Artificial Electrical Pulse Generation To Revive A Stalled Heart Using IOT

Arun kumar V[1], Mythili M[2], Dhanush kumar R[3], Gowtham V[4], Rohith D[5], Velmurgan S[6]
[1]*Assistant Professor, Department of Electrical and Electronics Engineering, Nandha Engineering College, Erode, India*
[2]*Associate Professor,* [3,4,5&6] *Studenst, Department of English, Nandha Engineering College, Erode, India*
[3]*Department of Electrical and Electronics Engineering, Nandha Engineering College, Erode, India*

Abstract: The paper aims to address the rising incidence of heart attacks and providing artificial electrical pulses for reviving a stalled heart by leveraging the internet of things (IoT). The use of IoT involves monitoring heart rates to detect potential heart attacks. The primary goal is to demonstrate how the IoT can be employed to deliver artificial electric pulses to a stalled heart, potentially reducing the death rate, associated with heart attacks.
Keywords: Internet of things (IOT), Wearable, Stalled heart, Sensor, Defibrillator, Microcontroller .

I. INTRODUCTION

The paper explores the use of electrical pulses, a method known as electrical defibrillation, to revive a stalled heart. While traditional defibrillation is effective for certain heart rhythm issues, it may not always work in cases of cardiac arrest. The research focuses on the feasibility and effectiveness of electrical pulses directed at the heart muscle to restore normal cardiac activity. The goal is to determine if this approach can be a viable, long-term solution for reviving a failing heart. The study introduces a device designed to deliver these pulses directly to the heart, minimizing their impact on surrounding organs compared to conventional methods. The research suggests that artificial electrical pulses could potentially provide a sustained solution for reviving stalled hearts, offering hope for saving lives.

II. LITERATURE SURVEY

The use of IoT in healthcare focuses on the development of an automated life-saving alarm system to monitor patients' vital signs, enabling caregivers to receive more attention. The system detects irregular heartbeats, preventing heart palpitations, heart attacks, and strokes [1]. Advancements in ambulatory and remote monitoring solutions for cardiac diagnostics show early detection of potential life-threatening conditions, but non-technical barriers and regulatory concerns need to be addressed [2].

The integration of IoT based wearable devices can monitor cardio-vascular diseases and provide remote healthcare to older adults. It analyzes commercial and non-commercial wearable [3]. Wearable technologies are used in remote cardiovascular disease screening and diagnosis. Challenges exist, but with evolving sensor and computer technologies, wearable could become integral to cardiovascular practices [4].They have developed a raspberry pi-based health monitoring system that uses IoT to detect body parameter like blood pressure, temperature, and heart rate. The system connects patients to doctors, reports abnormalities to concerned parties via messages, emails, and whatsApp, and stores information for future analysis [5]. Heart attacks are a significant cause of death, and an IoT-based innovation uses heart rate monitoring to detect them. This method uses an Arduino board, pulse sensor, and Wi-fi module to measure heart rates [6]. A wireless wearable ECG system is being developed to detect unusual heart conditions in high risk patients, using three electrodes, a java-focused framework, and a web-enabled surveillance network [7]. Heart attacksare causing deaths due to the unawareness of warning signs. Heart rate is often measured using oximeters and ECG machines, but they are not indefinitely used. This research proposes a method for detecting heartbeats directly, allowing doctors to check pulses using IoT without visiting patients[8].

III. PROPOSED SYSTEM

A device will be implanted in the patients' chest, which will monitor their heart rhythm and send their information to a monitoring system. This system will record the patient's heart rhythm and alert medical experts when an irregular or stalled heartbeat is detected. An artificial electrical pulse will be sent to the heart to revive it. Following heart revival, patients receive follow-up care to ensure proper functioning and prevent future stalled heart episodes. This component powers all circuit components. The voltage of the circuit is set to a suitable level for the component, which detects the heart rate, transmits the data to the PIC microcontroller based on the data received from the heartbeat sensor, and sends the appropriate signals to the other components in the circuit to send the data from the PIC microcontroller to the LCD to be activated as shown in figure 1.

