

# Low Cost Anesthesia Injector Based on Arduino with Multi Parameters

Mr. P. Ganesh<sup>1</sup> Babu M. Bhavadharani<sup>2</sup> V. Sherin Marshiyana<sup>3</sup> V. Vijayalakshmi<sup>4</sup>

<sup>1</sup>Assistant Professor <sup>2,3,4</sup>Student

<sup>1,2,3,4</sup>Department of Biomedical Engineering

<sup>1,2,3,4</sup>Adhiyamaan College of Engineering, Hosur – 635130

**Abstract**— In general practice, hospitals perform several operations which are considered as therapeutic condition for the patients. For such cases, anesthesia is a significant drug that would be infused to the patient which makes them in anaesthetized condition. If the surgery lasts for prolonged period of time, it becomes unfeasible to deliver the drug at a single stroke. Critical condition occurs, if there is excess of drug given to the patients, also when fewer amount of drug is delivered, the patient will become conscious at the middle of the surgery. Even if anesthetist fails to administer the drug to the patient, the procedure becomes tedious. In order to overcome these problems, the automatic anesthesia injector is implemented using microcontroller by receiving the signal from the keypad that customizes the working of stepper motor. After which it directs the drug to the infusion pump at one ml to the patient. If any uncertain condition occurs, the alarm will ON.

**Key words:** Micro-Controller, Syringe infusion pump, Stepper motor, Anesthesia

## I. INTRODUCTION

These days, embedded systems are widely used in the field of manufacturing sector and also in medical field for controlling both the systemic and biomedical parameters. In this design, a microcontroller is used for controlling the anesthesia machine automatically, depending upon the various biological parameters such as respiration rate, blood pressure, heart beat rate and body weight[1]. Major operations are performed to remove or reconstruct the infected parts in the human body. In certain cases, the pain can be arrested by impinging the anesthesia to the patient.

The anesthesia assistant device for the development of the automation in drug delivery system. In the final stage, they designed control system so called Rostocker assistant system for anesthesia control (RAN) should be the fitted out with the possibility to control four different drugs automatically. Currently the multiple- input, multiple output (MIMO) control of the depth of hypnosis and neuro muscular blockade is realized as well as the closed-loop control of deep hypo tension. A pilot study for the closed loop control of analgesia is currently running. In this paper, the designed (MIMO) system is used for controlling the depth of hypnosis and the neuromuscular blockade.

The system for the automated drug administration by closed loop system to optimize drug administration during anesthesia and sedation. Closed loop system are able to make the decision on their own and try to reach and maintain pre-set target. Closed loop control can be defined as the management of single or multiple output variables of the system following a specific target value, where by a controller adopts the system input to reach and maintain a desired effect on the output. The goal of a closed loop control is to calculate solution for an accurate corrective

action from the controller that result in system stability, the system will hold the set point and not oscillate around it.

## II. PROPOSED IDEOLOGY

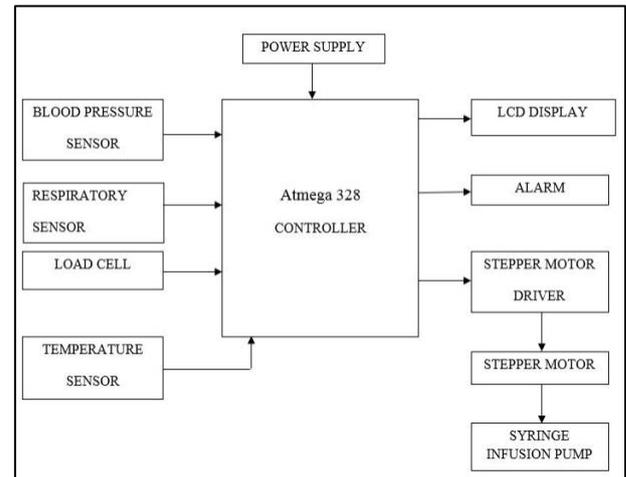


Fig. 1: Block Diagram of Low cost Anesthesia Injector based on Arduino with Multi Parameters

The input signals which are sensed by the sensors such as blood pressure sensor, respiratory sensor, load cell and temperature sensor are given as input to the micro controller.

With the help of Micro-controller the anesthesia level can be setup by the anesthetist that could be administered to the patient in terms of milliliters per hour (1ml to 1000ml). After receiving the anesthesia level and also based on the input biological parameters microcontroller sets the system to administer anesthesia to the prescribed level.

Depending on the instructions given by the micro controller permits the stepper motor to rotate with their respective rotations that causes the Infusion Pump to move in forward and the anesthesia provided in the syringe is injected into the body of the patient. If the level of anesthesia either increased or decreased to the set value, the alarm gets activated to alert the anesthetist to make the following changes in the system.

## III. HARDWARE REQUIREMENTS

### A. Temperature Sensor

Temperature sensor is a sensor, which is used to measure the body temperature.

### B. Respiratory Sensor

Respiratory sensor is a sensor, which is used to measure the respiration rate of the body.

### C. Blood Pressure Sensor

Blood pressure sensor is a sensor, which is used to measure the blood pressure of a patient.

#### D. Load Cell

Load cell is used to measure the body weight of a patient.

#### E. Micro-Controller

Micro-controller is used to control the work function of the system.

#### F. LCD Display

It displays the output characteristics of the parameters.

#### G. Stepper Motor

It drives the syringe pump based on their step angle.

#### H. Syringe Infusion Pump

Syringe infusion pump provides uniform flow of fluid by precisely driving the plunger of a syringe towards its barrel. It provide accurate and continuous flow rate for precisely delivering anesthesia medication in critical medical care. It has an alarm system activated by infra-red sensor and limits switches. The pump will stop automatically with an alarm when the syringe is empty or if any air bubble enters the fluid line. Glasses and plastic syringes of all sizes from 1ml to 30ml can be used in the infusion pump. The flow rate can be adjusted from 1ml to 99ml/hr. Since it accepts other syringe size also, much lower flow rate can be obtained by using smaller syringes.



Fig. 2: Overview of Kit

#### IV. CONCLUSION

From the experimental results, it shows that the respiration rate, blood pressure, body weight and pulse rate is taken as a significant parameter for delivering drugs to the patient. This drug delivery gets activated, when the patient is in normal condition and gets reduced based on the critical condition of the patient. As this project explains, that the automatic anesthesia injector is a low cost machine and it is efficient to be used in operation theatres.

#### REFERENCES

- [1] <http://www.slideshare.net/imran80/anaesthesia-machine>
- [2] <http://ieeexplore.ieee.org/document/6608721/?section=abstract>
- [3] <http://www.sciencedirect.com/science/journal>.