iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 8 **Issue:** V **Month of publication:** May 2020

DOI: http://doi.org/10.22214/ijraset.2020.5018

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue V May 2020- Available at www.ijraset.com

Automatic Cardiopulmonary Resuscitation (CPR) Machine

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Abstract: ***Cardiopulmonary resuscitation method is used to save more number of peoples from the neurological problem. In this case, the neurological problem denotes brain death. This brain death is mainly caused due to cardiac arrest and happen within 4 to 5 minutes. To avoid this problem we go for cardiopulmonary resuscitation method. It will be helpful to relieve the patient from cardiac arrest. When a cardiac arrest occurs, it is necessary to perform cardiopulmonary resuscitation as soon as possible. This requires maintaining the pressure depth at 5 cm at a rate of 100 cpm. For CPR machines, which are frequently used in ambulances, the return of spontaneous circulation is not superior to that of manual CPR, although CPR machines can maintain the compression rate more accurately. The manual CPR is not that much efficient when compared to automatic CPR because, the experts who are giving CPR to the patient are cannot able to give the continuous CPR to the patient but, the automatic CPR machine is able to give the continuous CPR to the patient. The article reviews such kind of automatic devices. The automatic CPR machine is already exist. But, the cost of that machine is high. So we intended to design the low cost CPR machine. This is achieved by replacing the component like Arduino microcontroller and solenoid lock. The replaced component also do the same work like in the high cost CPR machine.***

Keywords: CPR (Cardiopulmonary Resuscitation), Arduino Microcontroller, solenoid lock, Automatic devices.

I. INTRODUCTION

In cardiac arrest, the heart abruptly stops beating without prompt intervention, it can result in the person's death. The main symptom is loss of consciousness and unresponsiveness. This medical emergency needs immediate CPR or use of a defibrillator. Hospital care includes drugs, an implantable devices or other procedures. If not treated immediately, sudden cardiac arrest can lead to death. With fast appropriate medical care like CPR will be provided, then the survival of the patient is possible. Giving CPR can improve the chance of survival until emergency workers arrive. Cardiac arrest is one of the leading causes of death worldwide and it is also lead to coma due to acute embolism. But, this embolism managed by cardiopulmonary resuscitation(CPR) and extracorporeal membrane oxygenation with an excellent neurological recovery. The use of CPR in such cases is believed to reduce the mortality rate and increase the survival rate with good neurological outcomes. It saves nearly 4,00,000 to 5,00,000 peoples in every year and we believe this will be increased in the upcoming year. The effectiveness of the CPR depends on the quality of the resuscitation procedure. The parameters of the CPR machine are chest compression rate, chest compression force and execution timing. The chest compression rate is 30 compression per minute and 2 rescue breath and the chest compression force ranges from 100 to 125 pounds of force. The execution time for CPR is about two minutes before calling for help. Continue CPR until you see signs of life or until medical personnel arrive. These parameters are stated in the basis of AHA guidelines. The distance between the patient chest and the piston varies by patient to patient based on their physical appearance. Mostly the distance between chest and piston are 1.5inches to 2inches. During the time of first aid, automatic CPR machine is very helpful to lift the patient from one place to another place. The rigid stretcher is used during the transportation of the patient from the scene to the ambulance, the compression can continue uninterrupted all the time. The devices aimed at replacing completely the manual CPR.

II. OBJECTIVE

The objective of project is to reduce the cost of the CPR machine. It is achieved by the replacement of the component in the existing CPR machine. The replaced component also do the same work as the component in the existing CPR. But, it is cost effective. The existing CPR machine rice nearly 1,00,000 and our project reduce the price to 50,000. So, the ultimate aim our project is achieved.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
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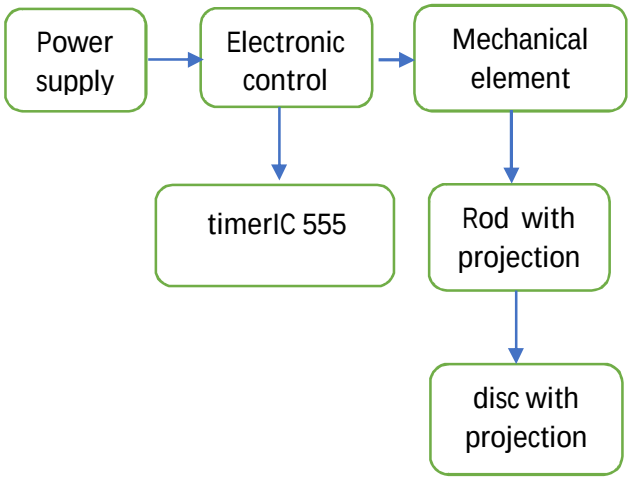
III. EXISTING SYSTEM

