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AUTOMATION OF RESUSCITATOR BY SENSING LOW HEARTBEAT

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ABSTRACT

A resuscitator is a device that helps patients who are not breathing well to breathe again. It usually works by forcing air or oxygen into their lungs. Bradycardia, as it is known in medical science, is when a person's heartbeat slows down as a result of having breathing difficulties caused by a lung condition. If a person has bradycardia, their heart rate may drop to less than 50 beats per minute, which can be a major issue since it prevents the heart from pumping enough oxygen-rich blood to the body. If this occurs, the patient can have shortness of breath or go into a coma. It is imperative to forcefully pump oxygen into the lungs under these circumstances. Patients who require continuous or intermittent ventilatory support can use assisted ventilation with the help of this automatic self-inflating resuscitator. In order to measure the blood flow cycles through our fingertips for this heart rate monitor, IR sensors are employed to detect the blood flow through our fingertips. These sensors can produce pulses in accordance with blood flow when connected to an LM358. LM 358 is a high-gain dual op-amp, and the embedded system built with an 89c52 microprocessor chip receives its output. This controller chip is now set up to detect the heart rate and display it on the LCD. Here, the system is set up to automatically activate the air pumping mechanism when the pulse rate drops to less than 40 because a healthy heartbeat will be more than 60. The pulse rate per minute is shown on an LCD. To start the air-pumping system, a DC motor is utilized.

Major Building Blocks:- Construction of air pumping mechanism designed with Silicon resuscitator with accessories, DC motor, Reciprocating mechanism, crank, Main processing unit built with 89C51/52 Microcontroller chip, Pulse rate sensor built with IR sensors and IC358, LCD, power supply unit, Buzzer, alarm reset key, etc.

I. INTRODUCTION

Bradycardia is a form of cardiac illness, and those who have it will have very low heart rates. If the heart doesn't pump enough oxygen-rich blood to the body and the pulse rate is exceedingly sluggish, bradycardia can be a major issue. The person experiencing it could have shortness of breath, dizziness, and extreme fatigue or weakness. Any patient with bradycardia should receive their initial care with a focus on supporting their airway and breathing. If the Bradycardia is severe, more air must be pushed into the patient's lungs to boost the heart rate. Currently, medical authorities employ manually operated resuscitation equipment, which increases the risk that the patient won't receive the right care in a timely manner. This automated motorized resuscitator is designed to prevent this scenario by automatically energizing the air-pumping mechanism when it detects a low heartbeat.

A resuscitator is a device that uses positive pressure to expand a person's lungs while they are unconscious, not breathing, or have a very low heartbeat in order to keep them alive and oxygenated. A bag valve mask (BVM) is a hand-held device that is frequently used to provide positive pressure ventilation to patients who are not breathing or are not breathing adequately. It is also sometimes referred to by the proprietary name Ambu bag or generically as a manual resuscitator or "self-inflating bag." A medical device called an oxygen resuscitator helps patients, conscious and unconscious, get the oxygen they require by applying positive pressure. Although many emergency rooms, intensive care units, and other places use mechanical resuscitators for patients and to forcefully pump the air, for this purpose continuous human efforts are required and a person must be present near the patient bed to operate this device for long periods of time, which is quite a painful activity.

An automatic resuscitator mechanism is created in order to prevent this painful activity. It continuously monitors the heart rate and activates the mechanism when it notices that the pulse rate is below 40. This project work's air pumping mechanism, made of a synthetic air balloon, is intended to deliver fresh air to the lungs in this regard. Fresh air can be pushed into the lungs with the aid of a pipe that is connected to the air-pumping device. The reciprocating style of the crank mechanism used in the fresh air pumping system is built to be connected to the shaft of a dc motor.

The motor is used to inflate a balloon by pushing its body through a mechanism that allows the balloon to draw in and expel fresh air from the outside while pumping it into its lungs. With the help of this specifically made rubber or synthetic balloon, you may forcefully push air through a pipe. In order to quantify the blood flow cycles through our fingertips, the heart rate monitor presented here uses IR sensors to detect the blood flow through fingertips. These sensors can produce pulses in accordance with blood flow when connected to an LM358. The output of the high gain dual op-amp LM 358 is fed into the embedded system built using the 89c51 microcontroller chip. Now, this controller chip is set up to detect the heart rate and display it on an LCD connected to the controller chip. Here, an alarm is utilized to alert the low pulse rate, which will be activated automatically when the heart rate drops to under 40 because a healthy heart will beat between 60 and 90 times per second. The pulse rate per minute is shown on an LCD. As soon as the alarm is activated, it stays activated until the reset button is pressed.

The 89c52 microcontroller chip that is employed in the primary processing unit of this project is playing a significant role in its operation. Instrumentation systems are increasingly implemented using microcontrollers. Therefore, it's critical to have a solid understanding of microcontroller-based systems. Microcontrollers are now a crucial component of every instrument. Microcontroller-based dedicated systems have undoubtedly improved the functional, operational, and performance-based characteristics. The computation and networking capabilities of the Microcontroller devices were and are the cause of the architectural changes in instrumentation and control systems. The microcontroller must be regarded as a computing and communication instrument. Understanding microcontrollers is valuable and highly satisfying if it is used to create a product that is beneficial to the industry or to society as a whole. This is a topic that directly relates to the automation and development of industrial products. This project uses a microcontroller that has been programmed to carry out the encoding and decoding operations necessary for any biological instrument.

