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Design of Laparoscopic Morcellator Endo-Surgery Instrument

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Abstract: The main report is based on Morcellators which is surgical tool that doctors use to cut bigger chunks of tissue into smaller once, usually during laparoscopic surgery we intend to built prototype of low-cost morcellators using dc motor controlling .By studying techniques of pwm and various other morcellators.

Nowdays the cost of abdomenal surgery is high the main reason behind this is the surgical cost involve in this process.The machinery is mostly imported from German countries as a result the cost is high so we intended to build an morcellator which is low in cost.

Keywords: morcellars, laparoscopy, surgey, Atmega328p.

I. INTRODUCTION

Laparoscopy is a type of surgical procedure that allows a surgeon to access the inside of the abdomen and pelvis without having to make large incision in the skin. This allows your doctor to view tissue or take a tissue sample, such as removing a damaged or diseased organ, or removing a tissue sample for further testing, called a biopsy.

What used to happen earlier, doctors used large cut on stomach to diagnose and perform the operation after that result used to come. In that process the patient used to suffer more, and it takes one or one and half months for him to recover.

So to decrease in the cost of the surgery can be done by reducing the operation cost so we came with this low cost morcellator**.**

II. COMPONENTS

A. System Components

1) Atmega328p

ATMEGA328P is high performance, low power controller from Microchip. ATMEGA328P is an 8-bit microcontroller based on AVR RISC architecture.It is a 28 pin chip. It has 6 PWM channels. In order to get the PWM from Atmega, we need to use the **timer/counter** module of the Atmega. This module can be used in several modes to generate different PWM signals of different characteristics; we use the counter in the "Phase Correct PWM" mode. Atmega32 has 3 timer/counters and we are using **timer/counter 0**In "**Phase Correct PWM**" mode, the counter counts repeatedly from 0 to its maximum value (0xFF) and then back from the maximum to zero.

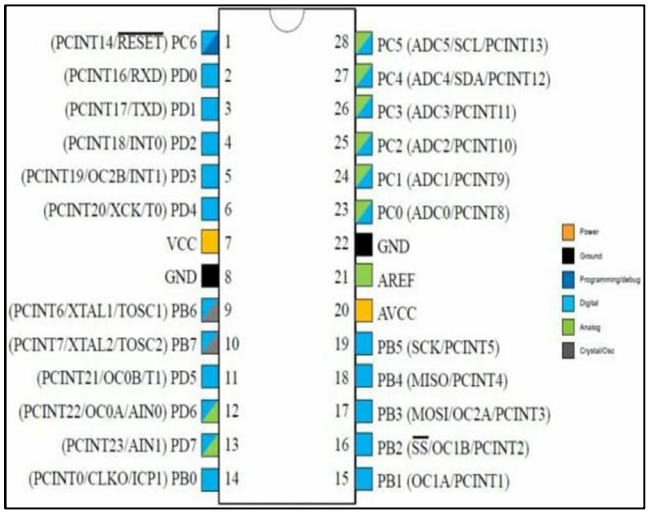

Fig. 1.1 Atmega328p pin

2) SMPS

A switched-mode power supply (SMPS or switcher) is an electronic power supply that incorporates a switching regulator to convert electrical power efficiently.

An SMPS transfers power from a DC to AC source to DC loads, such as a personal computer, while converting voltage and current characteristics.

In a SMPS, the output current flow depends on the input power signal, the storage elements and circuit topologies used, and also on the pattern used to drive the switching elements.

In our project SMPS convert 240v into 24v power supply.

Fig.1.2 SMPS 24 V

3) LM2596

The LM2596 is a commonly used popular step down switching regulator IC. It is 12v adjustable regulator IC. It is used in Switch mode power supply. It commonly used to power/control heavy loads.

Fig. 1.3 LM2596

4) 7805 IC

IC 7805 is used to make supply 5Volts for Digital Devices from 24V SMPS Source.

IC 7805 is a 5V Voltage Regulator that restricts the output voltage to 5V output for various ranges of input voltage. It acts as an excellent component against input voltage fluctuations for circuits, and adds an additional safety to your circuitry. It is inexpensive, easily available and very much commonly used.

The voltage regulator IC 7805 is actually a member of the 78xx series of voltage regulator ICs. It is a fixed linear voltage regulator. The xx present in 78xx represents the value of the fixed output voltage that the particular IC provides. For 7805 IC, it is +5V DC regulated power supply.

