Anesthesia Regulation using Different Sensors

Prof. S.M.Turkane[1] , Waditake Dipali B.[2] , Gite Punam E.[3] , Shinde Akshay N.[4]

[1]*Prof. S.M.Turkane, Department of Electronics and Telecommunication, Pravara Rural Engineering College Loni, Maharashtra, India.*

[2]*Waditake Dipali B, Department of Electronics and Telecommunication, Pravara Rural Engineering College Loni, Maharashtra, India.*

[3]*Gite Punam E, Department of Electronics and Telecommunication, Pravara Rural Engineering College Loni, Maharashtra, India.*

[4]*Shinde Akshay N, Department of Electronics and Telecommunication, Pravara Rural Engineering College Loni, Maharashtra, India.*

ABSTRACT

Anaesthesia traditionally meant the condition of having sensation blocked or temporarily taken away. It is pharmacologically induced and is a reversible state of loss of responsiveness loss of skeletal muscle reflexes or decreased stress response or all alone provides simultaneously. This allows patients to undergo surgery and other procedures without the distress and pain, they would otherwise experience.

Anaesthesia has to be given to a patient considering the various parameters such as heart rate, respiratory rate, temperature etc. The dosage given manually by doctors at times may vary from its standard value and result in ill effects on the patient. In order to achieve efficient injection of anaesthesia Automatic anaesthesia controller using heart beat sensor plays an important role which takes into account the heart rate of the patient and injects anaesthesia accordingly reducing the work of the doctors.

Anaesthesia is used to produce a state of unconsciousness in patients. The conventional method of Anaesthesia infusion requires experienced person to predict exact dose of Anaesthesia, which create lots of pressure on anaesthesiologist. This need emerged with an urge to develop an automated system that can assist to take decision for calculating dose of Anaesthesia.

Key words: Patient, Anaesthesia Drug, Syringe pump, AVRprocessor, Stepper motor, LCD Display.

1. INTRODUCTION

The word 'anesthesia' means 'loss of sensation'. Anesthesia prevents the feeling of pain and other sensations during an operation. Anesthetic is the term applied to the drugs used to produce anesthesia. There are number of anesthetic agents available these days.

Anesthetics are mainly categorized into two types:-

• Intravenous Anesthetics – injected into patient's body through needle

• Inhalation Anesthetics – patient is breathed the anesthetic.

Anesthesia infusion is a closed loop system, in which anaesthesiologist follow the process of anticipating and applying the predicted dose. To figure out appropriate dose one need to continuously monitor different physiological

parameters. This is a very laborious job. Many researchers are tried to advise solution to this problem. Major operations are performed to remove or reconstruct the infected parts in the human body. These operations will lead to blood loss and pain.In Bio-medical field anesthesia plays an important role in the part of painkilling.Anesthesia is very essential in performing painless surgery and so an Automatic administration of Anesthesia is needed for an effective surgery. In this design, an AVR processor is used for controlling the anesthesia machine automatically, depending upon the numerous biomedical parameters such as body temperature, heart rate, respiration rate, Sweat of patient body etc.

Mostly all the operations involve cutting and also coagulation when treating the infected organ.This will surely lead to loss of blood and pain. Therefore the blood loss or pain has to be completely to avast are reduced. For measuring the parameter embedded systems are used.

In this system, the AVR processor plays an important role so that it has control the whole syst while releasedthe anaesthesia automatically. During the operation biological parameter are measured is heart rate, respiration rate and temperature rate and sweat of patient. Here the temperature and respiration rate are digitally displayed through LCD display. In heart rate measurement the using pulse rate sensor is shown through display.