Since the controller cannot accept analog data and this sensor outputs data in that format, the software is set up in this case so that the system may acquire information from the sensor. To accomplish this, the data must be converted from analog to digital using an ADC. A microcontroller chip with which this ADC is interfaced has been configured to read the heart rate information from the pulse rate sensor and display it. Using an output connector, the LCD is connected to a controller chip. This is a basic outline of the project.

The software is known as machine language since the program is nothing more than a set of instructions. These instructions are frequently produced in binary code and are known as machine code. Writing software in such a code requires special skills and is quite time-consuming. Because the software is essentially a collection of 0s and 1s, it is prone to mistakes because it is difficult to understand the instructions by simply looking at the pattern. An alternative is to represent the patterns of 0s and 1s using a shorthand code that is simple to understand. A microcontroller has the ability to read and store data from external devices. Micro-controllers carry out a single duty and execute a single program. The program is typically not changed and is kept in read-only memory (ROM). The current program must be deleted from the chip and a newly modified program loaded into the chip using a chip burner if there are any changes to the function or software faults.

It is obvious that the aforementioned operations cannot be carried out without microcontrollers, which is why these components are referred to as the instruments' "hearts" nowadays. As a result, more and more communication systems, instrumentation, control systems, robotics, etc. are being designed with microcontrollers. Therefore, it's critical to have a solid understanding of instruments built with microcontrollers.

II. MOTIVATION

An oxygen resuscitator is a medical device that uses positive pressure to provide oxygen to both conscious and unconscious patients. While many emergency departments, intensive care units, and other areas use mechanical resuscitators for patients and to forcefully pump the air, continuous human efforts are required for this purpose, and a person must be present near the patient bed to operate this device for an extended period of time, which is a painful activity. To avoid this painful activity, an automatic resuscitator mechanism is designed that continuously monitors the heart rate and automatically activates the mechanism when the system detects that the pulse rate is less than 40. This project work is intended to pump fresh air into the lungs via an air-pumping mechanism designed with a synthetic air balloon. Fresh air can be pumped into the lungs via a pipe connected to

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the air-pumping mechanism. The fresh air pumping mechanism is built with a reciprocating crank mechanism that is connected to the dc motor shaft.

There are various causes for the heart rate to slow down, but weak hearts and low blood pressure are two major ones. Since these are common risk factors for heart disease, it is crucial to monitor heart rate for the reasons listed above and to take the appropriate medical care as needed. A personal monitoring device that enables for real-time measurement and display of heart rate, the heart rate monitor (HRM) developed here is a very helpful tool. It is a type of bio-medical instrument. In order to quantify the blood flow cycles through our finger tips, the heart rate monitor presented here uses IR sensors to detect the blood flow through finger tips. These sensors can produce pulses in accordance with blood flow when connected to an LM358.

III. DESCRIPTION OF CIRCUIT

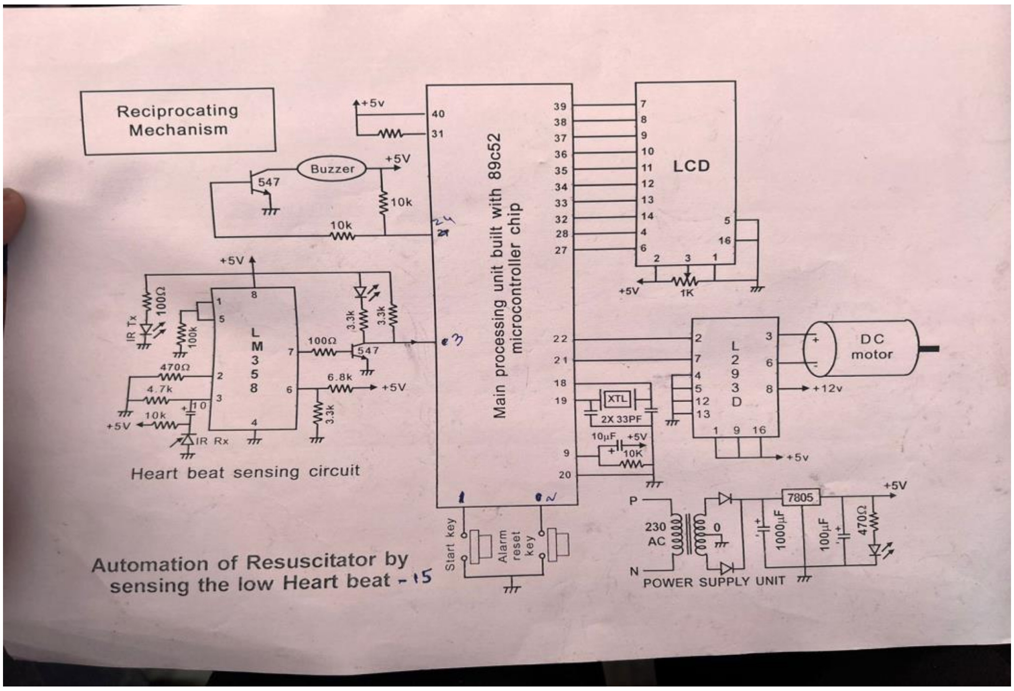

Figure1: circuit diagram

According to the circuit schematic, the procedure starts with a pulse rate sensor. This circuit, which uses the IC LM358 to monitor blood flow, is coupled with IR sensors to detect blood flow through fingertip tips. Monitoring heart rate is thought to be a crucial diagnostic tool and health status indicator. Until recently, it was only possible to continuously monitor heart rate and other physiological parameters in a hospital setting; however, with the advancement of wearable technology, we can now accurately monitor these parameters at home as well. If there is any difference in the rhythm and it cannot be controlled by forcing oxygen or air into the lungs, we must go to the hospital right away.

