IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Automatic Anesthesia Control System using LabVIEW

PRINCE SAMUEL S
ASSISTANT PROFESSOR
BIOMEDICAL ENGINEERING
SNS COLLEGE OF TECHNOLOGY
COIMBATORE, INDIA.

ADMA VIGIN M
BIOMEDICAL ENGINEERING
SNS COLLEGE OF TECHNOLOGY
COIMBATORE, INDIA.

ALWIN VARGESE JACOB
BIOMEDICAL ENGINEERING
SNS COLLEGE OF TECHNOLOGY
COIMBATORE, INDIA

BALAGANESH K
BIOMEDICAL ENGINEERING
SNS COLLEGE OF TECHNOLOGY
COIMBATORE, INDIA.

CHINJU V
BIOMEDICAL ENGINEERING
SNS COLLEGE OF TECHNOLOGY
COIMBATORE, INDIA.

ABSTRACT:

In all major surgeries, providing a painfree procedure and giving the patient a correct amount of anaesthetic are vital. F ailure to provide the patient an accurate dose could result in negative side effects and surgical problems. The full dosag e of anaesthetic cannot be given to the patient in a single dose in cases of lengthy surgeries since it could result in fatal complications. Less anaesthesia is given, which causes the patient to awaken during the procedure.Providing a precise amount of anaesthetic at regular periods is difficult for the anesthesiologist.To get through these challenges a computer controlled anesthesia device is created to provide a precise amount of anesthesia at regular intervals with steady speed. As a result, the objective of this project is to implement a LabVIEW-based automatic control system.

INTRODUCTION:

A medical medicine called anesthesia can be administered to a patient during surgery to make them pain-free. The best medical discovery ever made makes operating on patients more comfortable for both the patient and the surgeon. General, regional, and local anesthesia are the three different categories of anesthesia. While local anesthesia can be used to numb a small area of the body, regional anesthesia can be used to block pain in a region of the body like an armor leg. General anesthesia is typically used for all major surgeries to make the patient unconscious.Anesthesiologists are overworked with a variety of activities, including administering anaesthesia constant ly to keep patients unconscious until the end of surgery. Here the Patients might receive anesthesia in two different ways: either through inhalation or intravenous administration. In this we are using inhalation administration. Inhaled anesthetics are preferred for maintenance of anesthesia because they allow a more precise control of the anesthetic state and do so at low cost. Inhalation anesthetics (nitrous oxide, halothane, isoflurane, desflurane, sevoflurane, most commonly used agents in practice today) are used for induction and maintenance of general anesthesia in the operating room.

Since the process involves human life, failure from the developed system should be avoided.Thus, there is a critical necessity to look into the possibilities of creating andimplementation of a LabVIEW-based interactive real-time system.

IMPLEMENTATION :

LabVIEW

LabVIEW is a graphical programming language designed for engineers and scientists to develop test, control and measurement applications[2].It is simple for educators and researchers to use LabVIEW graphical programming in a variety of courses and applications due to its intuitive design. With LabVIEW, academics and researchers may create, test, and deploy embedded systems using a graphical system design technique.

MECHANISM:

- First identify which type of surgery is taking place.
- Based on the surgery type select the gases which needs to perform.
- Set the age of the patient .
- Set the Minimum Alveolar Concentration (MAC Value) depending on the age of the patient.
- Select the gas in the process.
- Set the intubation time of the gases which needs to go on to the patient.
- Set the O2 intubation time to come back the patient in normal state.

