INFUSION OF ANESTHESIA WITH FEEDBACK

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Abstract: The Monitoring of anesthesia for surgical procedures is a difficult and challenging skill that requires both knowledge and practice. The anesthetists are very busy, watching and evaluating their patients, the progress of the operation, the surgeon, and all the other members of the Operating Room team. The Respiratory rate of the patient is the main parameter that is to be assessed every 5 minutes throughout the anesthetic period. The ultimate parameter to be maintained during entire operation is respiration rate of 12-17 per minute. If respiration rate is above 17 per minute, the patient may feel pain resulting in hyper-tension. If respiration rate is a below 12 per minute, the patient is vulnerable to go to coma stage. In our project, we would like to sense the respiration temperature to calculate the respiration rate instead of regular chest expansion measurement principle. Respiration temperature measurement can be possible by using RTD PT100 temperature sensor, which is placed in a mask. Based on the breathing rate, infusion will be carried out by mechanical system specifically developed for this application. Before starting the surgery predefined amount of anesthesia flow will be set and constantly infused by our system. Once if the respiration rate goes down, anesthesia flow will be reduced to maintain respiration rate. If respiration rate goes up, the flow of anesthesia will be increased to maintain the constant breath rate.

***Index terms*- Respiration Rate, Anesthesia, RTD PT100 Temperature Sensor.**

I. INTRODUCTION

Anesthesia

Anesthesia refers to the practice of administering medications either by injection or by breathing in that block the feeling of pain and other sensations, or that produce a deep state of paralyzed that eliminates all sensations, which allows medical and surgical procedures to be undertaken without causing anxious. Anesthesia affect the nervous system by giving injection or inhaled gases or vapors.

Anesthiologist is a doctor who gives and manages anesthesia to patient. Anesthetics are the medications that frozen a area of a body that make you fall asleep. In addition to administrating anesthesia medications before the surgery, the anesthesiologist will:

- Monitor your major body functions during surgery
- Update any problem that arise during surgery.
- Manage any pain that occur after the surgery.
- Keep you as relaxed as possible before, during and after surgery.

A specially trained nurse anesthetist, who works with the anesthesiologist and surgeon, may assist in giving the patient anesthesia although the anesthesiologist will be the one to manage and make all major anesthesia-related decisions during the operation.

Types of Anesthesia

- **GENERAL ANESTHESIA**

General anesthesia cause conscious to both brain and nervous system. It involve two process

1.Injection of anesthesia to patient.
2.Maintain inhaled gas to the patient.

Initially injection is given to patient then inhaled gases are given to patient so that anesthesia maintained in patients body.

- **LOCAL ANESTHESIA**

Local anesthesia name itself indicate that it stop the sensation of particular organ which is going get operated. Patient remains waken after giving local anesthesia during operation.

LIMITATION OF LOCAL ANESTHESIA:

1. Minor surgery-via injection
2. Major surgery-cant be done so the physician move to regional anaesthesia.

- **REGIONAL ANESTHESIA**

  Regional anaesthesia is same as local anaesthesia. Only difference local anaesthesia is given to the part of the body but regional anaesthesia is given to the spinal cord or major nervous system of our body. It helps to blocks larger pain. And helps to relax or sleep during operation. Limitation of this type of anaesthesia blocks pain to the limited part of the body.

CLASSIFICATION OF REGIONAL ANESTHESIA:

- Spinal
- Epidural and caudal anaesthesia
- Nerve blocks

SPINAL

This type of anesthetic used in lower abdominal, pelvic
Rectal or lower extreme surgery. In this type anesthesia directly injected into the spinal cord of lower back of the body which cause no sensation in the lower body.

EPIDURAL AND CAUDAL ANESTHESIA

This type of anesthesia is similar to the spinal region anesthesia. Now a days it is commonly used in surgery for
Lower limb .Only difference is impregnating drugs continuously spinal chord in the lower back through a catheter which is thin causing no sensation in the lower part of the patient‘s body.

NERVE BLOCKS

Local anesthetic injected to the hands ,arms, feet, legs or face to block pain in the particular nerve in patient’s body.

