

LOW COST ANESTHESIA INJECTORBASED ON ATMEGA 32”

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Abstract:

In the hospital when any major operation is performed the patient must be in anesthetize condition. If the operation lasts for a long time, say for suppose for 4 or 5 hours, complete dose of anesthesia cannot be administered in a single stroke. It may lead to the patient's death. If lower amount of anesthesia is administered, the patient may wakeup at the middle of the operation. To avoid this, the anesthetist administers for milliliters of anesthesia per hour to the patient. If the anesthetist fails to administer the anesthesia to the patient at the particular time interval, other allied problems may arise. To overcome such hazardous problems the design of an automatic operation of an anesthesia machine based on a micro-controller is effective. In general, Anesthesia provides depression on Central Nervous System o patient to lose his consciousness and ease to further treatment. Local anesthetic affects sensation at the applied region and aids to surgical operation performed. To maintain the anesthesia levels considering the patient's health anaesthesiologist works as multi task feedback controller to regulate drugs titration. In Automatic Anesthesia Controller, anesthesia levels are controlled as well as feedback is regulated by microcontroller considering the physiological parameters of patient specially including heart beat.

Keywords: Anesthesia, Drug titration, Microcontroller, Syringe Pump, Stepper Motor etc.

1. INTRODUCTION

Major operations are performed to remove or reconstruct the infected parts in the human body. These operations will lead to blood loss and pain. Therefore it is necessary to arrest the pain and the blood loss. Anesthesia plays an important role in the part of painkilling. AAI can be defined as “Automatic administration of anesthesia based on the bio- medical parameters of the patient, eliminating future side effects and the need for an anesthetist.” Anesthesia is very essential in performing painless surgery and so an Automatic administration of Anesthesia is needed for a successful surgery. At present anesthetist controlled manual operation is employed, which may cause many difficulties such as, Level of anesthesia may get varied and there is a chance of getting side effects in future. If suppose the anesthetist fails to administer the level of anesthesia during the predetermined period, the patient may be disturbed during the operation. Other systems developed to administer anesthesia operates by sensing the consciousness level of the patient and not by measuring his overall body conditions.Embedded systems are used in many applications in medical field for controlling various biomedical parameters and monitoring biomedical signals. In this design, a micro- controller is used for controlling the anesthesia machine automatically,

depending upon the various biomedical parameters such as body temperature, heart rate, respiration rate, etc. Major operations are performed to remove or reconstruct the infected parts in the human body. These operations lead to blood loss and pain. Therefore it is necessary to arrest the pain and the blood loss. Anesthesia plays important role in the part of painkilling. Hence, anesthesia is very essential in performing painless surgery.

2. RELATED WORK

In hospitals when any surgery is performed, the patient must be in anesthetized condition. The anesthetist administers regulated amount of anesthesia to the patient. If the injections are given too closely together or a dose of anesthetic is injected too quickly, a patient may suffer from an overdose. On the other hand, if the dosage is too less, then the patient might wake up during the surgery which results in pain and shock leading to complications. The dosage and time of which depends on the vital parameters of the patient such as heart rate, body temperature etc. Usually, anesthesia is administered manually which may leads to anesthesia complications due to overdose or under dose. To reduce the risk of anesthesia complications, a system which automatically administers has been proposed in this paper. Anesthesia provides depression on Central Nervous System of patient to loss his consciousness and ease to further treatment. Local anesthetic affects sensation at the applied region and aids to surgical operation performed. To maintain the anesthesia levels considering the patient's health anaesthesiologist works as multitask feedback controller to regulate drugs titration. In Automatic Anesthesia Controller, anesthesia levels are controlled as well as feedback is regulated by microcontroller considering the physiological parameters of patient specially including heart beat Anesthesia Regularization using Heart Beat Sensor. Now days, embedded systems are used in many applications in medical field for controlling various biomedical parameters. In this design, a micro-controller is used for controlling the anesthesia machine automatically, depending upon the various biomedical parameters such as body temperature, heart rate, respiration rate etc. Major operations are performed to remove or reconstruct the infected parts in the human body. These operations lead to blood loss and pain. Therefore it is necessary to arrest the pain and the blood loss. Anesthesia plays important role in the part of painkilling. Hence, anesthesia is very essential in performing painless surgery.