The term "heart rate" (HR) refers to the number of heartbeats per minute (BPM) (Beats Per Minute). The HR value can vary from person to person and is influenced by a variety of variables, including body movements, emotional state, hunger, toughness, and air temperature. Normal heart rates for regular people are between 60 and 100 beats per minute. Normal HR can drop to 50 in athletes. Because of this, athletes can gradually strengthen their cardiac muscles and pump more blood at once than non-athletes. An essential factor in determining cardiac autonomic functioning is heart rate variability. According to physiological factors including stress, relief, exercise, age, and health, HRV fluctuates. The device is built with a resuscitator mechanism that pumps air into the lungs forcibly when pulse or heart rate falls below 40 in addition to the idea of sensing heart rate using a finger clip kind of heart rate sensor.

The equipment used in this project's intelligent technology is built with a resuscitation mechanism to preserve the life of a heart patient in an emergency. The 89c52 microcontroller has been configured to carry out several tasks at once. Every aspect of contemporary society uses intelligent technology, from satellite communication to

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washing machines. This reality is applicable to the world of medical instrumentation as well. In this situation, intelligent devices want to guarantee a good quality of life by offering the best possible medical care. A close examination of this procedure reveals that medical staff is overburdened with decision-making tasks. Medical professionals now have strong tools at their disposal thanks to the availability of high-performance microprocessors, microcontrollers, and personal computers, enabling them to monitor and manage patients in an intelligent and effective manner. Given the significance of heart rate sensing to this project's operation, the following is a full overview.

A. Heartrate sensor

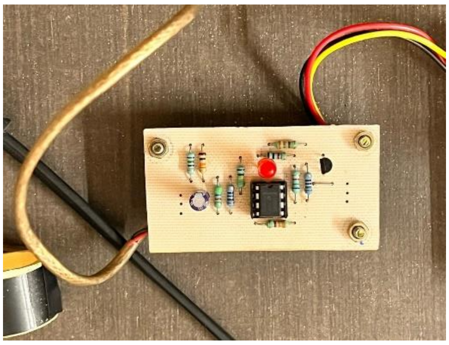

Figure2: Heartrate sensing circuit

Since this is a prototype module and ECG devices are often used to monitor heart rate and perform comprehensive analysis, a simple heart rate sensor that produces a digital pulse for each cycle of heart function is utilized here to demonstrate the basic idea. The sensor utilized here is what is known as an optical heart rate monitor, which continually monitors blood flow through the fingertip using a red LED and a light detector or photodiode built inside a compact device that holds the finger and has sensors. Blood will flow up to the tip of our finger during the heart's blood-pumping movement, creating an optical difference that the sensor will record. The LM358 IC, an OP-amp IC with two internal op-amps, receives the sensor's output. The first op-amp is set up as a signal amplifier, while the second is set up as a voltage comparator.

The procedure of utilizing light to monitor blood flow is called "Photo-plethysmo-graphy" (PPG) in biomedical jargon. The goal of this method is to produce a pulse. The sensor, which fits over the fingertip and is also known as a pulse sensor, measures the quantity of infrared light reflected by the blood flowing inside the fingertip. Blood pressure dramatically increases when the heart beats, causing the emitter's infrared light to be reflected back to the detector. The heartbeat sensor operates according to the PPG principle, which was previously discussed. According to this principle, the rate at which the heart beats determines the volume of blood that will flow, and because blood absorbs light, the signal pulses are the same as the heartbeat pulses. The LED attached to the output of the op-amp circuit will blink in time with each heartbeat when the sensor is mounted to the fingertip. It can be supplied to the processing controller to measure Beats Per Minute because it is a digital pulse (BPM).

The op-amp, in this case, the LM 358, which produces digital pulses in accordance with the blood flow in the fingertip, measures the amount of blood in the finger that fluctuates over time. The sensor circuit, which is made up of a light detector and a bright red LED, will fit within the finger clip. The finger now becomes slightly more opaque (dense) as the heart pumps blood via the blood arteries, and as a result, less light from the LED reaches the detector. Every time a heartbeat is produced, a different detector signal is produced. A pulse of electricity is created from the variable detector signal. This electrical signal is amplified, activated, and output as a +5V logic level signal by the amplifier. Additionally, an LED display that blinks in time with each heartbeat controls the output signal.

Light rays will be directed through the finger from one side in order to detect the pulse, and the strength of the light that is received on the other side will be measured using an LDR (Light Dependant Resistor). When the heart pumps blood, more light is absorbed by more blood cells; as a result, we see a reduction in the amount of light that the LDR is receiving. The LDR's resistance value consequently rises. Using a signal conditioning circuit, typically an OP-AMP, this variation in resistance is translated into a variation in voltage. The signal has been amplified to the point where the microcontroller inputs can pick it up. The Arduino input will receive a signal in the form of a +5V pulse. The CPU can be set up to count the number of interrupts or pulses in a minute and to receive an interrupt for each pulse that is detected. Through an LCD that is interfaced with the controller, the count value of pulses per minute will be shown. Known as the BPM value (Beats per Minute).