In the existing system, direct current is used as a power supply. The power supply have a power input connection, which receives energy in the form of electric current from a source, and one or more power output connection that deliver current to the load. The electronic unit gives supply to the motor and the timer circuit. The mechanical elements like gear assembly controls the speed of the DC motor. The DC motor is connected with the rod shape projection and disc shape projection. These two projection combine to give compression to the patient. Here the compression rate is controlled by the timer circuit. IC 555 is used in the timer circuit. The overall components used in the existing technique are DC motor, battery or DC supply, IC 555, gear assembly, disc.

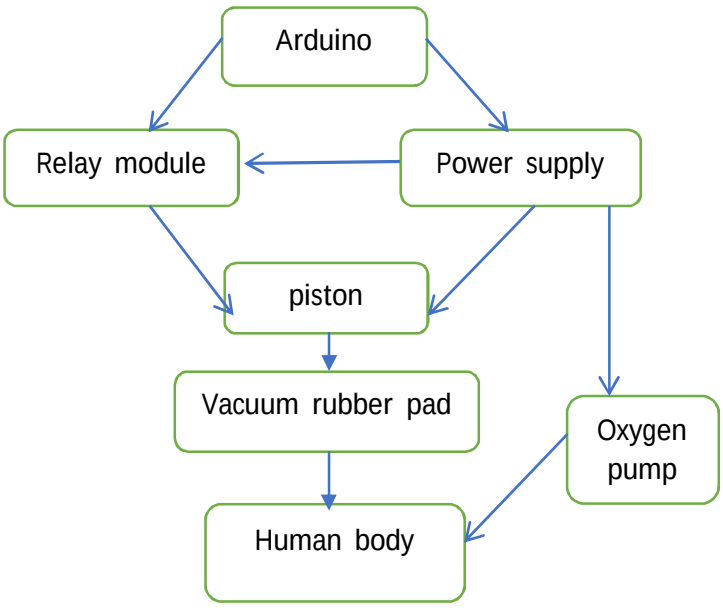
Flow Chart



IV. PROPOSED SYSTEM

In the proposed system battery or DC power supply is used as a power supply as same in the existing system. The Arduino board is used to control the compression rate, which is act as a timer circuit in the existing system. The world health organization was already mentioned the word " In the future, microcontroller replace the timer circuit". The time delay program is fed into the Arduino board to perform the timer function. The combined structure of projection in the existing technique was replaced here as a piston . piston is used to give the compression to the patient. There is no need of motor here to control the piston movement. Relay module is used for the delay purposes.

Flow Chart



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V. DESCRIPTION OF SCHEME

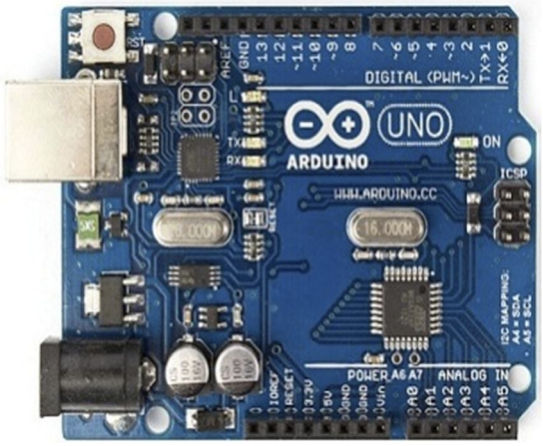
The components we are using here to reduce the cost of the CPR machine are Arduino microcontroller, relay module, power supply, piston, vacuum rubber pad. In our project, the Arduino board replace the function of the timer and piston replaces the function of rod & disc shape projection in the existing system. The main components in our project are,

