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MICROCONTROLLER BASED ANESTHESIA MACHINE

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Abstract - *When a major operation is carried out, anesthesia must be given to the patient. Sometimes it happens that estimated duration of the operation may get extended. This extension can be up to 4 to 6 hours, where the anesthetist cannot judge the level of overall anesthesia required. If appropriate level of anesthesia is not given to the patient it may lead to death of the patient and if incomplete level of anesthesia is given to the patient, the patient can wake up in between the operation. To handle such situations an anesthetist is assigned to observe the level of anesthesia. If the anesthetist fails to provide anesthesia to the patient at certain time interval, other consequences may occur. To avoid such unpredictable situations the scheme of automatic anesthesia machine using microcontroller is helpful. The system consists of microcontroller and syringe infusion pump. The level of the anesthesia is decided by the anesthetist based on the result of different sensors. The biomedical parameters will be recorded through different sensors upon which the anesthesia levels will be actuated. Once the level will of anesthesia in the machine is configured by the anesthetist machine will work accordingly.*

***Key Words*: Anesthesia, Anesthetist, Biomedical, Microcontroller, Sensors, Syringe.**

1. INTRODUCTION

Anesthesia is very important in major operations so that painless surgeries can be carried out. When anesthesia is given to the patient, the patient or any body part of that patient becomes unconscious. Anesthesia is given to the patient or any body part of that patient as per the requirement of the surgery. Major operations are carried out to get rid of any internal organ infections or replacement of any body part with an artificial body part. These kinds of operations lead to blood loss and pain and to arrest the pain and blood loss anesthesia is given to the patient. An anesthetist is present during such operations to monitor the level of anesthesia, but sometimes the level of anesthesia may get vary which may cause side effects which can be fatal for the patient. If an operation is extended than its estimated time and the anesthetist fails to administer the level of anesthesia in the fixed time interval, the patient may get disturbed and can wakeup in-between the surgery.

We have used Embedded system technology in our proposed system. An Embedded system is an integrated system that consists of a fusion of computer hardware, software and other required mechanical parts designed to perform a specific function. We can take the example of a Digital Camera. It has a software and processor installed in it but it is barely noticed though using it in our daily life. One more example from our daily life routine is an Automatic Washing Machine. The washing machine has microcontrollers installed in it for controlling all the tasks. Microcontroller based Anesthesia Machine is also an application of embedded technologies in which a microcontroller is installed to control the entire device. A microcontroller is a universal purpose device that is mainly used to gather the data and perform necessary functions by utilizing the acquired data. The main use of a microcontroller is to control the function of a machine using a fixed program. A microcontroller is a highly integrated chip that fulfills the need of a functional unit in a single chip. The microcontroller could also be called all in one solution chip. The basic difference between microprocessors and microcontrollers is that a microprocessor can only operate with the given data whereas the microcontroller can deal with the data as well as can handle an addon external equipment if required. Our proposed system will take the input data from the sensors and the anesthetist will set the level of anesthesia based on the result of the sensors. The parameters acquired through the sensors will be stored and will work accordingly. Our proposed system can act as a substitution for anesthetist which will overcome such a situation.

2. RELATED WORK

Smt. Leela Salim, Abey Thomas, Akshay M, Athul Alias, Muhammed Irshad they have done the related work which is anesthesia injector in which they have provided automatic injection to the patients by which the amount of anesthesia which will be given by the injector will be accurate and precise by which it will it will reduce the mistakes done by anesthetist.

In their system they have using a microcontroller to generate the readings and by that readings the injector will provide anesthesia to the patient. Reading's means the blood pressure, heart rate of the patient by which the injector will get to know that how much amount of the anesthesia will have to give. They have been used the components such as microcontroller, temperature sensor, heart rate sensor, Dc motor, pump etc. In their system they have only done the automatic fusion i.e. only the machine can decide how much anesthesia will have to give to patient after setting the parameters, i.e. the Arduino in which the code has been imported it will decide and it is difficult to change the parameter all the time. These difficulties have been overcome by our system which is microcontroller-based anesthesia machine.

Table -1: Literature Survey

Sr. No.	Paper	Year	Advantage	Disadvantage
1	Microcontroller based anesthesia injector	Smt. Leela Salim, Abey Thomas, Akshay M, Athul Alias, Muhammed Irshad June,2019	Automatic Injection of Anesthesia	No manual supervision
2	Monitoring Multiple Biomedical Parameter to Automate Anesthesia Injection using FPGA	Deepakfranklin.P, Krishnamoorthi.M, 2018	Only monitors the level	Not reliable
3	The role of non-technical skills in anesthesia: a review	G.C.L Fletcher, McGeorge,	Checks the parameters of the human body	Not reliable
4	When are human factors can't intubate oxygenate scenarios	Moneypenny, 2017	Anesthesia levels and how much it require	Require more people

3. METHODOLOGY

The inputs are fed through the sensors which are installed in the system. The sensors acquire the biomedical parameters of the patient and the anesthetist sets the level of anesthesia suitable to the patient's condition. If the surgery is extended and the amount of anesthesia level starts decreasing in the patient a buzzer installed in the system will alert the anesthetist or the staff present there to recalibrate the level but if no response is given from the other side then it automatically decides the level of anesthesia and is injected to the patient.