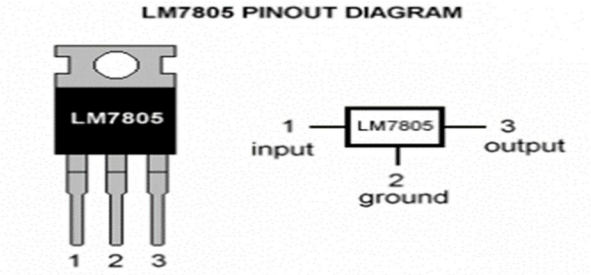

Fig.1.4 7805IC

5) Relay

Single pole Single throw relay is a device that has only input and one output. It only connects or disconnect only one contact when it is operated.

Including the coil terminal, it has a total of four terminal or electronic circuit.it has a total of four terminal. The SPST relay can control a single electrical or electronic circuit.

It generally provides a switching function or on/off function as an electrical switch provides, just the difference is, it controlled by an electrical or electronic signal.

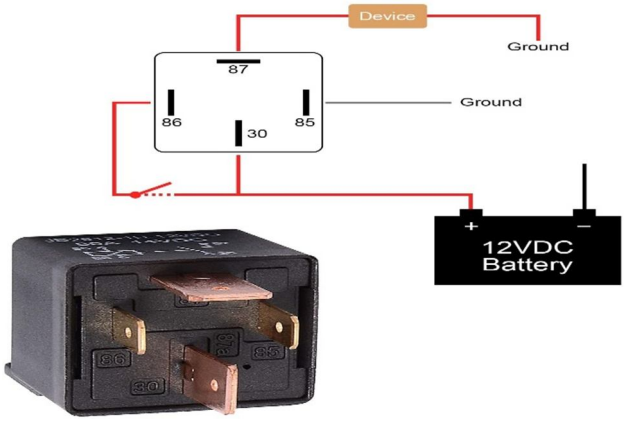

Fig.1.5 Relay

6) LCD Display

A Liquid Crystal Display (LCD) has liquid crystal material sandwiched between two sheets of glass. Without any voltage applied between transparent electrodes, liquid crystal molecules are aligned in parallel with the glass surface.

LCD Display send to Show The Speed Status of our Motor.

It is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers. Liquid crystals do not emit light directly.

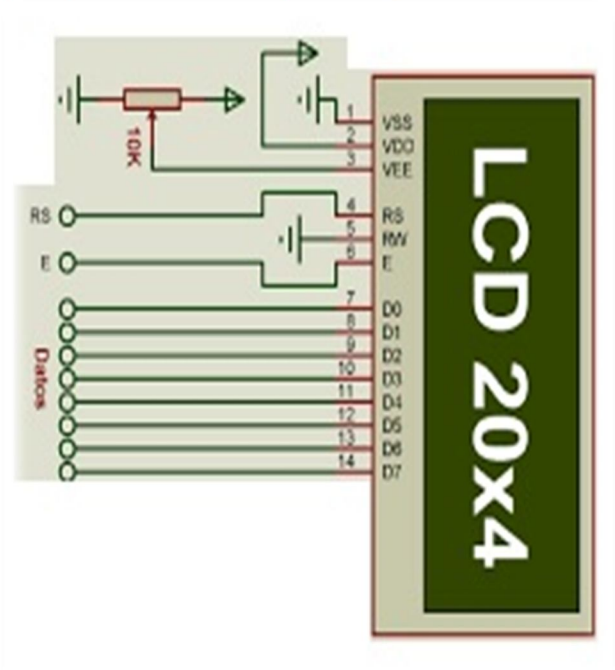

Fig 1.6 LCD

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III. METHODOLOGY

The main aim is to control the speed of motor very efficiently. Cosidering a lot of components we designed PCB using proteus. The components used are very fragile in nature .we have tried to made them as much compact as possible so failure ratio is decreased and can be used efficiently is surgeries.

Our Morcellators has basically 3 main PCB division one is SMPS. Firstly we have use 24 v dc SMPS where 240 volt AC domestic supply is converted to 24 V DC with 5 ampere of current.

Another one is ATmega328p board and other is power control board .Atmega 328p is used to control our motor speed using pulse width modulation. Then LM2596 step down 24 V dc voltage to 12 V dc which is supplied to atmega board where 7805 again regulates it and gives 5V to our Atmega 3208p .

