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# Design of Arduino based Automatic Anaesthetic Drug Injector

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***ABSTRACT -*** *The objective of this proposed system design is to eliminate human errors while injecting specific amount of anaesthetic drug to the patient during surgery. Because anaesthesia remains the severe pain in the backbone in many of the cases. At the hospitals when any minor or major operation is performed it is compulsory that a patient must be in anaesthetic condition. Before injecting the drug the anaesthesiologist must measure the quantity of anaesthesia. In addition to this anaesthesiologist should have information about body temperature, blood pressure, pulse rate within given period of time. The huge amount of dosage cannot be injected in a single stroke. If a surgery takes long duration of time for 7 to 8 hours, then complete dosage cannot be injected in one stroke which may leads to the death of a patient. If the amount of dosage is less than the patient might wake up in the middle of operation. To overcome this problem the anaesthesiologist injects few millimetres of anaesthesia per hour, if an anaesthetist miss to inject the anaesthesia in a given interval of time the patient may suffer from many health problems. This project is designed to avoid such problems while performing the operation. In this paper any changes in the level of anaesthesia in the patient's body it will automatically inject the drug through infusion pump with the help of data acquired by the sensors. Based on the rotations of the dc motor the anaesthesia injected into the patient.*

***Key words:*** Anaesthesia, Microcontroller, Syringe infusion pump, DC motor, Sensor.

## 1. INTRODUCTION

Anaesthesia is injected near a cluster of nerves; the large area of the body goes numb (such as down to waist, same as given to women in labour), usually a regional anaesthesia is used to make a patient comfortable during and after the completion of operation procedure. In out phase operation or surgery centre and hospitals. An anaesthesia machine is a medical device which is used to generate and mix the flow of gases and inhaling anaesthesia agent is used for the purpose of inducting and maintaining anaesthesia.

Anaesthesias Injector is also an application of embedded technologies in which a microcontroller is used for controlling the entire device. The general purpose microcontroller will perform operations like reading data from sensors and performing limited calculations, depending on those calculations it will control the entire system. .The microcontroller is used as a key element for controlling the operation of a overall machine that uses predetermined program which is collected in random access memory (ROM)and it will never going to change the structural lifespan. The highly integrated microcontroller chip includes almost all the parts needed for a controller in a single chip. When a patient undergoes operation without injecting appropriate amount of anaesthesia that may leads to severe pain and blood loss.

## 2. RELATED WORK

Rasheedha et al.,[1] In this particular paper they explained about injecting anesthesia using load cell. Backbone pain remains for long time when anesthesia is injected to a patient during the operation. Earlier anesthetist use to give the anesthesia manually. The work of an anesthesiologists is to calculate the biological parameters of the patient before injecting. The aim of this project was to overcome the side effects that occurred due to miscalculation. The weight and height of a patient are determined to inject appropriate level of dosage. The load cell is used as an input, and the dosage level is observed by monitor.

Ishwari Ingale et al., [3] in this paper the infusion of anaesthesia is a control system. Procedure of calculating and injecting the specified amount of dosage is done by anaesthesiologist. For to inject appropriate amount dosage they need to check the monitor continuously different biological framework. Many number of researchers have tried really hard to solve this problem and this is very tough work. Major operation is performed to remove or deconstruct infected parts. These operations will lead to great agony and anesthesia is itself known as pain killer. Hence it is prepared for painless surgery. In this project design the AVR processor is used for controlling anesthesia machine, depending upon the biological parameters like body temperature, heart rate.

Akshay Sharma A S et al.,[4] In Greek Anesthesia means "lack of sensation" or "no sensation". In modern days anesthesia is used to facilitate painless surgery. In this paper they developed an automated system, in which it receives information from parameters like, heartbeat, temperature, blood pressure of a patient and calculates the amount of dosage required in millimetres by considering age, weight and drug concentration and maximum allowable drug.