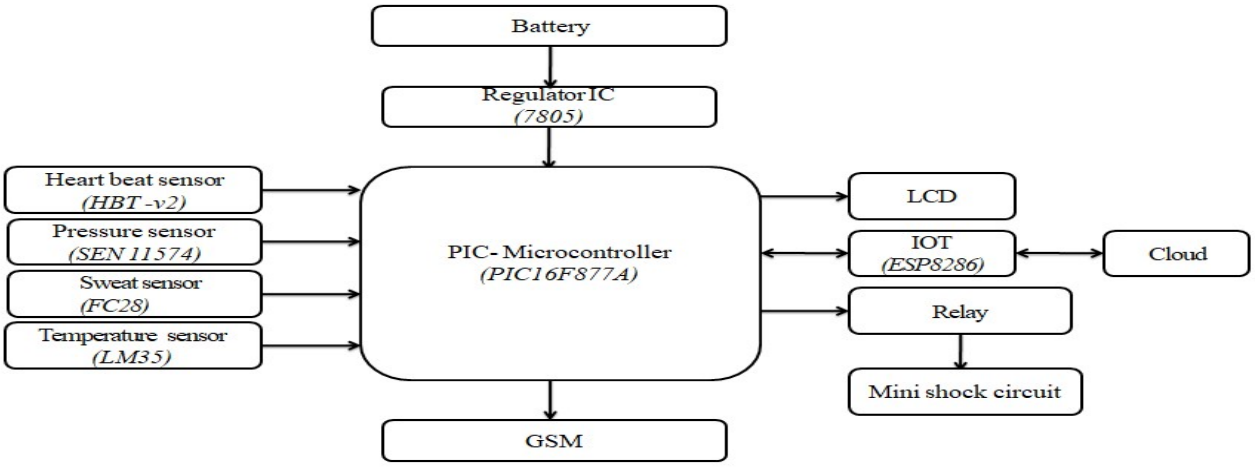

Figure 1. Block diagram

The defibrillator of the electrical pulses restores thefluttering heartbeat.

Working

The project utilizes IoT technology to enhance the monitoring and treatment of stalled hearts, offering several advantages. It replaces traditional methods of checking vital signs with sensors and a microcontroller, ensuring more advanced and precise monitoring. Continuous surveillance allows for prompt detection of abnormalities, leading to a faster response and treatment. The remote monitoring feature provides constant observation, offering peace of mind to patients and their families. Automatic notifications enable immediate medical attention during emergencies, potentially saving lives. This IoT-based approach brings convenience by minimizing the need for frequent hospital visits and reducing the strain on healthcare facilities. The innovative use of IoT in reviving a stalled heart not only improves heart condition treatment but also holds potential application in other medical fields. As technology advances, so do treatment methods. The promising possibilities and potential of IoT in the medical field pave the way for existing exploration and development.

IV. HARDWARE IMPLEMENTATION

The implementation of this hardware concept will have significant implications in saving lives and providing better healthcare for patients with heart-related issues. One of the most crucial components of this hardware implementation is the sensor. Sensors like pressure, pulse, sweat, and temperature are used to monitor a patient's vital signs and detect abnormalities. The pressure sensor is responsible for measuring the blood pressure of the patient continuously. The sensor, which uses the principle of resistance, is placed on the patient's arm to measure the pressure exerted by the blood flow. The data collected by the pressure sensor is crucial in understanding heart activity, as it can indicate whether the heart is pumping too fast or too slow. Any fluctuations in the blood pressure can also be an early sign of a stalled heart, making the pressure sensor a crucial component in this hardware implementation. The pulse sensor measures the heart rate and oxygen level in the patient's blood. This sensor works by emitting a beam of light onto the skin, and the amount of light reflected is used to determine the heart rate and oxygen levels. The pulse sensor, placed on the patient's finger, is a non-invasive, easily accessible, and long-term monitoring device for monitoring vital signs without discomfort. The data collected by the pulse sensor is crucial in determining overall health.

The sweat and temperature sensors are responsible for detecting any abnormal changes in body temperature and sweat production. Sensors measure skin electrical resistance, detecting body temperature and sweat production for heart issues, and are placed on patient's chests using a PIC microcontroller for accurate readings. This controller is responsible for receiving and processing the data collected by the sensors, as shown in figure 2.