1) Arduino microcontroller
2) Piston
3) Relay module
4) Oxygen pump

The description of the above mentioned components are given below,

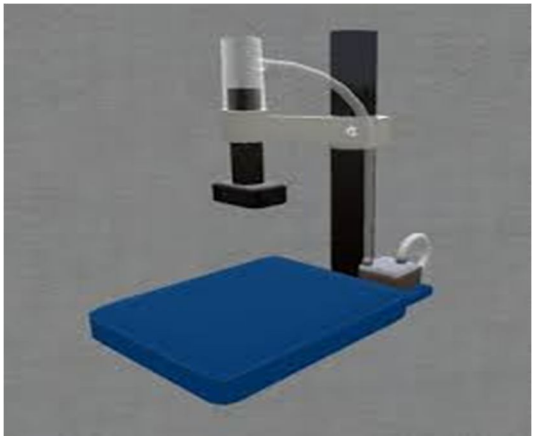
A. Arduino Microcontroller

Arduino microcontroller contain 14 digital pins and 6 Analog pins. In this paper, the 14 digital pins are used to give input or output for our project using pinMode(), digitalWrite() and digitalRead() functions. DC current for 3.3V out is 50mA and the DC current for 3.3V in is 1A. It is supplied with the external adapter. The recommended supply voltage ranges from 16 to 20V and the clock speed is 16MHZ. we fed the coding into the Arduino board to perform the timer function. A maximum of 40mA is the value that must not be exceeded on any input and output pin to avoid permanent damage to the microcontroller. The memory used in Arduino is EPROM, so we can able to upload the more number of program. Arduino consists of both a physical programmable circuit board and a piece of software, that runs on your computer, used to write and upload computer code the physical board.



B. Piston

Piston is the disc shape metal connected with the rod shaped projection. These structure is used to give the compression to the patient. The speed of the piston is controlled by the relay module. If the speed of the piston increases, the relay module break the loop and sace the patient from danger.



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C. Relay Module

The relay is an electrically operated switch that can be turned on or off, letting the current go through or not, and can be controlled with low voltages, like the 5v provided by the Arduino pins. Relay module using here is single phase or single channel relay module. This module is powered with 5V, which is appropriate to use with an Arduino.

D. Oxygen Pump

The oxygen pump is given oxygen supply to the patient. The flow of oxygen is depends upon the patient. In automatic devices we can be use only oxygen pump.

E. Manual and Automatic Cpr Devices

The CPR device is categorized into two types, they are manual and automatic devices. Fig 2 shows the one example for manual CPR machine (a) CPR PRO cradle and then the three automatic devices are (a) EM-CPR, (b) life stat, and (c) LUCAS. The above mentioned these automatic components are shown given below.

Fig.1 Function of Cpr

Fig.2 Manual Cpr Machine

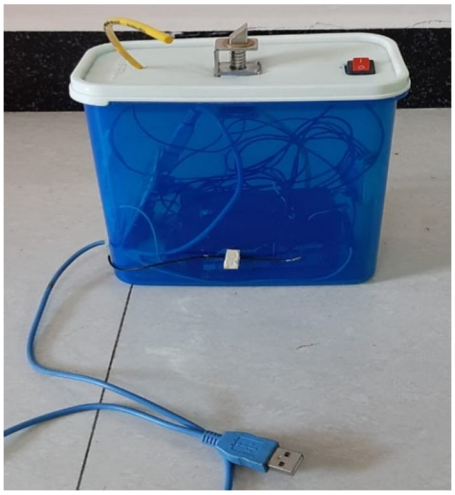
The manual devices are auxiliary component to perform the step-by-step procedure to give proper massage to the rescuers. In some devices, it is used to reduce the fatigue of the rescuers for the more efficient compression process.

Fig.3 Automatic Cpr Machine

The automatic CPR machine are able to provide the automatic chest compression to the patient with proper rate and depth. So the automatic CPR machine is more helpful than the manual CPR machine. The different types of automatic CPR machine are available. These CPR machine are classified based on the their structure and compactness.

VI. RESULT

The result of our paper, In this output we display the compression produced by the solenoid lock and oxygen supply produced by the oxygen pump. This is achieved by replacement of some components. The components we are replaced here are Arduino microcontroller, solenoid lock, relay module and these are main components. Power supply or battery, vaccum rubber pad are supporting components.