2. Block Diagram:-

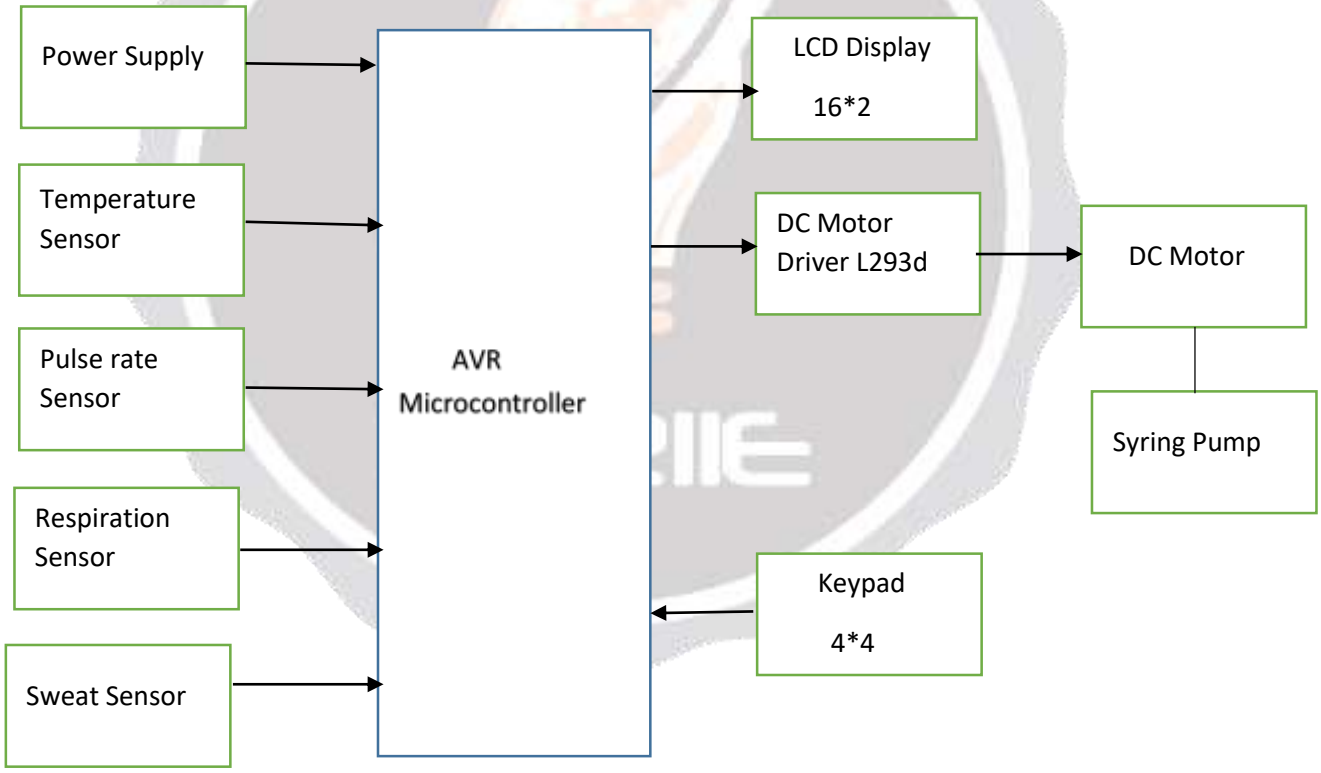


Fig. Block diagram of Anesthesia regulation using heart beat sensor

2.1 WORKING:-

The keypad is connected with the AVR processor in which the amount of anaesthesia to be delivered is entered. The anaesthesia to be administered in the range of milliliter's per hour. AVR will control the system to deliver the administered level when it receives the rage of drug. Based on the direction of rotation of dc motor the biological parameters are measured. The dc motor rotation will make the syringe pump to move forward and backward to

deliver the exact amount of anaesthesia to the patient. If the anaesthesia level in the machine is lower than the set value an alarm will be switched on to alert the nearby person to refill the cartridge to continue the process. With the help of this system the opposite blood flow can also be detected.

Temperature sensor used to measure the temperature of the patient.

Respiration sensors are used to measure the respiration rate of patient body.

Heart beat sensor used to measure the heartbeat of patient.

Microprocessor used to control the overall process of given system.

For movement of the syringe pump DC motor are used.

Amplifiers are used to amplify the signal because the amplitude of those signals will be always low.

LCD 16*2 display is used as a digital display for showing the values of respiration rate, temperature rate and heartbeat rate.

3. PARAMETERS

3.1 Temperature Sensor(LM35)

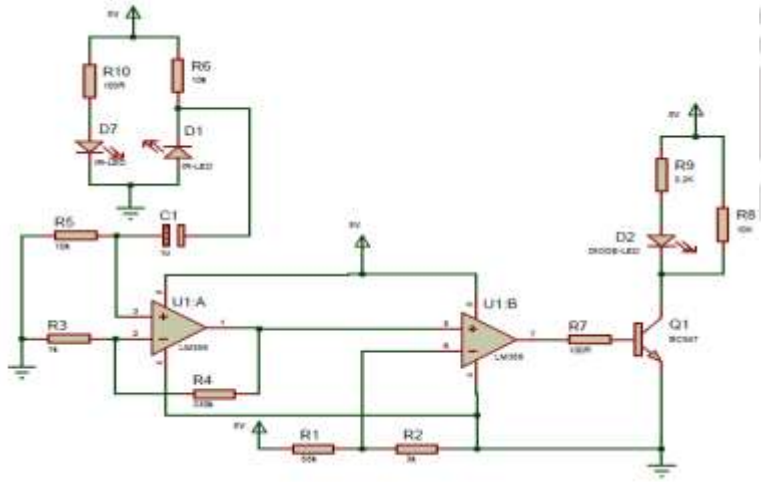
By using LM35 the temperature can be measured accurately. The lm 35 is a semiconductor device whose resistance is sensitive to temperature. LM35 has high temperature coefficient. The temperature value increases with decrease in resistance. The temperature co-efficient of it is ideally negative. The resultant output is sent to the amplifier for theamplification of signals. Because of its constancy, the resistance characteristics do not drift with repeated heating or cooling and high resistivity to permit the construction of small sensors.