B. Microcontroller

The ATMEL 89C51 microcontroller chip is used to build embedded systems or microcontroller units. The ATMEL AT89C51 is a high-performance, low-power CMOS 8-bit microcomputer with 4K bytes of flash memory that can be programmed and erased (PEROM). It is a powerful controller that offers a highly versatile and affordable solution for control applications thanks to its high-density non-volatile memory that is compatible with the industry-standard MCS-51 instruction set. A microcontroller runs the program that is stored there. The program is designed in such a way that the pulse sensor's output is continuously tracked and the pulse rate in beats per minute is shown on the LCD. The breathing apparatus is also configured to turn on automatically when the pulse rate falls below 40 on the same controller.

In order to control the features or operations of the product, microcontrollers are "embedded" inside another device. Consequently, "embedded controller" is another name for a microcontroller. Micro-controllers carry out a single duty and execute a single program. The program is typically not changed and is kept in read-only memory (ROM). Most microcontrollers are low-power electronics. 50 milliwatts may be used by a microcontroller that runs on batteries. In addition to having a specific input device, microcontrollers frequently (though not always) have a small LED or LCD display as an output. In addition to receiving input from the device it is managing, a microcontroller also directs the device by sending signals to various parts of the device. Microcontrollers could only be programmed first in assembly language and later in C code. A programmer can use a debugger to debug the software of an embedded system thanks to recent microcontrollers that have on-chip debug circuits that can be accessed by in-circuit emulators via JTAG (Joint Test Action Group).

This chip can be compared to a small computer because it has all the newest features. A microcontroller's main function is to regulate a machine's functioning using a fixed program that is stored in ROM and remains constant throughout the system's lifespan. The instructions utilized by the microcontroller design to transfer code and data from internal memory to the ALU are significantly more constrained. Pins on the IC chip are connected to numerous instructions. The pins may each be programmed independently, allowing them to perform a variety of tasks depending on the software. The design and instruction set of the microcontroller are tuned to handle data in a bit, byte, and word sizes. The microcontroller is concerned with obtaining data from and to its own pins. Because 8-bit microcontrollers are currently the most common microcontrollers in use, designers frequently select them for all applications. Cost-effectiveness is another crucial consideration.

The following are the features of the 8051 microcontroller

[1] 8 – bit CPU with registers
[2] 16 – bit program counter and data pointer
[3] 8 – bit program status word
[4] 8 – bit stack pointer
[5] Internal ROM or EPROM (4k)
[6] Internal RAM of 128 bites
[7] Four register banks, each containing eight registers
[8] 16 bytes, which may be addressed at the bit level
[9] 80 bytes of general-purpose data memory
[10] 32 input/output pins arranged as four 8 – bit ports
[11] Two sixteen-bit timer/counter
[12] Full duplex serial data receiver/transmitter
[13] Two external and three internal interrupt sources
[14] Oscillator and clock circuits
[15] Control registers

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The circuitry that produces the clock pulses used to coordinate all internal activities is the chip's brain. The oscillator pins of a microcontroller are often coupled with capacitors and a quartz crystal. The microcontroller's internal clock frequency is ultimately determined by the crystal frequency. For the convenience of programming, 12 MHz crystals are frequently preferred. One microsecond per cycle is conveniently produced by a crystal operating at 12 MHz. The frequency range for 8051 devices is established by the manufacturer; any frequency below that range may cause the data contained in ROM to be lost; as a result, the frequency must always be higher than the aforementioned average. A pulse train is produced at the crystal's frequency by the oscillator that the crystal and capacitors construct.