VII. CONCLUSION

This paper review the advantages of automatic CPR machine and how it will be implemented in the affordable price. This is achieved by the replacement of the solenoid lock and oxygen pump. We will see the output in the form of piston movement and the oxygen supply by using manikins. This manikins are very helpful to find out the compression rate & force movement with given oxygen supply.

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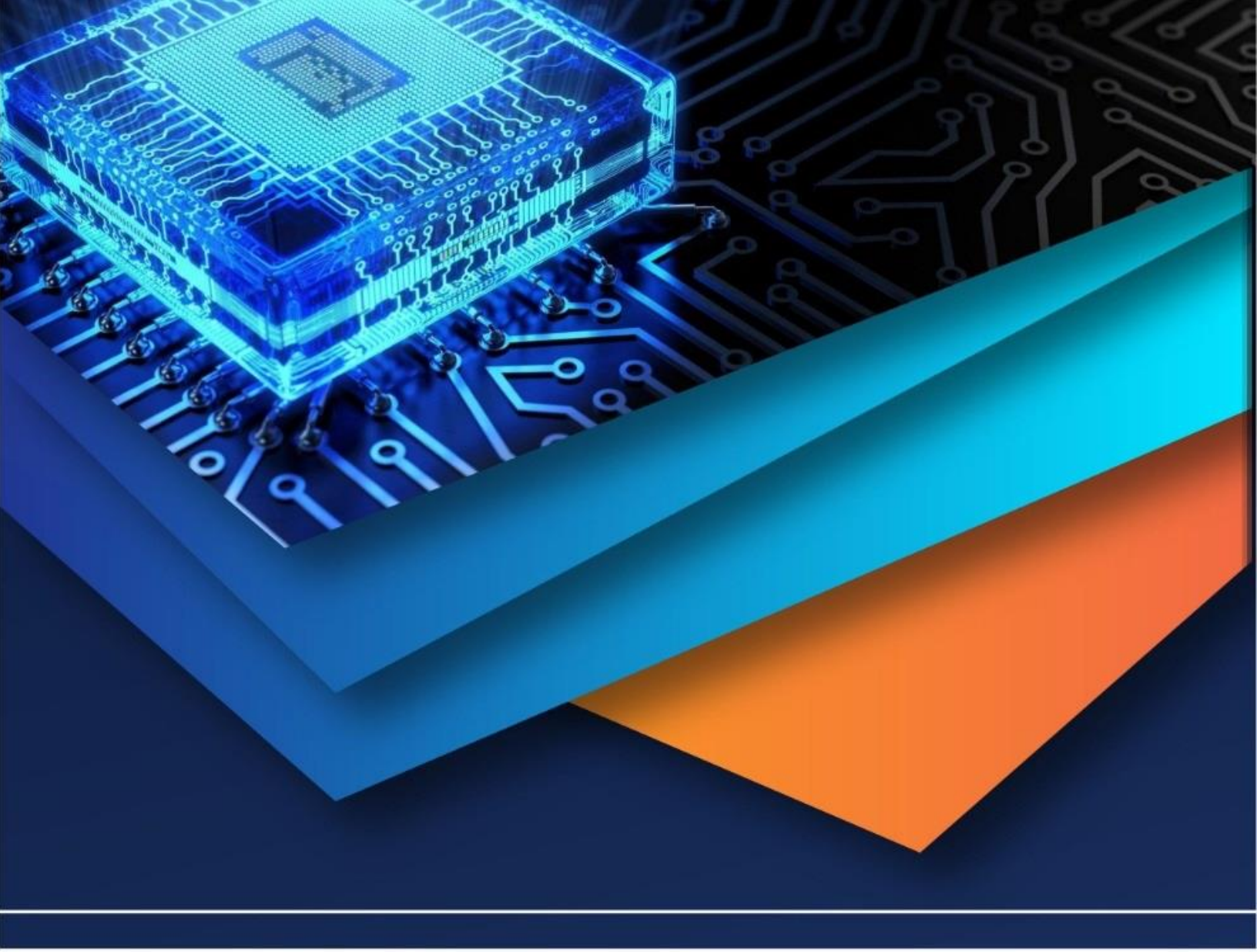

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