3.2 Heart Beat Sensor

The heartbeat sensor gives the output in the form of pulses. For the purpose of calculating the pulses, a counter is set and the number of pulses is counted for a period of 15 seconds. The count value is then multiplied by 4 to get the heart beat per minute(BPM).

3.3 PULSE RATE SENSOR

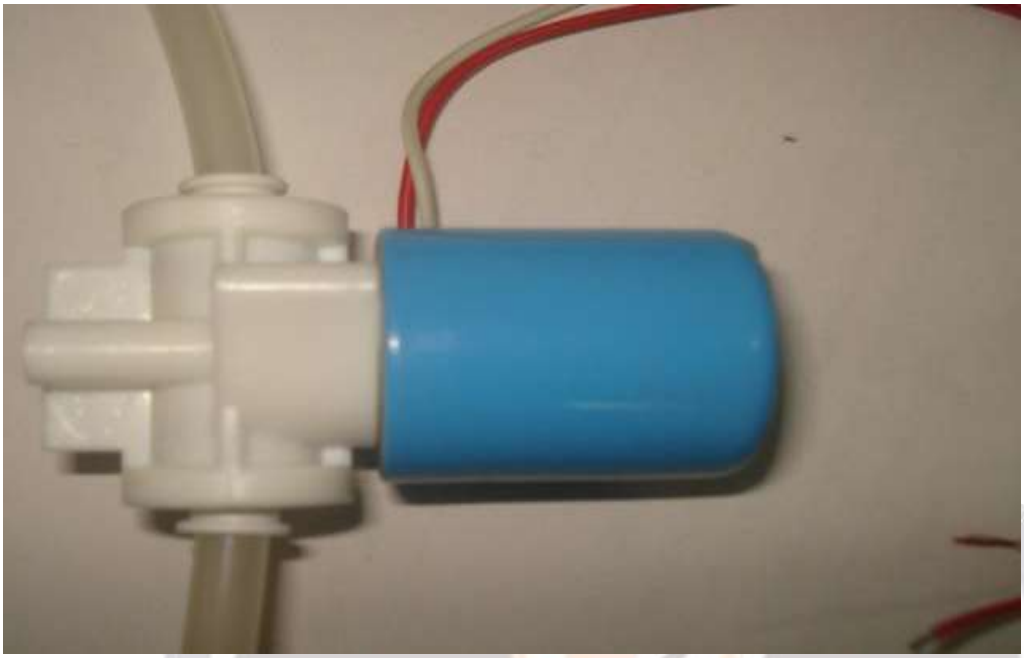
The pulse signal mentions to the flow of blood that passes from heart to the limbs. The pulse was slow on the wrist of the patient. Pulse rate is dissimilar from the heart rate. This pulse occurs once per heartbeat. These signals can be picked up by putting a pizzo-electric pick up on the wrist.



3.4 RESPIRATION SENSOR

The primary roles of the respiratory system are to supply oxygen to the tissues and eliminate carbon dioxide from the tissues. The action of breathing is organized by muscular action causing the volume of the lung to increase and

decrease to disturb a precise and sensitive control of the tension of carbon dioxide in the blood. Under normal situation, this is rhythmic action.



4. HARDWARE DESCRIPTION

4.1. *Processor*

The microprocessor is used to control the complete unit. This has more memory and IO devices that are linked to the data bus and pins in the integrated circuits. The microprocessor uses the single and double byte instruction that are used to transfer the data from the memory device to the ALU. The pins in the microprocessor are programmable so that each and every pin has several functions.

4.2 Stepper Motor

A stepper motor is used to translate the electrical pulse into equal incriminatory steps. The stepper motor work in connection with the electronic switching devices. The switching device is used to maintainof the windings of the stepper motor with particular frequencies. It has a stator and the non-exited rotor. Stepper motor is classified into 2-phase, 3-phase or 4-phase depending on the stator windings.

