical Pulse Generation through external skin to restore normal pumping rhythm.

7. Alert to family doctor, relatives or emergency contact.

8. Even during epilepsy or heart attack electric pulse is generated thus normal functioning of body is ensured and thus providing adequate time to reach out to hospital.

5. RELATED WORKS

The existing systems support just sending alert messages after the cardiac arrest but does not help in delaying it. During sudden heart attack in ambulance there exists a defibrillator that sends an electrical pulse directly over the chest area such that the heart is awakened again. Recently there have been many systems like artificial pacemaker which replaces the work of SA node-the natural pace maker.

5.1. EXISTING SYSTEM

The existing systems support just sending alert after the cardiac arrest but does not help in delaying it. The model comprises cardiac regional cellular-electrophysiology types connected by a path model along a conduction network. The regional electrophysiology and paths are modeled with hybrid automata that capture non-linear dynamics, such as action potential and conduction velocity restitution and overdrive suppression. The hierarchy of pacemaker functions is incorporated to generate sinus rhythms, while abnormal automaticity can be introduced to form a variety of arrhythmias such as escape ectopic rhythms. Model parameters are calibrated using experimental data and prior model simulations

6. PROPOSED SYSTEM

The main aim of the project is to monitor the human periodically and their loved ones need to be informed about their health status   while there are working. If system detects any abrupt changes in patient heartbeat, body functionality the system automatically alerts the doctor and respective relatives about the patient's status through IOT and also stores the patient details While patient gets epilepsy and heart attack we are going to generate electric pulses through whole body with the help of   Electric pulse simulator.

7. COMPARISION (EXISTING vs. PROPOSED)

PARAMETER	EXISTING	PROPOSED
HBR & Temperature	YES	YES
Body position	NO	YES
Electric pulse generation	NO	YES
Epilepsy detection	NO	YES
IOT	NO	YES

8. COMPARISON ANALYSIS

| PARAMETER	Normal person	Abnormal person
HBR	**60–100** beats	60-85 beats
Body position	0-90 degree	0-90 degree
Temperature	90-100	>90 && <105
Skin conductance Before Epilepsy	21–47%	30–70%

9. ARCHITECTURE
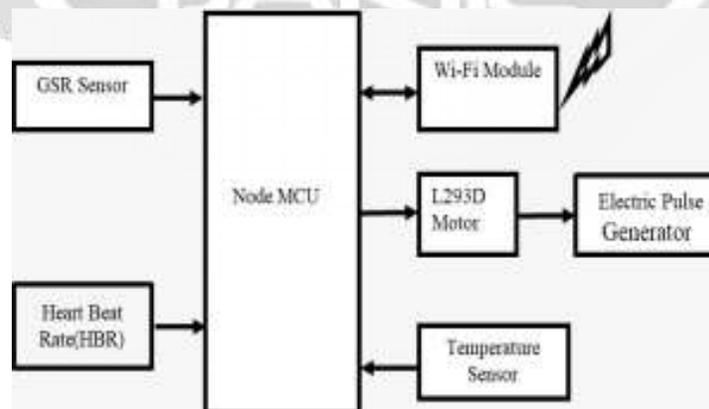
Fig 2 Architecture diagram

10. MODULES:

There are four models majorly involved. First the temperature sensor and heart beat rate sensor module, GSR (Galvanic Skin Resistor) Module, Electrical Pulse Generator module, the storage module using cloud & the message/Communication module using IOT.

10.1 TEMPERATURE AND HEARTBEAT RATE SENSOR MODULE:

This module involves detection of temperature and heartbeat rate of the patient's body. A temperature sensor measures the temperature around or the temperature of the object in contact with it. The heartbeat rate sensor detects the rate at which the heart beats and returns the rate per minute.
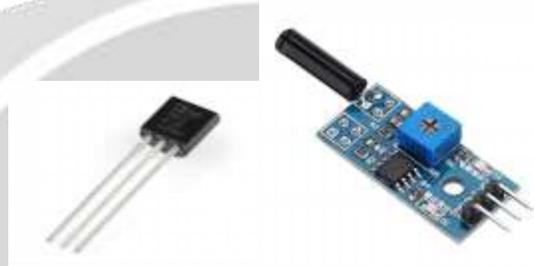
Fig3 Temperature and HBR Sensor

10.2 GSR (GALVANIC SKIN RESPONSE) MODULE:

As the name suggests the GSR – Galvanic Skin Response is a sensor that measures the resistance of the body. The SA node in the heart, the natural pacemaker or the natural electric pulse generator sends electrical signals from brain to heart to keep the heart pumping at a normal rate. So this creates a resistance in our body. This resistance is detected and these levels are measured using this GSR sensor. If the levels are detected to be abnormal by GSR, then externally electrical impulse is generated to ensure normal functioning of heart.

Fig 4 Galvanic skin Response Sensor

10.3 ELECTRICAL PULSE GENERATOR MODULE:

The Electrical pulse Generator is like an electrode used to send accurate amount of electric pulse. It is designed in such a way that an accurate amount of electric pulse is generated as required. When the range of temperature,

heartbeat rate and resistance are abnormal, the electric pulse generator is activated and thus it sends an electric pulse externally and thus keeps the normal pumping of heart for a particular period of time. These pulses are sent periodically i.e. the pulses are sent at regular intervals of time such that the normal pumping of heart is ensured and thus heart attack and epilepsy is delayed for a period.

10.4 CLOUD STORAGE & COMMUNICATION MODULE:

The data of the patient is constantly collected and monitored using various sensors. These data are stored for future use. When the patient is admitted in hospital his/her prior medical records and their history are required for the doctor for proceeding to further treatment. Instead of making calculations and analysis after checking the reports earlier and taking readings again for knowing the heartbeat rate, temperature and other body functionality for knowing the state of the person, these collected & analyzed data could be of major use and the time taken on these process could be eliminated thus increasing the probability of immediate treatment and life expectancy of the person. Meanwhile alert messages are sent to relatives/emergency contact of the patient.

11. IMPLEMENTATION:

Using GSR (galvanic skin response) the resistance and body functionality of the patient is constantly monitored. The GSR is connected to WIFI module, electrical pulse simulator using node MCU. The WIFI module already exists in the node MCU, so no need to attach   it externally. The temperature sensor, Heart beat rate which are connected to the node MCU are constantly monitoring the person, the temperature sensor monitors the temperature of patients body. While the heartbeat rate (HBR) sensor monitors the heartbeat. If any abrupt changes in heartbeat or body functionality are detected then electrical pulse is generated for temporary delay of heart attack. The amount of artificial electrical pulse generated is according to the requirements of the patient body. And immediate alert is sent to doctors and patient's relatives using IOT. They are informed about patient's current status, location.

12. CHALLENGES:

The various challenges that we faced while working on the project include charging the device. The device should be charged continuously while working or a 5v power supply should be given in order for it to work without interruptions. Constant Internet connection required as the device has to keep track of the heart rate, temperature, body functionalities, store them and alert should be sent if it finds any abnormalities. This whole process requires internet .Availability of signals for internet, and to send messages. The signals play major role as they help to send the patients information to the doctor and family. Cost and Device maintenance, as we are using hardware components the maintenance shall be high.

13. CONCLUSION:

We have proposed a smart IOT device for Heart attack detection and controlling. Patient is constantly monitored Using GSR (galvanic skin response),their body resistance and functionality with temperature and heart beat rate are stored. If the device finds any abnormality in the patients heart rate it will create an electrical impulse and delay the stroke . The patients family and doctor will receive alert about his condition.

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