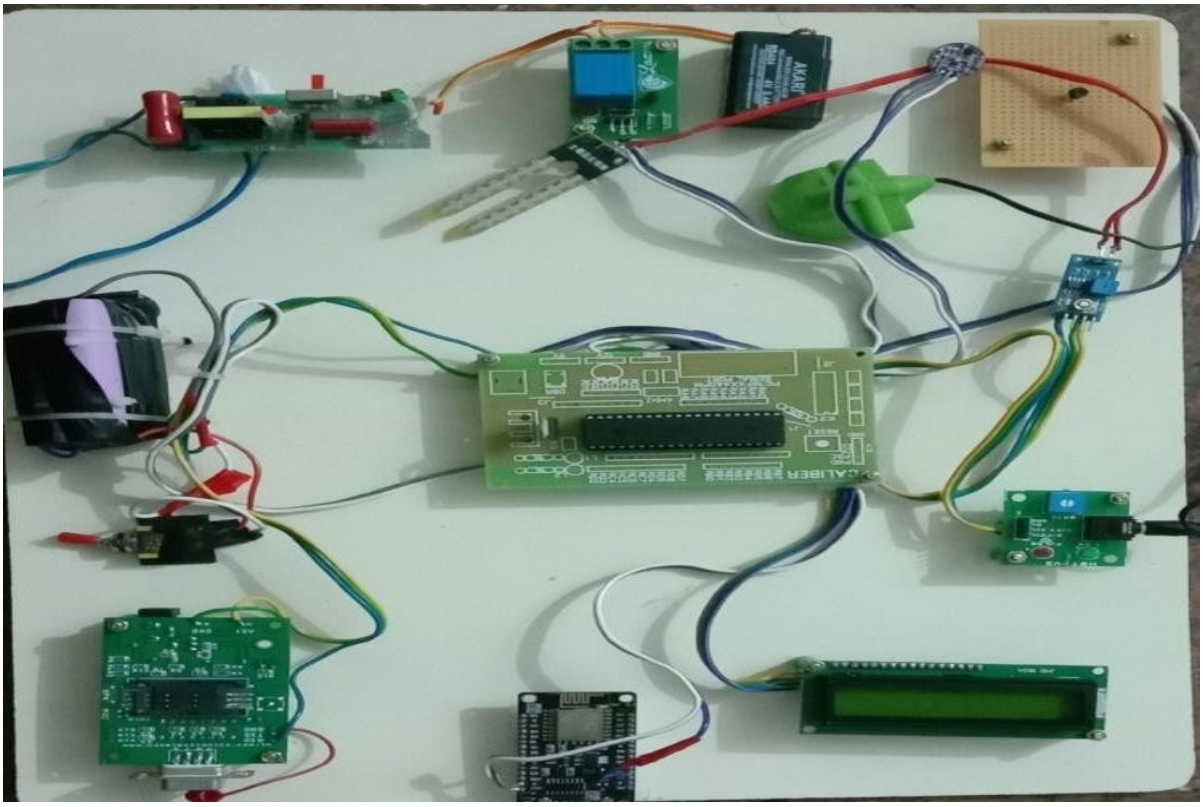

Figure 2. Artificial electrical pulse generation to revive a stalled heart using IoT

The microcontroller also analyzes the data to determine whether the heart is experiencing a slowdown or a complete stop. In the case of a stalled heart, the microcontroller sends an electrical pulse to stimulate the heart muscles. The PIC microcontroller also plays a crucial role in connecting the sensors and the GSM technology, creating a seamless flow of information. With the use of conditional programming, the microcontroller can be programmed to deliver a stronger electric pulse if needed. This system's real-time monitoring capabilities are made possible by the PIC microcontroller. The GSM technology used in this concept allows for remote monitoring and automatic notification of medical professionals in case of an emergency. The GSM module is responsible for establishing communication between the hardware system and a remote server. This server is connected to medical professionals who can monitor the patient's vital signs on a remote server. In cases where the electric pulse sent by the microcontroller is not strong enough to revive heart activity, the defibrillator's presence becomes critical. The defibrillator can deliver a more substantial electric shock to restore the heart's rhythm effectively. This integration of defibrillator in the system ensures that even in the most severe cases, the heart can be revived, providing a higher chance of survival for the patient. With the integration of an LCD screen, the patient's vital signs can be displayed in real-time. The LCD screen, which is connected to the microcontroller, displays the patient's vital signs such as blood pressure, heart rate, oxygen levels, and body temperature. This screen allows medical professionals to monitor the patient's condition manually, providing a backup in case of any technical difficulties with the remote monitoring system.