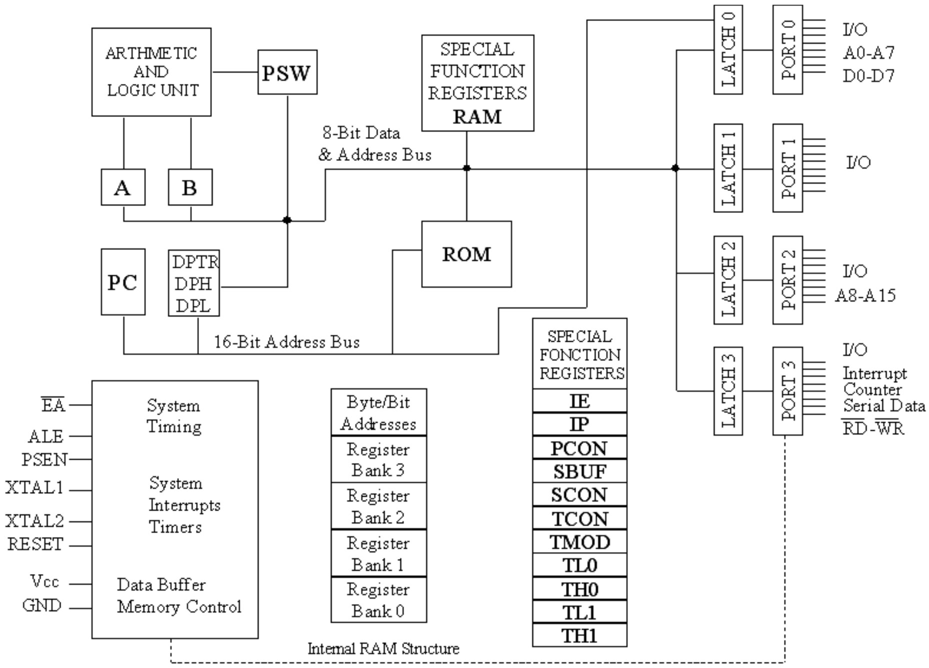

Figure 3: Functional block diagram of microcontroller

C. LCD

LCD displays outperform LED displays because they can show letters, numbers, and several special symbols, whereas LED displays (seven-segment displays) can only show numbers. These LCD panels are excellent for communicating with and informing users. A variety of formats are offered for LCD displays. The most typical format is 2 x 16, or two lines of 16 alphanumeric characters. 3x16, 2x40, 3x40, and other formats are available. Because LCD can display numbers, characters, and images, it is increasingly being used in place of LEDs. Another benefit is that more information in the form of text messages or graphics may be displayed due to its compactness and ease of programming for characters and pictures. In addition to the 8-bit data bus, LCD modules often have an 8-bit interface with a few more control lines. The control lines are connected to port "2," and the 8-bit data bus is attached to port "0." Although communication with the LCD module can be accomplished using just four of the eight data lines, the LCD module's standard data transfer between it and an external device is 8 bits. Since the R/W line is wired to the ground, the CPU can only write data to the LCD because it cannot read any status information from the LCD module.

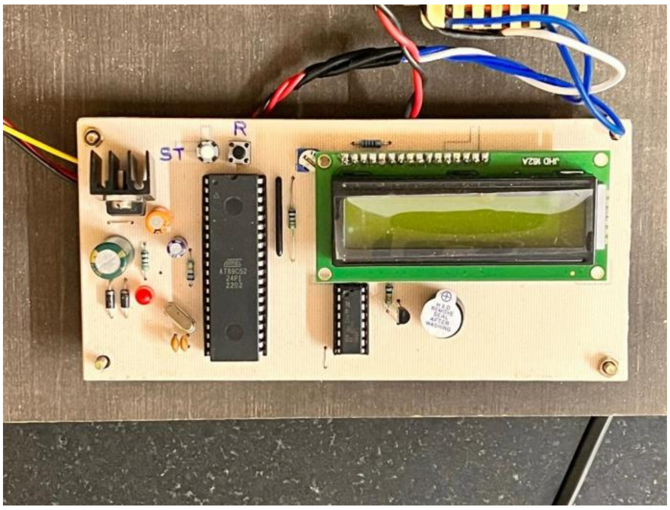

Figure 4: LCD display

There are 14 pins on the LCD panel that was used for this project. Each pin's purpose is described in a table along with its function.

Pin No	Name	Description
Pin no. 1	**VSS**	Power supply (GND)
Pin no. 2	**VCC**	Power supply (+5V)
Pin no. 3	**VEE**	Contrast adjust
Pin no. 4	**RS**	0 = Instruction input 1 = Data input
Pin no. 5	**R/W**	0 = Write to the LCD module 1 = Read from the LCD module
Pin no. 6	**EN**	Enable signal
Pin no. 7	**D0**	Data bus line 0 (LSB)
Pin no. 8	**D1**	Data bus line 1
Pin no. 9	**D2**	Data bus line 2
Pin no. 10	**D3**	Data bus line 3
Pin no. 11	**D4**	Data bus line 4
Pin no. 12	**D5**	Data bus line 5
Pin no. 13	**D6**	Data bus line 6
Pin no. 14	**D7**	Data bus line 7 (MSB)

Vcc, Vss, and VEE: Vcc and Vss supply +5V and ground, respectively, while VEE controls LCD contrast.

RS – Register Select:

Inside the LCD, there are two crucial registers. The RS pin is used to select them as follows. If RS is set to zero, the instruction command code register is selected, allowing the user to send commands such as clear display, cursor at home, and so on. If RS = 1, the data register is selected, allowing the user to send data to the LCD for display.

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R/W – read/write:

The R/W input allows the user to either write to or read from the LCD. When reading, R/W equals one; when writing, R/W equals zero.

E – enable:

The LCD uses the enable pin to latch information presented to its data pins. When data is supplied to data pins, a high-to-low pulse must be applied to this pin in order for the LCD to latch in the data. This pulse must be at least 450 ns wide.

D0 – D7:

D0 - D7 are 8-bit data pins that are used to send information to the LCD or read the contents of the LCD's internal registers. We send ASCII codes for the letters A-Z, a-z, and numbers 0-9 to these pins while making RS = 1. There are also command instructions that can be sent to the LCD in order to clear the display, force the cursor to the home position, or blink the cursor. The instruction command codes are listed in the table below.

D. Keys

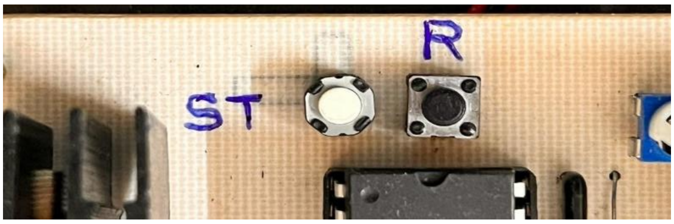

Figure 5: Start key and Reset key

A key, also known as a pushbutton, is a simple switch mechanism used to control some aspect of a machine or process. Buttons are usually made of a hard material, such as plastic or metal. The surface is typically flat or shaped to accommodate the human finger or hand, allowing it to be depressed or pushed easily. Buttons are commonly used as biased switches, process reset switches, or keys. In this project, two push buttons are used as input signal sources or control keys and are interfaced with the main processing unit.

One key serves as the alarm reset key, while the other serves as the start key. The alarm reset key's purpose is to turn off the alarm. When the system detects that the pulse rate is low, which means the controller receives less than 40 pulses from the pulse sensor, it activates the alarm to alert the carers. When the alarm or buzzer is activated, it remains active until this key is deactivated. Similarly, the other key is used to initiate the process, which means that once the fingertip sensor device is properly attached to the fingertip and the proper pulses are detected, this key must be activated, and the controller will begin counting pulses.