Classification of anesthetic drug sedation

The surgery procedure in which people will undergo anesthesia could vary from simple surgery to major surgery requires shorts ,simple, rapid and complex decisions to keep people safe. Based on the period of operation, the anesthetic sedation is subdivided into the following:

- **Minimal Sedation**

During a drug infusion state the patient will react normally to the direction which is given by the surgeon . Cognitive function and coordination are not affected during minimal sedation.. Ventilator and cardiovascular functions remain unaffected.

- **Moderate Sedation/ Analgesia**

Moderate sedation is partly similar to minimal sedation in which the patients are respond to verbal commands but painful stimulus reflects is not considered as a response in which purposeful the patient must be kept undisturbed.
Continuous ventilation is adequate. Limitation of this type to maintain the Cardiovascular function.

- **Deep Sedation/ Analgesia**

Patients cannot be aroused easily during this type of sedation but they will respond for repeated or painful stimulation. Painful stimulus reflex is unconsidered a purposeful response. It may require to maintain ventilator function. In this type sedation patient requires assistances. Ventilation may not be adequate. Cardiovascular function will be maintained properly.

- **General Anaesthesia**

During infusion of drug patient will loss their conscious even to painful stimulation. Ventilator Functions are maintained independently. patient often require guidelines to maintain their respiration rate. Positive pressure ventilation may be determined because of depressed ventilation or drug induced depression. By which the Cardio vascular function may be damaged.

- **The Continuum of Sedation**

In this type of sedation it is not feasible to predict how the patient will respond to it. Practitioners intending is to give the level of sedation to patient which is able to regain the patient from that particular sedation which is deeply intended.

Individuals who is administrating moderate Sedation which helps to recover the patient who go in to the state of general anesthesia.

- **Monitored Anaesthesia Care (MAC)**

The special type of anesthesia care and service to the patients by an anesthesiologist while undergoing diagnostic or therapeutic procedure.

An Anesthetist stay with the patients from beginning till their recovery of their medical condition. The patient's body condition is continuously monitored to assure that they have a smooth and comfortable recovery.

A Pain relief and suffering is the major part of the anesthesia. However ,an .increase in the difficulty of the operation, in this situation modem anesthesia is considered to be safe in high standard of training which provides safety and quality in it.
In addition too, it has been proved that there are the improvements in drugs and equipment which are used in infusing the drugs into the patients.

II. OBJECTIVE

To monitor and analyze the patient ,calculate the respiration rate by using RTD PT 100 temperature sensor according the respiration rate of the patient the anaesthesia drug has been infused.

III. SCOPE

- The respiratory rate is measured for every 5 minutes with accuracy.
- The drug delivery system is based on the Time Domain Analysis.

IV. PROPOSED SYSTEM

In Proposed method we implement a infusion mechanical model where we infuse the anaesthesia into the patient. Here, we use the RTD PT 100 Temperature sensor to calculate the respiration rate from the patients it is measured in every 5 minutes. The sensor is placed in the mask where the patient inhaul during the surgery every time when the patient breathe the respiration rate is calculated according to it the anaesthesia is infused to the patients.

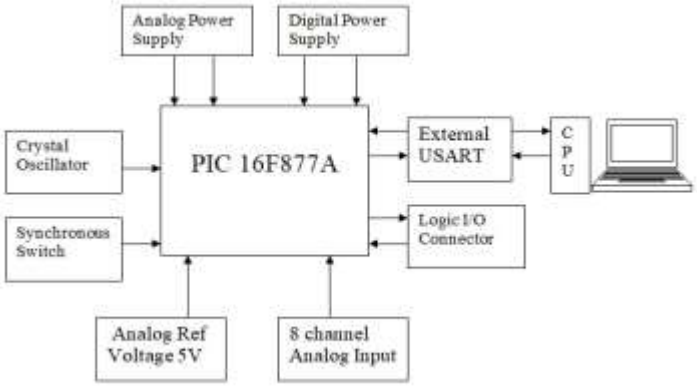

Figure: System Architecture

POWER SUPPLY

- DIGITAL
- ANALOG

PARTS:

1.Step Down Transformer:

It is used for isolation and reduce the voltage.

2.Rectifier:

It is used to convert AC to DC current. The o/p frequency of Full Wave Bridge Rectifier is 100Hz and i/p frequency is 50Hz.Full Wave. Bridge Rectifier efficiency is 86% and for Half Wave Bridge 82%.

3.Filter:

It is used to bypass the unwanted AC signal. It allows AC and block the DC.