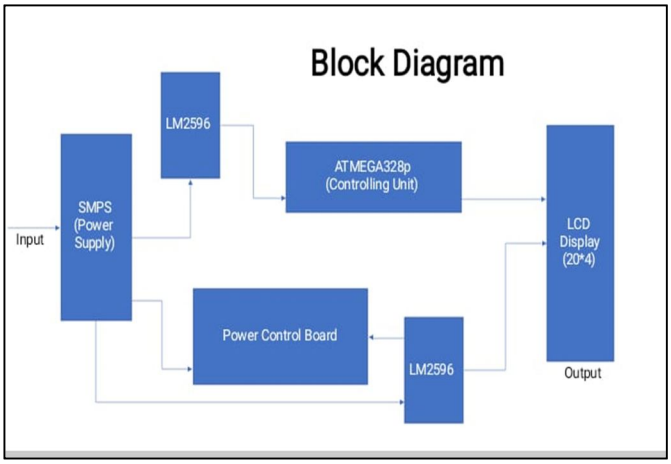
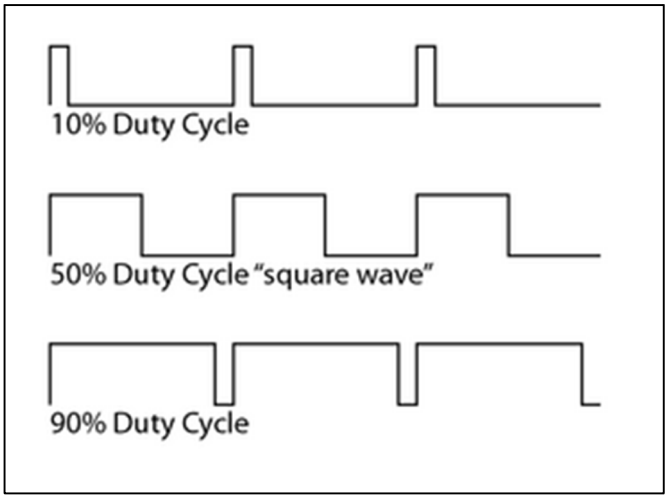


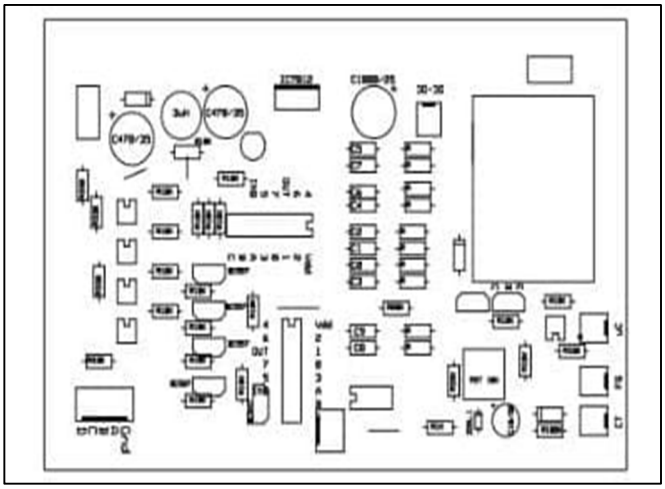
Fig. 1.7 Block Diagram

IV. PULSE WIDTH MODULATION

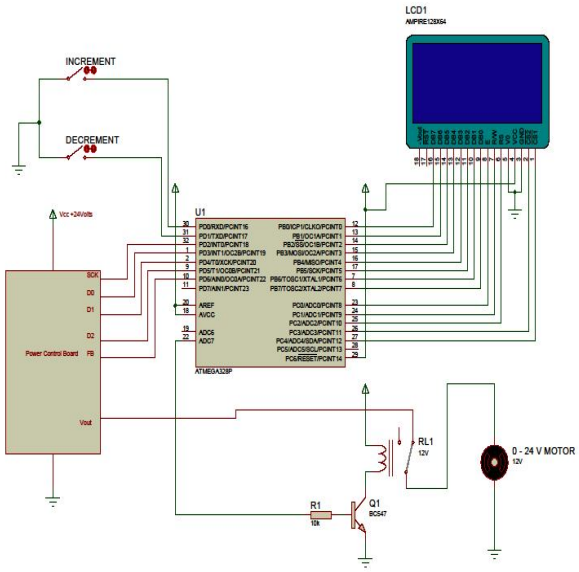
Pulse width modulation is a modulation technique used to encode a message into a pulsing signal.The average value of voltage fed to the load is controlled by turning the switch between supply and load on and off at a fast rate. The longer Switch is on compared to the off periods, the higher the total power supplied to the load.fig:1 represents the PWM.