Deepfranklin P et al., [8] in this proposed system the anesthesia level in a current position of a patient is analyzed. In this paper field Programmable Gate array technology is used along with the biological parameters. It is helpful in in maintaining the correct level of anesthesia that to carefully and also monitoring the patient vital parameters with accuracy. There are many number of number of ways to monitor vital parameters more efficiently and different values that are derived from the signals are useful in monitoring the status of patients and keep infusing the proper proportion of drugs

D Hemapriya et al.,[5] this paper mainly explains about the hypnosis level of patient. The capital b i s methods previously used doesn't give accurate results. So to give accurate prediction adaptive model depending on a fuzzy logic and genetic algorithm is used. The evaluation process is done in simulation. The drug injection is based a real needs of patient. This gives accurate controlling of level of anesthesia with dynamic inherent unaesthetic process. The inter and intra patient variability is handled effectively. Proteus microcontroller software is used and we get the schematic output.

## 3. PROPOSED SYSTEM

### 3.1 BLOCK DIAGRAM

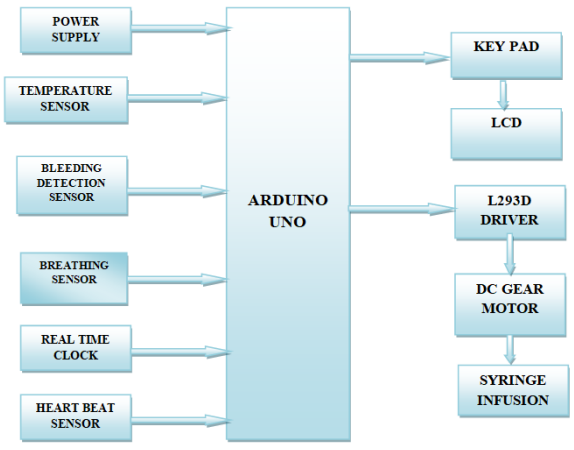
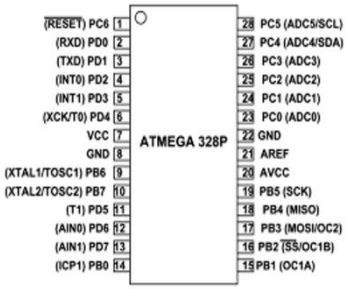



Fig-1: Block diagram of the system

### 3.2 WORKING OF THE PROPOSED SYSTEM

The Arduino anaesthesia machine is controlled by Arduino UNO with Atmega328 microcontroller which control the entire system. As all the devices are connected to the central part that is microcontroller. A DC gear motor is used for injecting process which is nothing but the extension of a normal DC motor and it is used because of its more rotation as the process of pumping required more rotation. Different types of sensor are used such as temperature sensor, Heartbeat sensor, breathing sensor and bleeding detection. Firstly the data from each sensor is observed one by one, and then time and date for the dosage is set with the help of RTC.A real time clock (RTC) is available in microchip with its own inbuilt battery, which is also referred as complementary metal-oxide semiconductor,it is basically like a watch. The dosage that need to be injected is selected when the operation needed to startalso date and timing is added depending upon how long the operation goes. Keypad is used to enter the timing,date,day and for other options and LCD is used to display all the information of sensors and other information'slike the number of dosage using keypad etc. The specific time period is considered for the dosages, the first dosage is given at the starting and after a specific amount of time the second dosage is given automatically by the machine at mentioned timing by using RTC.

### 3.3 ARDUINO MEGA328




The microcontroller which we are using in our project is AT mega 328 which has EEPROM memory of about 1KB. This feature helps in checking whether the electricity supply is removed. Then it will store the collected data and will provide output result when electricity is supplied to it.

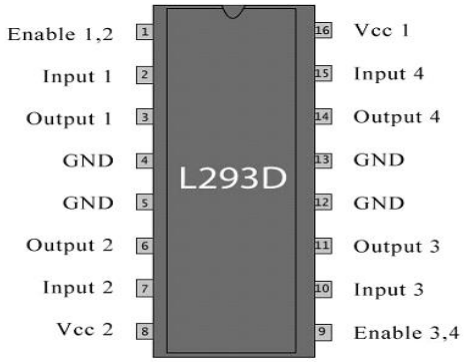
The microcontroller which we are using has a SRAM(static random access memory)of about 2KB. There are a variety of different features that are available in a Atmega 328 for that reason it is extremely popular in the market.

The feature that included are advanced RISC architecture that is reduced instruction set computers, performance is really good , consumption of power is really low, real time clock which is used in this also has oscillator

connected separately, the pins available for pulse width modulation are six in number, serially programmed using Universal asynchronous receiver transmitter , and for the security of a software programming lock is used, throughput is about 20 million instructions per second (MIPS).