4.Voltage Regulator:

It avoids the incoming voltage fluctuation on electrical lines and Keeps the output voltage(5V) as constant for embedded controller. The entire output is fed back to the input. This is a special technique Called as Fold Back Technique. This is made up of Aluminum.

5.Noise Filter:

It contains Low-Pass filter and stability capacitor. The Low-Pass filter is used to allow the low frequency signal and bypass the high Frequency signal. Noise Filter is used to remove the radio frequency Interferences, electromagnetic interferences, harmonics.

PIC MICROCONTROLLER (PIC 16F877A)

Peripheral Interface Controller (PIC) is enhanced version of microcontrollers. It is an embedded controller. PIC microcontroller contains several families. They are classified as three categories.

1. Low End Family:
   It has 33 instructions. For example, PIC 12XXX
2. Mid-Range Family:
   It has 35 instructions. For example, PIC 16XXX
3. High End Family:
   It has 77 instructions. For example, PIC 17XXX and PIC 18XXX.

Architecture:

Two types of Architecture are followed.

- **Van-Neumann Architecture:** The width of address and data bus is same.
- **Hayward Architecture:**
  The bus width of address and data may not be same. Pipelining is possible here.

Microcontrollers have built-in peripherals, they are:

- **Memory**
  Program Memory (Eg. PROM, Flash memory)
  Data Memory (Eg. RAM, EEROM)
- I/O Ports
- ADC

- Timers
- USART
- Interrupt Controllers
- PWM / Capture

STEPPER DRIVER

The stepper driver logic consists of pre-driver, driver and buffer.

PRE DRIVER: We cannot directly couple the TIP122 (NPN) to the opto coupler since it requires large current for driving. We use the driver SL100 to boost the current level.

DRIVER: The main principle of the driver is to amplify the current. It amplifies the 50mA current to2A, which is needed to drive the motor.

BUFFER :Buffer interfaces 8255 with high-level circuits (such as MOS.) for driving high current loads.

OPTO COUPLER

An opto coupler is essential to prevent the computer from hazardous conditions like voltage transients, back emf, and high voltage spikes.

We use dc Stepper motors for our robotic applications. Normally when we pass dc current to a coil it will get Electro magnetized, when we with draw the dc source & also it wont get demagnetized. If it is not demagnetized, back EMF is produced which can create kick back current to the subsequent devices or associated circuitries.

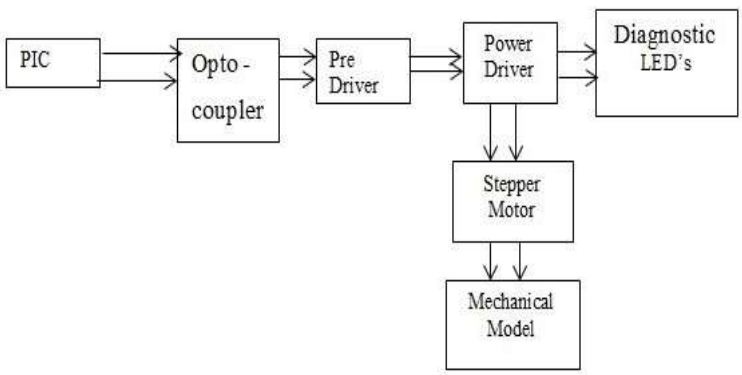

Figure: Stepper Driver And Opto-Coupler.

SOFTWARE REQUIREMENTS:

FRONT END:

In the front end we have used a visual basic software to display the output in the form of graph.

Visual basic(VB) is a programming environment where the programmer can use graphical user interface(GUI) to choose and modify pre-selected sections of code written in the basic programming language.

BACK END:

In the back end we have used Embedded C code to calculate the respiration rate from the patients.

Embedded C is actually the extension of C language. It consists of C language sets that can be used for different purposes.