V. RESULT AND DISCUSSION

The process begins by placing an advanced sensor on the patient's body. These sensors, including the pulse sensor, pressure sensor, temperature sensor, and sweat sensor, continuously monitor and control the patient's vital signs. A pulse sensor measures heart rate and oxygen level. A pressure sensor monitors blood pressure and temperature, and sweat sensors detect any abnormal conditions or changes in body temperature and sweat production. These sensors work together to collect accurate and real-time data on the patient's body condition. The data is collected by the sensor that is sent to the big microcontroller, which acts as the brain of the system. The microcontroller analyzed data compared to pre-set limits. The microcontroller activates the next step of the process while observing any complete stoppage or abnormal changes in the functioning of the heart. While the heart stops, the microcontroller sends an artificial electrical pulse to stimulate the heart

muscle and heartbeat This electrical pulse is delivered through the electrodes attached to the patient's chest. The pulse gives a shock to the human heart, which helps the heart's normal function. This process is called defibrillation. It has been shown to be effective in receiving stopped hearts as shown in figure 3.

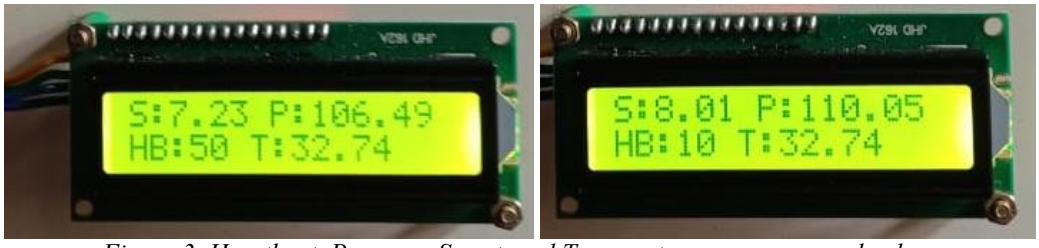

Figure 3. Heartbeat, Pressure, Sweat, and Temperature sensors sensed values

IoT technology enables real-time monitoring and control of patient conditions, detects changes, and enables immediate medical professionals to intervene in emergency situations. Measures of medical professionals in cases where there is an emergency situation. With the help of an LCD screen, the patient's vital signs are displayed, providing information to the medical team. The Internet of Things (IOT) is an innovation that utilizes heart rate monitoring to spot heart attacks, as shown in figure 4.

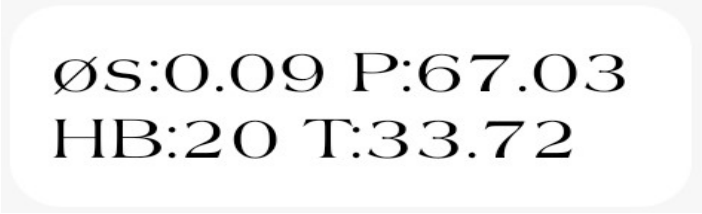

Figure 4. Output on SMS

If the patient's human heartbeat goes below normal, the mini-shock circuit uses a high voltage between 200 and 1,000 volts to shock the heart with an artificial pulse to revive heart, as shown in figure 5.

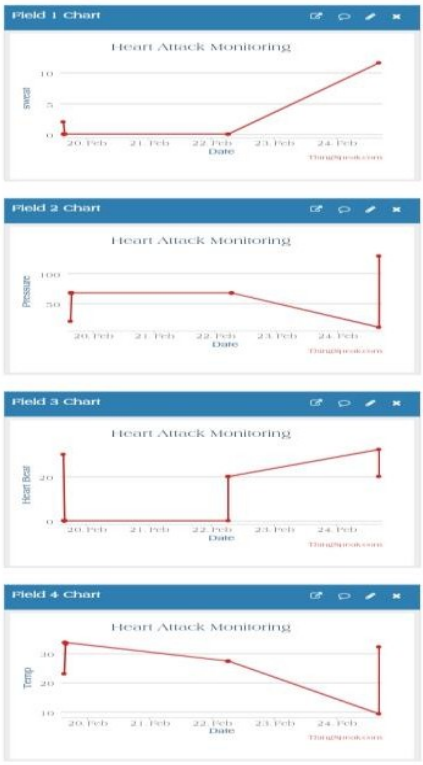

Figure 5. Output shows in mobile application

The temperature sensor detects when the bodytemperature goes above 37 degrees Celsius. Theheartbeat sensor detects the heart rate goes above 72.The pressure sensor detects when the body pressure goes above 120. The Sweat sensor detects when the body sweats 20 percentage.

VI. CONCLUSION

In conclusion, the use of artificial electrical pulses to restore a fluttering heartbeat is a remarkable development in the field of medical science. It has provided hope to millions of people who suffer from cardiac arrest and has allowed healthcare professionals to intervene before the heart stops completely. The heart sensor has been able to effectively restore a normal heart rhythm and has been shown to be safe and effective. This treatment can be used in patients who have suffered from cardiac arrest or a heart attack and can help improve the quality of life for these individuals. The technology has allowed more patients to be revived and to live a healthy life after cardiac arrest. It has provided a valuable tool for healthcare professionals to save lives.