3. PROPOSED SYSTEM

Major surgeries are performed to remove or reconstruct the infected parts in the human body. These surgeries will lead to blood loss and pain. Therefore it is necessary to arrest the pain and the blood loss. Anaesthesia plays an important role in the part of painkilling. So when a surgery is performed the patient must be in anesthetizing condition. If the surgery lasts for a long time, say for suppose for 4 or 5 hours, complete dose of Anaesthesia cannot be administered in a single stroke. It may lead to the patient's death. If lower amount of Anaesthesia is administered, the patient may wakeup at the middle of the surgery. To overcome such hazardous problems the design of an automatic surgery of an Anaesthesia machine based on a micro- controller is effective. Automatic Anaesthesia Injection can be defined as "Automatic administration of Anaesthesia based on the bio-medical parameters of the patient, eliminating future side effects and the need for an anesthetist". Anaesthesia is very essential in performing painless surgery and so an Automatic administration of Anaesthesia is needed for a successful surgery. The regional or local Anaesthesia do not lead to the loss of consciousness, they only cause the elimination of pain. However, it

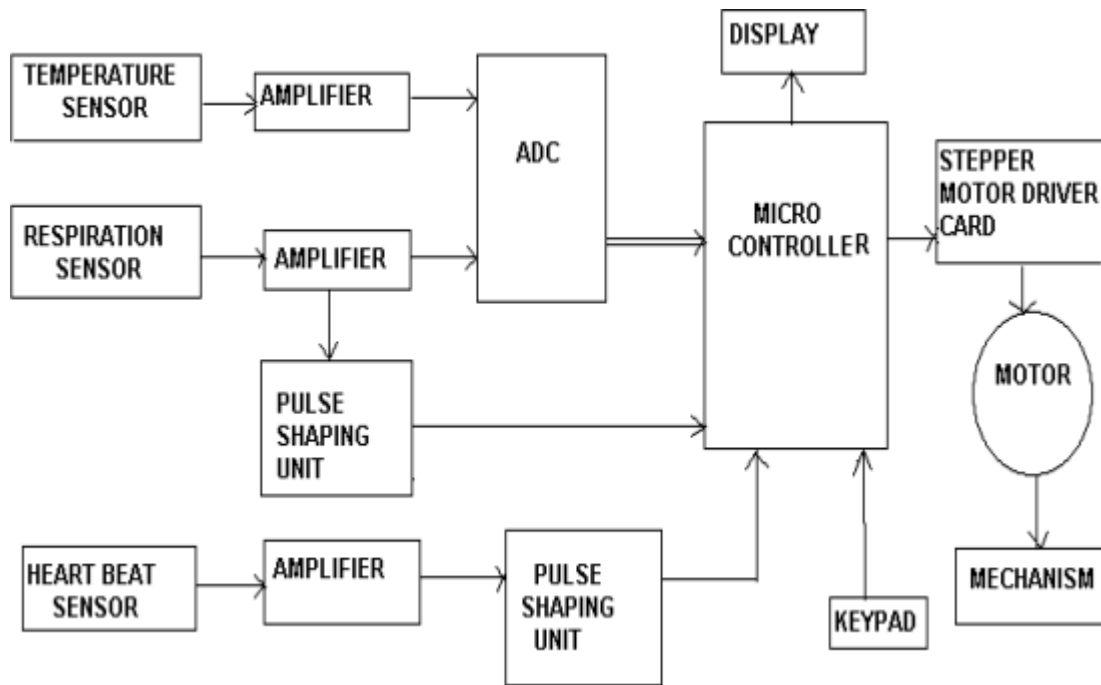


Fig.1.Block Diagram

is possible to complement those methods with sedation, using small amounts of anesthetic or similar drugs to make the patient feel sleepy and relaxed during a procedure. Sedation can also be used as the only method during procedures that do not require Anaesthesia, but may be unpleasant or uncomfortable.