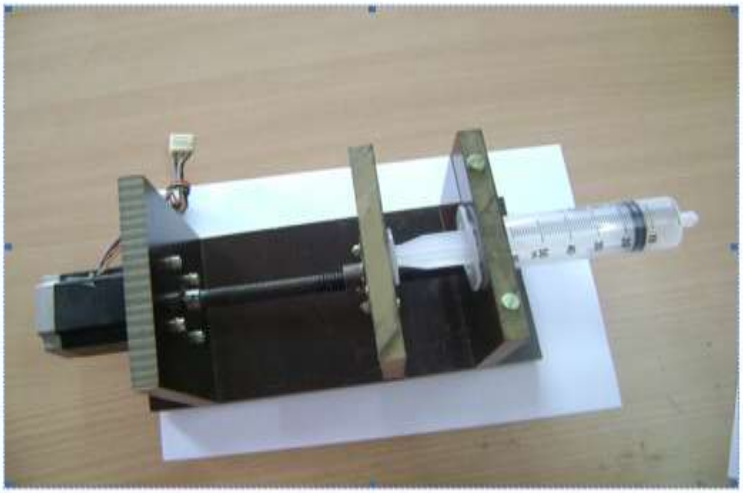

Figure: Infusion Mechanical Model

V. RESULTS AND DISCUSSION

Here it includes the hardware and software testing and the final sample result.

Table 4.1: Hardware Testing

TEST CASE SNO	MODULES	EXPECTED BEHAVIOUR	PASS/FAIL
1	EMBEDDED KIT	LED LIGHTS ON	PASS
2	POWER SUPPLY KIT	LED LIGHTS ON	PASS
3	INFUSION MODEL	MOTOR ROTATES	PASS

In Table 4.1 it shows the testing part of the Hardware Components of our Project. If Embedded kit, Sensor kit and infusion model have passed their testing part then it is considered the hardware components of our project works perfectly.

Table 4.2 : Software Testing

TEST CASE SNO	INTEGRATION TESTING BETWEEN	EXPECTED BEHAVIOUR	PASS/FAIL
1	PIC MICROCONTROLLER AND PC	Does the pc receive readings from the RS 232 cable	PASS
2	SENSOR AND PIC MICROCONTROLLER	Does the microcontroller read the readings	PASS

		from sensor	
3	SETPPER MOTOR AND PIC MICROCONTROLLER	Does the motor rotate with respect to the sensor	PASS

In Table 4.2 shows the testing part of the Software Components of the project. It includes the Integration testing which means it will tested according to the Respiration rate which is taken from the patient with respective to which the motor has to rotated .

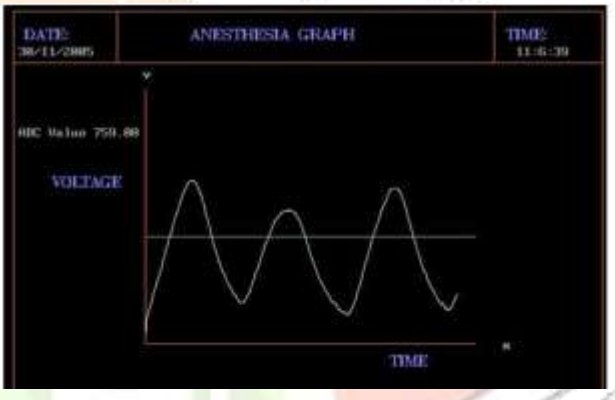

Figure: Sample Anesthesia Respiration Rate Graph.

VI.CONCLUSION

In this paper, a respiration rate has been calculated with the help of RTD PT 100 temperature sensor according to the respiration rate anesthesia is being infused to the patient where it will save lives of people without delaying of time during surgery.so here the drug delivery system is analyzed using time domain.

VII. Acknowledgment

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REFERENCES

[1] An Article in advances in Physiotherapy (August 2011) Measuring chest expansion, A study comparing two different instruction.

[2] Dr. Rachel Davison(FRCA),Dr. Daniel Cottle (FRCA) north west deanery school of anesthesia (15th November 2010) The Effects of Anesthesia in Respiratory Function.

[3] An Article in bio science (March 2012) in Monitored The Anesthetized Patient.

[4] An Article in Bio science(January 2013) The Anesthetic Equipment.

[5] ECE 4760 THERMISTOR RESPIRATORY MONITOR(Monitor the breathing of patients).

[6] Tim Newman in (4th March 2016) General Anesthesia :Uses, Risks And Side Effects.

[7] An Article (July 2015) Target Controlled Anesthetic Drug Infusion.

[8] Ruth Ravichandran (IEEE 2015) WIBREATHE:ESTIMATING RESPIRATION RATE USING WIRELESS SIGNALS IN NATURAL SETTINGS IN HOME.