4.3 Syringe Pump

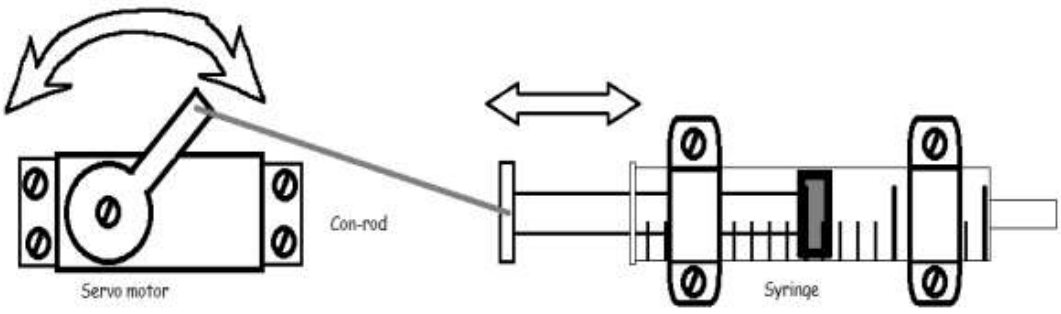


Fig. Syringe Mechanism

Syringe pump is used to deliver the correct amount of medication in a regular period of time. During critical care the syringe pump is used to deliver the anaesthesia to the patient continuously by moving the plunger towards the medication. An IR sensor is attached to the syringe pump for alarm. The pump will automatically give an alarm when there is any bubbles in the medication or if there is no medication. Smaller amounts can also be delivered using small syringes.

5. SOFTWARE REQUIREMENTS:

- Embedded C
- MPLAB
- Proteus

5.1 Embedded C

Embedded C is a high level language, which includes many features of the ANSI (American National Standard Institute) C programming language. Additions for the programming language C to support embedded processors, supporting portable and efficient application programming for embedded systems. Embedded C is a set of language extensions for the C Programming language by the C Standards group to address commonality issues that exist between C additions for different embedded systems. An embedded C programming requires non-standard extensions to the Clanguage in order to support unusual features such as fixed point arithmetic, multiple distinct memory banks, and basic I/O operations.

6. BENEFITS AND FUTURE SCOPE

The anticipated potential benefits of the system wereachieved. The proposed system can be used as an effective device to estimate the dose of anesthesia. The system is designed to provide following benefits:

- Emancipate the burden on anesthesiologist.
- Improve patient's safety and console.
- Expedite smooth anesthesia infusion.
- Reduce the cost of an operation.
- Make superlative use of anesthetic agent.

This system has been proved to be beneficial but there is still scope of following improvements in order to make the system more effective.

- Reduce response time delay of system.
- Boost precision of the system.
- More input parameters can be taken into account.
- More safety measures can be incorporated for thepatient's well-being.
- Improve accuracy and expertise of result underextreme or exceptional conditions.
- More effective method can be developed for patient'sphysiological data collection.

- To show full clinical worthiness the system still needto be tested in real-time environment

7. Conclusion :-

The processor *used here will read the* signal from the sensor and offer the required anaesthesia to the patients. This design is fully automatic and very much supportive for the doctors who are treating the patients. It is the cheap and best approach handled by the doctors. Nowadays, Modern technologies have developed automation in every spears of biomedical instrumentation .This project is also based on automation and this will be very much useful to physician to see the current position of anesthesia of patient so that the proper anesthesia will be injected to patient. Protection is intelligent than prevention and our project on an automatic anesthesia injector in one of the efficient protecting system.

8. REFERENCES

[1] A. Lowe, "Evidential Inference for Fault Diagnosis", in Engineering Auckland: University of Auckland, p. 217, 1998.

[2]Hanumant R. Vani *1, Pratik V.Makh*2, Mohanish K. Chandurkar*3.

[3] V. Esmaeilia, A. Assarehb, Shamsollahia, M. H. Moradib, and N. M. Arefianc, "Estimating the depth of anesthesia using fuzzy soft computation applied to EEG features", Intelligent Data Analysis, pp. 393-407, 2008.

[4] M. L. Kumar , R. Harikumar, A. K. Vasan, “Fuzzy Controller for Automatic Drug Infusion in Cardiac Patients”, In Proc. of the International MultiConference of Engineers and Computer Scientists , Hong Kong, Vol I, pp. 76-80, March 18 - 20, 2009.

[5] D. S. Diwase, R. W. Jasutkar, “Expert Controller for Regulating Dose of Isoflurane”, IJAEST, Vol 9, Issue No.2, pp. 218-221.

[6] S. N. Sivanandam, S. Sumathi and S. N. Deepa, “Introduction to Fuzzy Logic using MPLAB", Springer, pp. 200-204, 2007.

[7] L. A. Zadeh, "The birth and evolution of fuzzy logic” International Journal of General Systems, vol. 17, pp. 95-105, 1990.

[8] D. S. Diwase, Prof. R. W. Jasutkar, “Automatic System for Calculating Dose of Thiopentone Based on Static Physiological Parameters.”, International Journal of Advanced Research in Computer Science ,Vol. 3, No. 2, pp. 217-230, Mar-Apr 2012

[9] http://io9.com/5899228/anesthesia-unlocks-a-more-primitive-level-of consciousness.

[10] http://www.anesthesiaznalgesia.org/content/108/5/1

560 long.