E. Motor driving circuit

Figure 6: Motor driving circuit

A 12v DC motor is used to power the resuscitator mechanism, and its shaft is connected to the reciprocating mechanism. This mechanism is connected to the motor via a crank and its driving rod. The motor used for this purpose has a built-in reduction gear mechanism that reduces its speed while increasing its torque. The L293D H Bridge IC is used to drive the motor, which can drive two motors independently based on the command signals produced by the microcontroller chip. Because the system only has one motor to power the air pumping mechanism, only one section of IC is used.The motor driver package L293D communicates with the microcontroller chip via IN1 to IN4 of the H Bridge (L293D). To access the command signals, both enable pins (EN1 and EN2) of motor driver L293D are combined and fed to the controller.

The enable pins are activated to control all four internal drivers of the L293D respectively to drive two geared DC motors based on the command signals issued by the controller chip. However, because only one motor is used in this application, two control codes are required to drive the single motor in both directions. Because the controller output is insufficient to drive the DC motor, a Hear H Bridge IC is required. Current drivers are required for motor rotation.

The L293D is a quad, high current, half-H driver capable of bi-directional drive currents of up to 600mA at voltages ranging from 4.5V to 36V. It makes driving DC motors easier. The L293D is made up of four drivers. Pins IN1 through IN4 and OUT1 through OUT4 are the input and output pins of drivers 1 through 4. Enable pins 1 and 2, as well as pins 9 and 10, respectively, enable drivers 1 and 2. When the enable input EN1 (Pin1) is set to high, drivers 1 and 2 are enabled, and the outputs associated with their inputs are active. Similarly, enabling EN2 (Pin9) activates drivers 3 and 4. A detailed description of this IC can be found in a separate chapter.

The L293D is a dual H-Bridge motor controller. Thus, two DC motors can be interfaced with a single IC and controlled in both clockwise and anticlockwise directions, as well as having their motion direction fixed. The four I/Os can connect up to four DC motors to rotate in one direction. Only one motor is used in this project to activate the Ambu bag or resuscitator mechanism. The L293D has a 600mA output current and a peak output current of 1.2A per channel. Furthermore, output diodes are included within the IC to protect the circuit from back EMF. The output supply (VCC2) has a wide range of 4.5V to 36V, making the L293D an excellent choice for DC motor drivers.It is also known as the "Full Bridge". TTL is supported on all inputs. Each output is a fully functional totem pole drive circuit, complete with a Darlington transistor sink and a pseudo-Darlington source. Drivers are enabled in pairs, with 1,2EN enabling drivers 1 and 2 and 3,4EN enabling drivers 3 and 4. When an enable input is set to true, the associated drivers are activated, and their outputs are active and in phase with their inputs. When the enable input is set to zero, those drivers are disabled, and their outputs are turned off and in high-impedance mode. Each pair of drivers, when combined with the appropriate data inputs, forms a full-H (or bridge) reversible drive suitable for solenoid or motor applications.The device is a four-channel monolithic integrated high voltage, high current driver that accepts standard DTL or TTL logic levels and drives inductive loads (such as relays, solenoids, DC, and stepping motors) and switching power transistors. Each pair of channels has an enabled input to facilitate use as two bridges. The logic has a separate supply input that allows it to operate at a lower voltage, and internal clamp diodes are included. This device can be used in switching applications with frequencies of up to 5 kHz. The L293D is packaged in a 16-lead plastic package with four center pins connected together for heat sinking. The L293DD is packaged in a 20-lead surface mount with 8 center pins connected together for heat sinking.

MOTOR 1		**MOTOR 2**		**ACTION**
IN1	IN2	IN3	IN4	
0	0	0	0	High "Z"
1	0	1	0	Rotate right
0	1	0	1	Rotate left

Because of the direct control using pulse width modulation (PWM) to on/off and speed control for motors, we use the input/output information from table 2 to enable the motors, as shown below:

INPUT	**PIN ENABLE**	**OUT**
1	1	1
0	1	0
1	0	High "Z"
0	0	High "Z"

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An isolated purpose interface was implemented between microcontrollers and the L293D circuit to provide electrical protection for the microcontrollers from short circuits and high energy current peaks caused by continuous motor switching activity.

F. DC motor

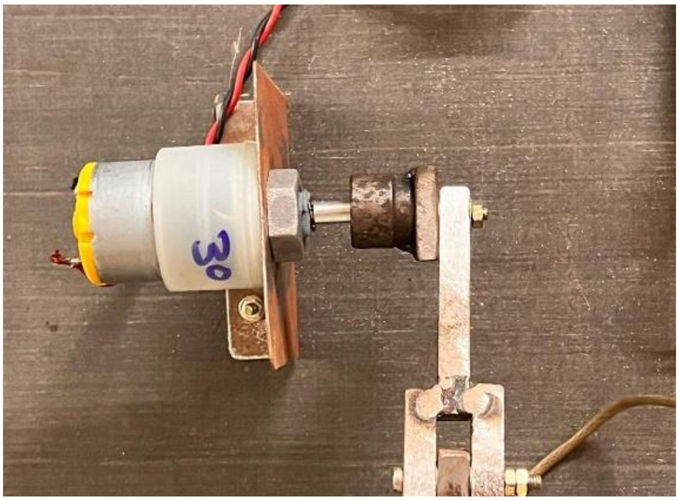

Figure 7: DC motor

DC motors are widely used because they are inexpensive, small, and powerful for their size. They are the easiest to control. A single DC motor requires only two signals to operate. Direct current motors use direct current voltages as input and convert them into rotational movement. DC motors are typically wired with two wires and can be powered directly from a battery or a DC power supply. DC motors can also be powered by a driver's circuit, which controls the motor's speed and direction. DC motors are commonly used in robots and mechanical applications due to their low cost, variable speed, higher starting torque than running torque, and frequent start/stop cycles or closed-loop positioning. The most common DC motor voltages used in robotics are 6V and 12V. The gear shaft contained within the power window motor will undoubtedly increase the motor's torque.