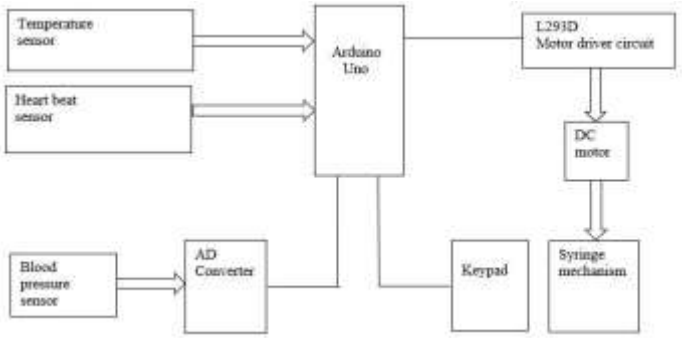


Fig -1: Block Diagram

Microcontroller Arduino Uno is used in the system. It is built on ATmega328P. It consists of 14 digital input/output pins, it also consists of 6 analog pins. It is a RISC based microcontroller. Sensors used in this system are heart rate sensor, temperature sensor and blood pressure sensor. The Heart rate sensor has a sensor and control circuit. After connecting properly to the Arduino UNO, a green colour LED is switched on which indicates it has started his working. The Temperature sensor that we have used is LM35. The LM35 output voltage is linear and proportional to the Centigrade temperature. It does not get self-heated easily since it has low Self-Heating, 0.08°C in still air. The Blood pressure cuff with the help of transducer is used to measure the systolic blood pressure. The mechanism of the syringe pump is controlled by the DC motor. Along with that L293d motor driving circuit is also used to control the direction of the DC motor.

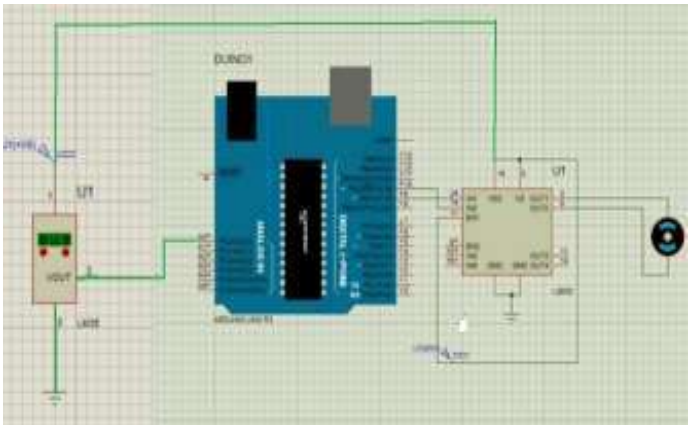
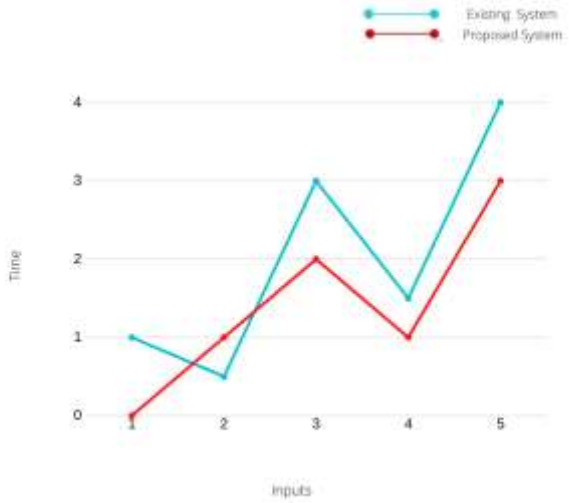


Fig -2: Pictorial Representation



4. PROGRAM FLOWCHART

Steps involved in this are as follows:

Step 1: Gather the data from the sensors and set the level of anesthesia with the help of anesthesia.

Step 2: If anesthetist is not present check the predetermined level of anesthesia for normal parameters.

Step 3: At particular time interval DC motor rotates with the help of driving circuit.

Step 4: Anesthesia is injected and the motor stops.

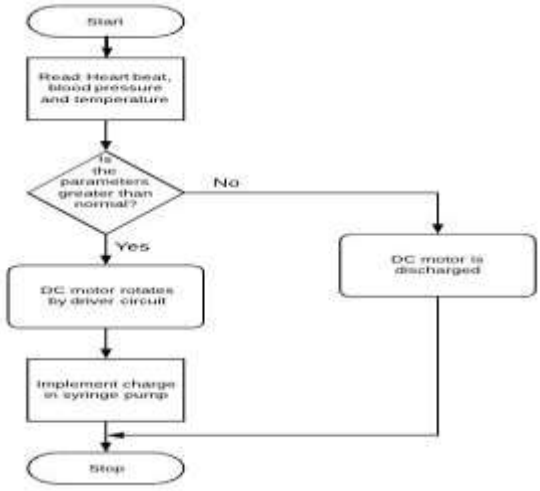


Fig -3: Flowchart

5. RESULTS

We compared results of the existing system with our proposed system by following the respective procedure to get the precise output. We found out that the results were better in case of our existing system by nearly 17% on average.

5. CONCLUSION AND FUTURE SCOPE

Here in this the Microcontroller anesthesia machine will perform the injection where the initial values will be provided by the anesthetist and after that timing is provided to the machine by the different parameters which we are checking of the patient and perform as per it. The Microcontroller based machine is the machine which is sufficient, efficient in the Bio-medical filed which will change the role of medical field. The machine which check the parameters are very vital process because it will determine overall condition of the patient and through that only the machine will process further process or we can give the control the machine manually by which the chances of the mistakes are very minimal and it is very effective.

In future we can develop an application on this microcontroller which can be accessed from long distance so that it will help for the doctors to examine the parameters of the patient from long distance or if they are not available at the moment.

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