REFERENCES

[1] S. Jacobs son, and A. Johnson, "The dilusion of renewable energy technology: an analytical framework and key issues for research." Energy Policy 28, pp. 625-640, 2000.

[2] S. Raju, and G. Pillai, "Design and real time implementation of type-2 fuzzy vector control for DFIG based wind generators." Renewable Energy, 2015.

[3] D. Xie, Z. Xu, L. Yang, J. Østergaard, Y. Xue, and K. P. Wong, "A comprehensive LVRT control strategy for DFIG wind turbines with enhanced reactive power support," IEEE Transactions on Power Systems, Vol. 28, No.3, 2013.

[4] A. Kumar, and K. Nair, "Wind power potential at Benau, Savusavu, Vanua Levu, Fiji", International Journal of Energy, Information and Communications, Vol. 4, Issue 1, 2013.

[5] Y. Chu, "Review and comparison of different solar energy technologies," 2011.

[6] C.Nagarajan and M.Madheswaran - 'Experimental verification and stability state space analysis of CLL-T Series Parallel Resonant Converter' - Journal of ELECTRICAL ENGINEERING, Vol.63 (6), pp.365-372, Dec.2012.

[7] C.Nagarajan and M.Madheswaran - 'Performance Analysis of LCL-T Resonant Converter with Fuzzy/PID Using State Space Analysis'- Springer, Electrical Engineering, Vol.93 (3), pp.167-178, September 2011.

[8] C.Nagarajan and M.Madheswaran - 'Stability Analysis of Series Parallel Resonant Converter with Fuzzy Logic Controller Using State Space Techniques'- Taylor & Francis, Electric Power Components and Systems, Vol.39 (8), pp.780-793, May 2011.

[9] C.Nagarajan and M.Madheswaran - 'Experimental Study and steady state stability analysis of CLL-T Series Parallel Resonant Converter with Fuzzy controller using State Space Analysis'- Iranian Journal of Electrical & Electronic Engineering, Vol.8 (3), pp.259-267, September 2012.

[10] Nagarajan C., Neelakrishnan G., Akila P., Fathima U., Sneha S. "Performance Analysis and Implementation of 89C51 Controller Based Solar Tracking System with Boost Converter" Journal of VLSI Design Tools & Technology. 2022; 12(2): 34–41p.

[11] G.Neelakrishnan, K.Anandhakumar, A.Prathap, S.Prakash "Performance Estimation of cascaded h-bridge MLI for HEV using SVPWM" Suraj Punj Journal for Multidisciplinary Research, 2021, Volume 11, Issue 4, pp:750-756

[12] G.Neelakrishnan, S.N.Pruthika, P.T.Shalini, S.Soniya, "Perfromance Investigation of T-Source Inverter fed with Solar Cell" Suraj Punj Journal for Multidisciplinary Research, 2021, Volume 11, Issue 4, pp:744-749

[13] C.Nagarajan and M.Madheswaran, "Analysis and Simulation of LCL Series Resonant Full Bridge Converter Using PWM Technique with Load Independent Operation" has been presented in ICTES'08, a IEEE / IET International Conference organized by M.G.R.University, Chennai.Vol.no.1, pp.190-195, Dec.2007

[14] M Suganthi, N Ramesh, "Treatment of water using natural zeolite as membrane filter", Journal of Environmental Protection and Ecology, Volume 23, Issue 2, pp: 520-530,2022

[15] M Suganthi, N Ramesh, CT Sivakumar, K Vidhya, "Physiochemical Analysis of Ground Water used for Domestic needs in the Area of Perundurai in Erode District", International Research Journal of Multidisciplinary Technovation, pp: 630-635, 2019

[16] S. H. Fukurozaki, R. Zilles, and I.L. Sauer, "Energy payback time and CO2 emissions of 1.2 kWp photovoltaic roof-top system in Brazil," International Journal of Smart Grid and Clean Energy, 2013.

[17] M. Maaßen, M. Rübsamen, and A. Perez, "Photovoltaic solar energy in Spain," International Financeand Economics, 2011.

[18] H. Liu, S. Ma, W. Li, H. Gu, Y. Lin, X. Sun, "A review on the development of tidal current energy in China," Renewable and Sustainable Energy, pp. 1141-1146, 2011.