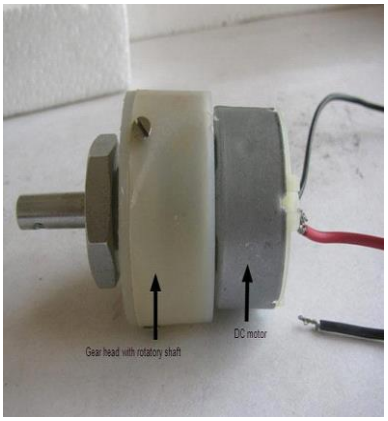
### 3.4 MOTOR DRIVER (L293D)

L293D has Two H Bridges and is an integrated circuit. It is used as it consume less current controlling signal so they behave as current amplifiers and given signal is of higher current. Here the signal used for driving Motors are of higher current value .In the normal operation they can use two Motors per driver and that is in two directions forward and backward.




### 3.5 DC GEAR MOTOR

The seed motor used in this system is the DC gear motor which is the extended version of DC motor. Assembly of gears is attached to a motor, in this DC gear motor the counting is done by the rotations of the shaft in a single minute referred as rotation per minute. The Assembly is very useful when it comes to increasing the rotating effect by reducing the quickness of the device. If we combined gear in proper way then it will be very useful in decreasing the quickness to any value which we admire. The procedure where the device reduces the rate of quickness of a car or any vehicle by raising the torque referred as gear reduction. The whole working procedure of the device can be learnt when we go through all the details of the gear that makes the gear head.




### 3.6 SYRINGE INFUSION PUMP

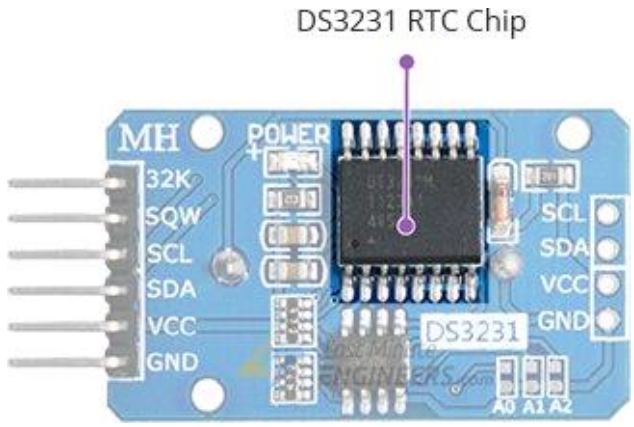
The syringe pump continuously provides a uniform flow of fluids by driving the syringes plunger towards the barrel. It provides accurate and precise flow rate for delivering anesthesia medication in critical medical care center and plastics syringes are of different sizes from 1 ml to 30 ml can be used for inner infusion pump. The flow rates of anesthesia drug can be adjusted from 1 ml to 99 ml/HR. since it accepts other syringe sizes to smallest syringe can be a obtained with lower flow rate. It is easy to setup and use portable and robust. Powered with battery and mains both. It has Rapid override in fusion facility.

### 3.7 SENSORS

A sensor is an electronic device that takes variation in environment as input and response from sensor is taken as output to the other system. The sensor is used for conversion of real world environmental circumstances into digital or analog voltage and is further converted in such a manner that human can read the output for to continue further process. Types of sensors used are heart beat sensor, breathing sensor, bleeding detection sensor, temperature sensor.

### 3.8 REAL TIME CLOCK

The MCU's we use in all our projects are time agnostic, they are unaware of time around them and they just put them. But for some project timing is an important time factor and thus DS3231 is a precision RTC and is mostly used for this purpose. It is used where processes like data logging, clock building, time stamping, alarms and timers included in a project.




DS3231 RTC chip a low cost more accurate RTC chip. It has other features like SQW pin, gives a output square wave of 1KHz,4KHz,8KHz and 32KHz and can be programmable controlled, it also has temperature compensated crystal oscillator, battery backup, onboard 24C32 EEPROM.

### 3.9 4X3 KEYPAD

A 4X3 keypad matrix can be called as block of push buttons that set for meeting all all digits, alphabets and different symbols. But mostly the keypad consists of numbers and they are also used in computers as Number keypad. These are mainly found in the devices that require numbers inputs such as calculator, television and telephones with pushing of a button, ATMs, vending machines, for sale devices, union of locks, also locks for Digital door. The keypad which we are using has 4 rows and 3 columns the switches will be placed in between the rows and columns.

