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Arduino Based Self Operated CPR Belt

SHIMNAS U, SEETHAL.E, RINSIYA.K, FATHIMA HIBA .P, SAVITHA .V

UG Students, Dept. of BME, Dhaanish Ahmed Institute of Technology, Coimbatore, Tamilnadu, India

Assistant Professor, Dept .of BME, Dhaanish Ahmed Institute of Technology, Coimbatore, Tamilnadu, India

ABSTRACT : This project introduces a "self operated CPR belt" That automates the cardio pulmonary resuscitation (CPR) process. The process of keeping someone who has ceased breathing alive is known as artificial respiration .An automatic portable, battery operated chest compressor known as a self -automated CPR belt applies chest compression in addition to manual CPR.

To increase blood flow to the brain and heart, the patient's entire chest is compressed by the belt .lithium-ion batteries, which are made for hectic mobile conditions where weight is the primary consideration, can power it. The efficiency of data transfer from the gadget to the next hospital is improved by IOT. The pacemaker parameter will raise the caliber of the situational job that has to be done

I. INTRODUCTION

A self-operation CPR belt is a small portable device meant to be used by one person during a heart emergency. It is composed of a belt with internal mechanical alignment intended to deliver chest compression of the right depth and rate. By sliding a lift handle, the belt facilitates continuous and reliable compressions necessary to support blood flow in the victim until a professional arrives.

It is simple to use, and individuals with little training can use it on their own, making it useful in situations where immediate help is not possible. Moreover, due to its small size, one can comfortably carry it in their car, first aid kit, or other luggage for use when necessary. The self-operation CPR belt simply ensures that one can increase one's chances of surviving a heart emergency and supporting colleagues.

This project introduces a "self operated CPR belt" that automates the cardiopulmonary resuscitation process there we use an Arduino microcontroller unit and a specially adapted motor, which transform circular motion into a to-and-fro motion using appropriate gear system

Furthermore the integration of a potentiometer enables adjustment of the CPR process's speed the proposed system aims to streamline and enhance the effectiveness of CPR potentially improving survival rates during critical cardiac incidents.

II. RELATED WORKS

Autopulse device is an automated chest compression system designed for use in emergency medical conditions, especially cardiac arrest. It entails a band that encapsulates the patient's chest and a piston driven by a motor that delivers high-quality, consistent compressions.

This is in contrast to compression done by human, which would be interrupted and, as a result, blood flow into vital organs might be impeded. Once the Autopulse device is set up on the patient's chest, high-quality compressions are ensured the mechanism at which the Autopulse machine operates ensures that compressions are delivered evenly, hence preventing the high rate of fatigue among the patient's rescuers.

The device is also adjustable to fit body settings and can facilitate patient recovery to the hospital. From a broader perspective, The Autopulse device is an example of the technological advancements done in resuscitation approaches due to its high quality of regarding compressions and patients.

III. METHODOLOGY

The adequately designed and assembled self-operated CPR belt system uses an Arduino MCU to control the motor's motion, which is then rerouted from its natural circular motion to a to-and-fro cum accurate movement using a combination of precision micro gears. Additionally, the robotic belted CPR system integrates a potentiometer, which sets the speed of the chest compression and leaves room for the paramedical, clinician, or first responder to adjust to the

appropriate speed for individual patients. The belted system robot continues to offer the most precise and consistent form of chest compressions as the manual process but guarantees the speed control that determines the best performance.