Because they are non-polarized, you can reverse the voltage without causing any damage to the motor. DC motors have positive and negative leads. Connecting them to a DC voltage source causes the motor to move in one direction (clockwise), and reversing the polarity causes the DC motor to move in the opposite direction (counterclockwise). The maximum speed of a DC motor is specified in revolutions per minute (rpm) (rotation per minute). There are two rpm settings: no load and loaded. When moving a load, the rpm decreases, and when the load increases, the rpm decreases. Voltage and current ratings are two other DC motor specifications. The specifications of the motor used in the project are shown in the table below.

	Ratings
Operating Voltage	12V DC
Operating Current At now load	150MA
Speed	30 RPM

The applied voltage across the motor can be changed to change the speed of the motor. DC motors lack the torque required to drive the mechanism directly by connecting it to it. The motor driving circuit is built around the L293D chip, which is also known as an 'H' bridge device and is commonly used to drive low-power DC motors. The drive sequence is programmed based on the information gathered from the push buttons to drive the motor in both directions.

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G. Power source

Figure 8: Transformer

The power supply unit is designed with a step-down transformer of 12V at secondary that can generate 1 amp current to generate the required power source to drive the mechanism. We generated two different DC supply sources of +5V and +12V from this supply source. The mechanism is powered by a 12V unregulated power supply via a DC motor. A regulated supply is not required for this purpose. The control circuit designed with the 89c52 microcontroller chip and the heartbeat sensing circuit, on the other hand, requires a stable supply source of +5v regulated power. The 7805 three-terminal voltage regulator chip is used to generate a stable supply of +5V. Although the input voltage varies from +20 to +9, the output voltage of this device generates a constant voltage of +5v. The DC motor used in this application is designed to operate at 12V DC and consumes a maximum current of 300 milliamps on load, which means driving the mechanism. The remaining circuitry, including the controller chip, will consume another 100 milliamps, bringing the total system current consumption to around 400 milliamps. To be on the safe side, a 1 amp transformer is used here to reduce system failures.

H. Resuscitator

This mechanism is intended to deliver pressured air in a continuous cycling fashion. In the case of a manual resuscitator, the device must be used for a short period of time because rhythm is important here, which is not possible with manual operation. The system developed here, known as a breathing machine or mechanical ventilator, can be used instead of manual operation. Because the mechanical version is powered by a motor that rotates at a constant speed, the rhythm or breathing cycles can be maintained continuously. Resuscitation is a type of artificial respiration that uses a breathing bag to help patients breathe when their lungs are not functioning properly. In the case of manual operation, the bag is squeezed by hand, whereas in the case of mechanical or automatic operation, the bag is squeezed continuously at consistent intervals. One end of the bag can be attached to the oxygen source or left to drag through the open air, while the other end can be attached to the face mask. When the mechanism begins to work, the patient can feel air being pushed into the lungs. Pumping too much air into the lungs can cause a variety of problems, so rhythm is essential so that air pumping action can be tailored to the patient's age and symptoms. Normal breathing should be done at a rate of 4 to 5 seconds per breath.

To squeeze or press the bag and release it automatically, a reciprocating motion is created in the mechanism, which is coupled with a DC motor. Reciprocation is a linear motion method that produces repeated press and release functions of the air bag. The pushing type of mechanism moves back and forth between the specific span in this mode. Circular motion is converted to reciprocating motion by a crank or disc connected to the motor shaft. The connecting rod used between the crank and the air bag in this method generates reciprocating motion and periodically pushes the bag. The wheel or crank is connected to the motor shaft at its midpoint by a connecting metal bush, allowing the wheel to be driven at a constant rotational speed, and the point at which the crankshaft, which connects to the connecting rod, rotates smoothly and at a constant velocity in a circle.

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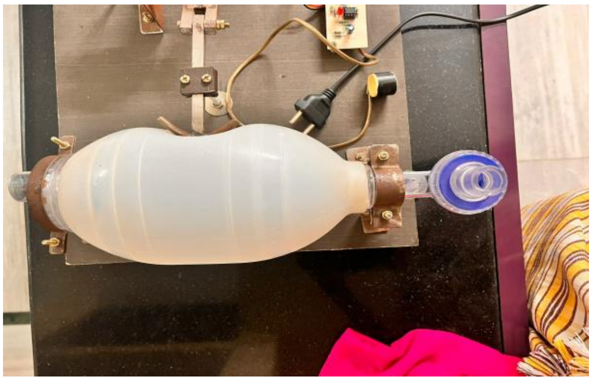

Figure 9: Resuscitator

IV. RESULTS

A resuscitator is a piece of medical equipment that is used to force oxygen or air into the lungs of a patient who is not breathing properly. When a person's lung condition prevents them from breathing normally, their heart rate drops, which could lead to serious illness. Bradycardia results in the heart beating less frequently than 50 times per minute, which can be extremely harmful since the heart cannot pump enough oxygen-rich blood to the body. The use of a resuscitator is essential in such a circumstance.