4. ANALYSIS

The block diagram of Automatic Anesthesia Injector was shown above in Figure 1. By using the keypad provided along with the Microcontroller, the anesthetist can set the level of Anaesthesia to be administered to the patient in terms of milliliters per hour (1ml to 1000ml). After receiving the Anaesthesia level from the keypad, the Microcontroller sets the system to administer Anaesthesia to the prescribed level. It then analyses various bio-medical parameters obtained from the sensors to determine the direction of rotation of the stepper motor. The rotation of the stepper motor causes the Infusion Pump to move in forward or in a backward direction and the Anaesthesia provided in the syringe is injected into the body of the patient. If the level of Anaesthesia is decreased to lower level than the set value, the alarm gets activated to alert the anesthetist to refill the Anaesthesia in the syringe pump to continue the process. In this design, the total timing and opposite flow of blood will also be detected by using the Micro Controller. The measurement of bio-medical parameters is a vital process. These parameters determine the overall condition of the patient. It plays a very significant process in the level of Anaesthesia that has to be administered to the patient. Only based on these parameters the movement of the stepper motor is determined. Transducers and Thermistors are the key links in all sensors designed to describe and analyze the bio-medical parameters. The transducers

used here are just those that find applications in patient monitoring systems and experimental work on three parameters namely temperature, heart beat and respiratory activity. Both transducers and thermistors are made in a wide variety of forms suitable for use in medical applications. They are available as wafers for applying on the skin surfaces tiny beads for inserting into the tissues.

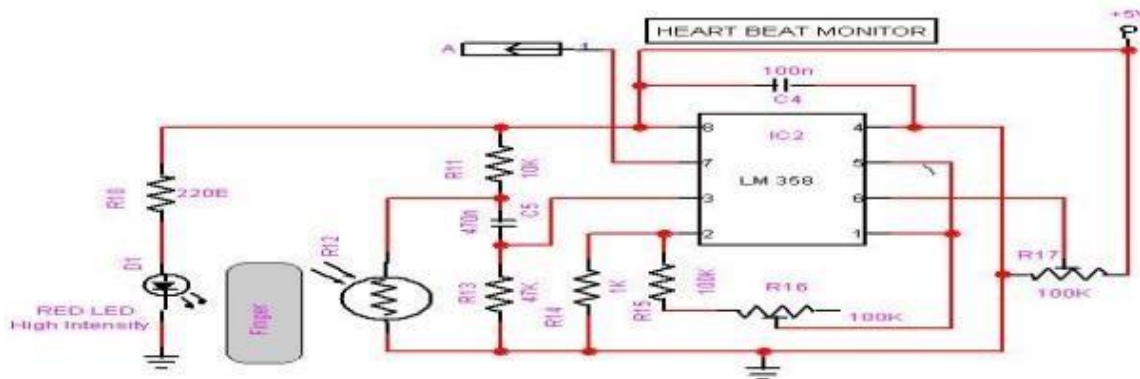


Fig.2.Filter system

The primary functions of the respiratory system are to supply oxygen to the tissues and remove carbon dioxide from the tissues. The action of breathing is controlled by muscular action causing the volume of the lung to increase and decrease to affect a precise and sensitive control of the tension of carbon dioxide in the arterial blood. Under normal circumstances, this is rhythmic action. Respiratory activity can be detected by measuring changes in the impedance across the thorax. Several types of transducers have been developed for the measurement of respiration rate. A Strain Gauge type Chest Transducer is a suitable transducer to measure the respiratory activity. The respiratory cycle is accompanied by variations in the thoracic volume. Such variations can be detected by means of a displacement transducer incorporating a strain gauge or a variable resistance element. The transducer is held by an elastic band around the chest. The respiratory movements result in resistance variations of the strain gauge element connected in one arm of a Wheatstone bridge circuit. Bridge circuit output varies with chest expansion and yields signals corresponding to respiratory activity.

CONCLUSION

Nowadays, Modern Technologies have developed automation in every spears of biomedical instrumentation this paper is also based on the automation and this will be very much useful to physician to see the current position of Anaesthesia of patient so that the proper Anaesthesia will be injected to patient. Prevention is better than cure. But „Protection is intelligent than prevention“ and our paper on automatic Anaesthesia injector is one of the efficient protecting system.

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