### 3.10 20X4 LCD

The working procedure of LCD depends upon the modulation technique of liquid crystals and there are found in video playing, flat panel and electronic visible display. The number of classes and features that exist in market and we can see it it in our laptop, phone, television and computer. LED and also the gas plasma technologies are replaced by the invention of LCD that has given a new life for electronic industries. It also replaces a technique known as cathode ray tube that is CTR which was used for visible display. The liquid crystal displays has less input power consumption then light emitting diode and Plasma display.

## 4. SCHEMATIC DIAGRAM

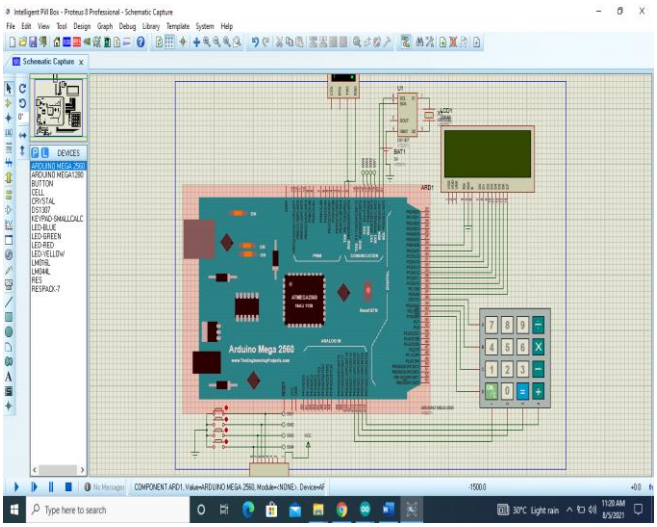



Fig-2: shows schematic diagram of the agribot

## 5. RESULT

In the above figure we used ARDUINO ATMEGA328 microcontroller along with bleeding sensor, temperature sensor, respiratory sensor and heart beat sensor. A keypad is used to manually enter the details like date, time and day other options. LCD to display all the information, DC gear motor is used which will intern moves the syringe to inject the drug properly.

Figure3 Shows the output result in which the amount of dosage that should be injected to a patient. Figure4 shows the output result in which the specific period of time at which the anesthesia need to be injected by considering the vital parameters like heart beat rate, respiratory rate, temperature and bleeding detection.


Fig-3: LCD display

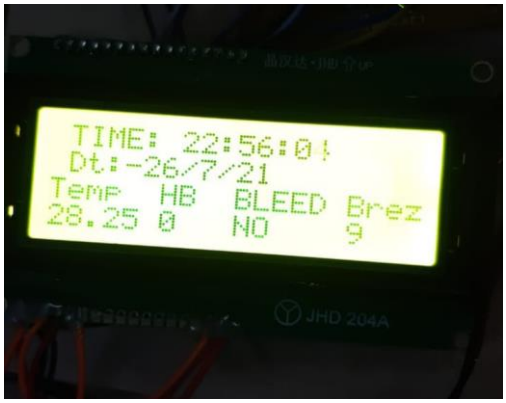



Fig-4: LCD with sensor results

## 6. CONCLUSION

The order no base automatic unaesthetic drug injector machine elaborate elaborated in this paper is extremely safe and suitable in any environmental condition that is reliable and can be easily operated this project has few sensors that observed, the eighth cracks or airways for anaesthetic gas concentration and mental processes of a patient. It also shows the depth of the anaesthesia but not directly. When a parameters per frame of mind changes in a designated time or a specific period of time then the motor will be initiated to give the injection. The LCD will display the values of vital parameters with time and date and day information by which administration and management will become very easy to work. By this the automatically induction process of the system please main role in reducing the risk that appear due to giving the extra dosages bye anaesthesiologist. The user interface is very easy, so it makes the interfacing with user lot easier and it can be used in much number of surgeries this makes very less use of Technology and find functions used here are very simple. After testing and validating continuously the system can perform uniform operations and for this reason it will have huge application in the market

## 7. FUTURE SCOPE

In future drug quantity based on patients age and health will be and be administered by using an Android app and IOT web server by keeping patients database.

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