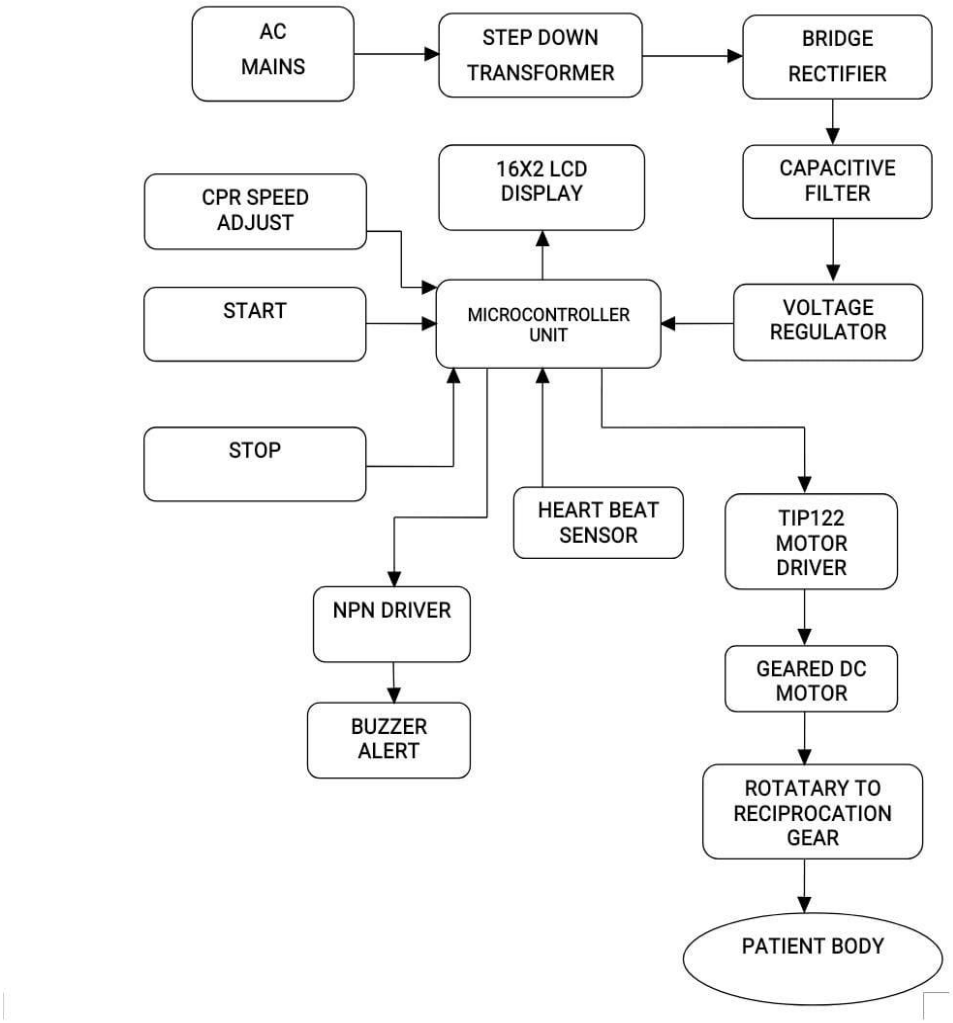

Fig.1 Block diagram of proposed system

COMPONENTS:

- **Arduino Uno**

An ATmega328P-based microcontroller board is the Arduino Uno. It contains a 16 MHz quartz crystal, 6 analogue inputs, 14 digital input/output pins (six of which can be used as PWM outputs), a USB port, a power jack, an ICSP header, and a reset button. It comes with everything needed to support the microcontroller; all you have to do is use an AC-to-DC adapter to power it or a USB cable to connect it to a computer. Several features of the Arduino Uno allow it to communicate with other microcontrollers, computers, and other Arduino boards.

- **16x2 LCD DISPLAY**

This LCD display is intended to be used with E-blocks. It has a single 9-way D-type connector and a 2-line alphanumeric LCD display with 16 characters. As a result, the device can be linked to the majority of E-Block I/O ports. The user manual that follows provides information on the serial format of data that is needed for the LCD display. A 5V power source is also needed for the display. Please be careful not to exceed 5V since this can harm the gadget. The finest sources of 5V are a 5V fixed regulated power supply or the E block Multi Programmer. There are 224 distinct characters and symbols that can be displayed on the 16 x 2 intelligent alphanumeric dot matrix displays. Pages 7–8 publish a complete list of the characters and symbols .

- **CPR Speed Adjust Potentiometer**

Which is based on its position, Its Function is to adjust the speed of the Geared DC Motor. This aspect changes how often chest compressions are made.

- **Buzzer**

An audible alarm was utilized. It generates signals that enable a sound output, for instance, starting and stopping.

- **Geared DC Motor**

The Hormann Gear Motor Elosport by Hormann was used to provide mechanical power for the CPR belt. The higher the load, the slower the Speed. The graph represented here that describes the character of a typical motor. As long as the motor is used in the area of high efficiency the shaded area, long life, and good performance can be expected. However, using the motor outside this range, high temperature rises and deterioration of motor parts takes place. Note that a motor's basic rating point is slightly lower than its maximum efficiency point. Load torque also can be measured by measuring the current drawn on measuring, the current drawn when the motor is attached to a machine whose actual load value is known.

- **Circular to Rotatory Gear**

Mechanical Component: this mechanical component is used to transfer the rotational motion to reciprocal and to and fro movement.
Function: the circular to rotatory gear helps in changing the rotational motion of the DC motor to the applied reciprocal motion of the DC motor for effective chest compression.

- **Heartbeats Sensor**

When a finger is placed on a heart beat sensor, it is intended to provide a digital output of the heartbeat. The beat LED glows in time with each heartbeat when the heart beat detector is functional. To measure the Beats per Minute (BPM) rate, a microcontroller can be directly attached to this digital output. It operates on the basis of the finger's blood flow modulating light with each pulse. Attach a 5 volt regulated DC power supply. The ground wire is black, the output wire is brown in the middle, and the positive supply wire is red. The PCB is likewise labeled with these wires

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- The sensor just has to be powered by connecting two wires—+5V and GND—in order to be tested.
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IV. EXPERIMENTAL RESULTS

A biological model of human body using biobrain which is identical to biological cells which exhibits the characteristics such as flexibility, endurance contraction and relaxation have been made. The arduino based CPR belt was implemented on to the model and initiated the CPR process. 4 to 6cm in depth compression has been given and the normal heartbeat was obtained. The risk of internal injuries or bleeding was not found.

V. CONCLUSION

In conclusion, the "Self-Operated CPR Belt" project demonstrates the feasibility of an automated CPR system, utilizing an Arduino MCU and a motor with adaptable speed control. The integration of a potentiometer further enhances the system's functionality, enabling healthcare providers to customize the CPR process according to the patient's specific requirements. This innovative solution has the potential to significantly improve the outcomes of

cardiac emergencies, emphasizing the importance of continued research and development in the field of automated medical interventions. Further refinements and comprehensive testing are necessary to optimize the system's performance and ensure its seamless integration within emergency medical services.

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