So thus we manipulate our motor for efficient controlling and uses. Now other board is of IC 4805.The HC4051 8-Channel analog multiplexer module can be used when there are many analog inputs in a circuit. In this case, one of these inputs needs to be selected and processed each time. This multiplexer can be used to select from 8 analog inputs. There are three S0-2 pins, which by giving appropriate values, one of the analog inputs is set as the output on the Z pin.



Power Control Board Block Diagram



Circuit Diagram

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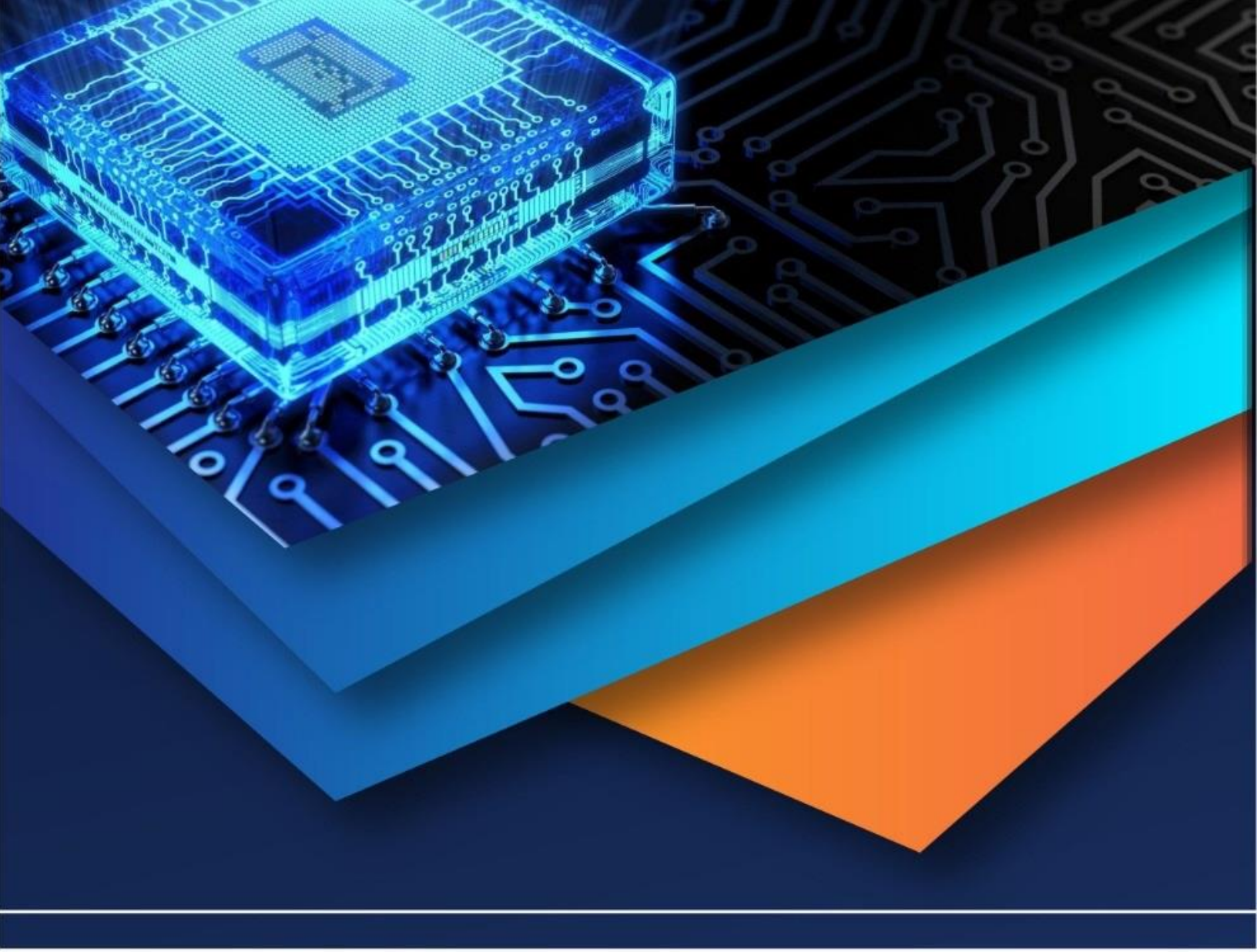

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