The heart rate monitor developed here is designed to measure the blood flow cycles through our fingertips; IR sensors are used to detect blood flow through fingertips. These LM358-connected sensors can generate pulses dependent on blood flow. An embedded system called the LM 358 was created using the 89c51 microcontroller microprocessor. It is a dual op-amp with a high gain. This controller chip is currently measuring the pulse rate and displaying the results on the LCD. Due to the fact that a healthy heart beats more than 60 times per minute, the technology is programmed to automatically start the air pumping mechanism when the pulse rate falls below 40. The pulse rate in beats per minute is displayed on an LCD. The air-pumping apparatus is driven by a DC motor.

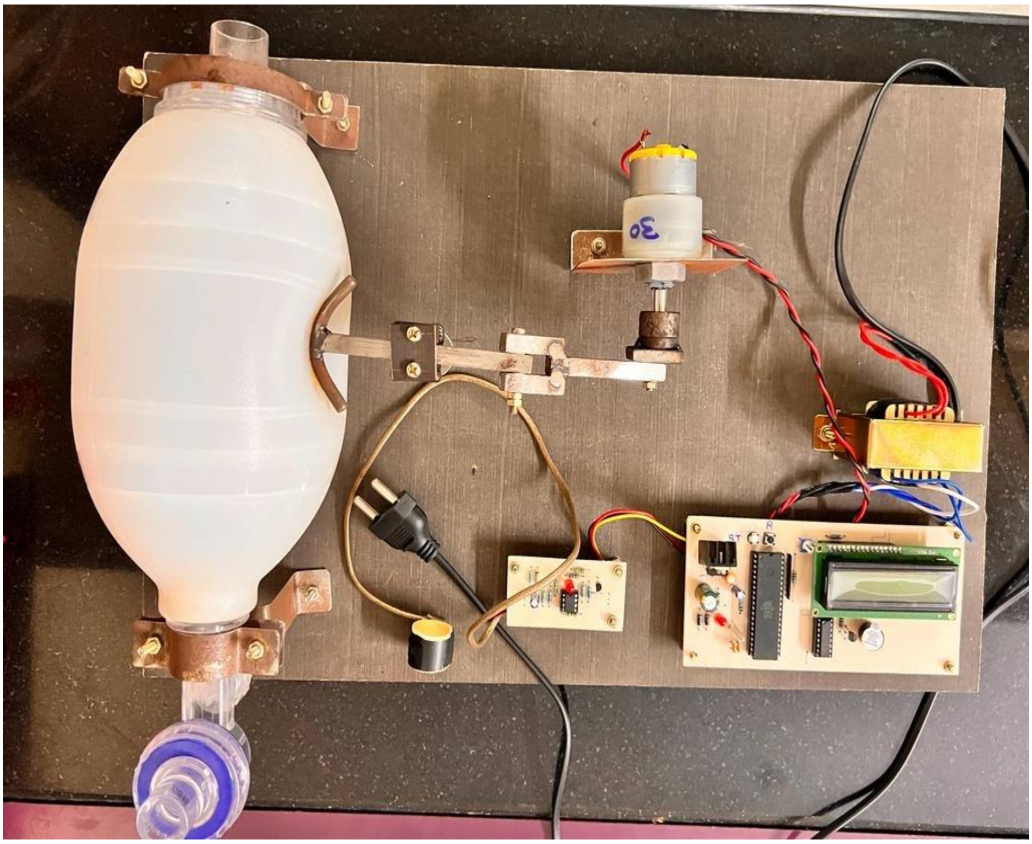

Figure 10: System setup

V. CONCLUSION

The project work for "Automation of Resuscitator by Sensing the Low Heart Beat" has been successfully completed, and the results are positive. We learned throughout our trail runs that there aren't many easily available sensors, making it extremely difficult to develop a heart rate monitoring system. In this sense, we made our own by integrating IR sensors with an IC358. IR sensors are necessary for this combination to track the blood flow through the fingertip. After building multiple trails, we learned that measuring blood flow requires incredibly sensitive sensors. An improved sensor output that generates a logic pulse is triggered by each wave of blood flow across the fingertip.

Currently, the controller is configured to read and display the We purchased a mechatronics-based manual resuscitator, where the machine will be activated automatically upon the detection of a low heartbeat. The fundamental part of this device is a compressible reservoir, often made of silicone, that expands automatically when released. The self-inflating manual resuscitator can be used for hand ventilation if there is no source of oxygen or air. However, a motor and its associated mechanism are utilized to designate it as automatic in our project work.

VI. FUTURE SCOPE

The future scope of automatic resuscitators (also known as automatic external defibrillators or AEDs) is likely to include advances in technology that make them more widely available, user-friendly, and effective in saving lives. Some potential developments include:

Miniaturization: AEDs are already portable, but they could become even smaller and more easily carried by individuals, increasing the likelihood that one will be nearby when needed.

Integration with other devices: AEDs could be integrated with one medical device, such as a smartphone, to provide additional information and assistance to users. Improved algorithms: The algorithms used in AEDs could be continually refined to Improve the accuracy and speed of diagnosis and treatment. Increased accessibility: AEDs could become more widely available in public places, such as schools, airports, and shopping centers, making them more easily accessible to those who need them.

Overall, the future of automatic resuscitators looks promising, with the potential for increased availability, improved accuracy, and greater ease of use.

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