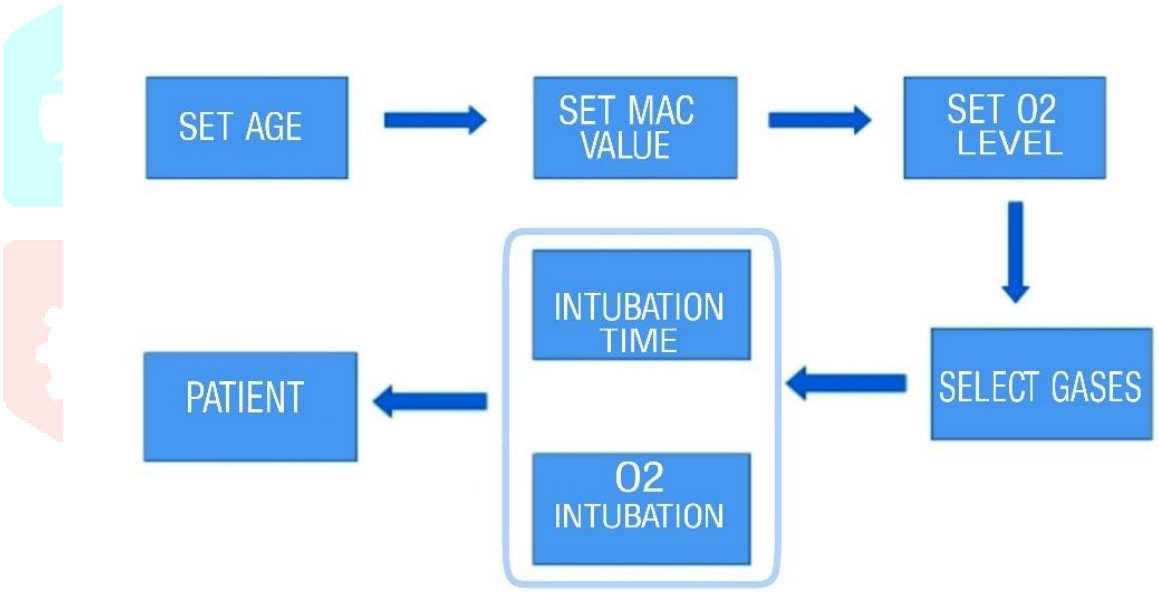

FIGURE 1:FLOW CHART

MAC(MINIMUM ALVEOLAR CONCENTRATION) CALCULATION

The depth of inhaled anaesthetic is indicated by the fundamental indicator called MAC. The ISO 21647 defines MAC as follows: alveolar concentration of an inhaled anesthetic agent that, in the absence of other anesthetic agents and at equilibrium, prevents 50% of subjects from moving in response to a standard surgical stimulus.

The following table lists I MAC of various inhaled anesthetic agents.

Anesthetic agent	Des	Iso	Enf	Sev	Hal	N_2O
1 MAC	6.65%	1.15%	1.7%	2.1%	0.77%	105%

1 MAC NO can only be reached in a hyperbaric chamber.

Note: The data shown in this table is from ISO 21647, which are published by the U.S. Food and Drug Administration for a healthy 40-year-old male patient.

Note: In actual applications, factors such as age and weight should be considered to influence the effect of inhaled anesthetic agent.

When one or more than one anesthetic agents are used, the formula for calculating MAC is:

$$MAC = \sum_{i=1}^{N-1} \frac{EtAgent_i}{AgentVol_{age}i}$$

Where, N stands for the number of all anesthetic agents (including N2O) which the AG module can measure,EtAgenti for the end-tidal concentration of each anesthetic agent and Agent Volaget for the 1 MAC value corresponding to the anesthetic agent after age correction.

The formula for calculating age correction of 1 MAC is:

$$MAC_{age} = MAC_{40} \times 10^{(-0.00269 \times (age-40))}$$

For example, for a 60-year-old patient, if the AG module detects 0.9% Iso and 50% NO in the patient end-tidal mixed

$$MAC = \frac{0.9\%}{1.01\%} + \frac{50\%}{92.7\%} = 1.4$$

gas, the 1 MAC of Iso is 1.01% and 1 MAC of NO is 92.7% of the 60-year-old patient based on the above age correction formula. The MAC value is computed.

RESULT:

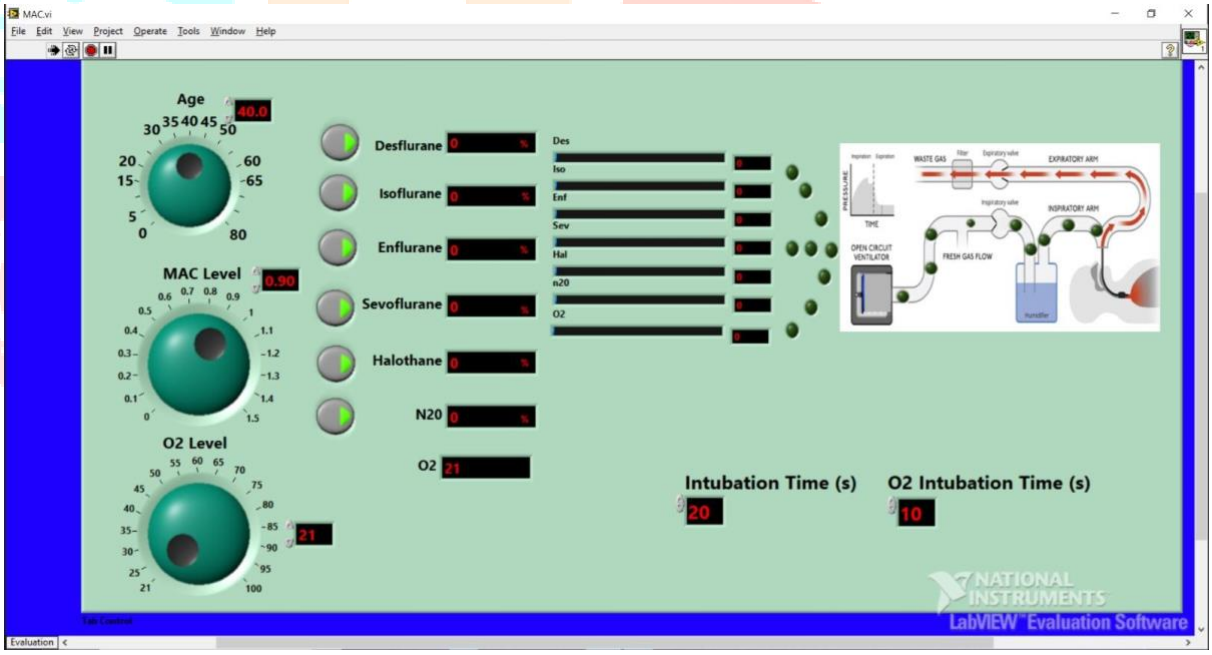

FIGURE 2: SETTING THE VALUES IN WINDOW

First step in the process is setting the patient age,MAC level,O2 level and select the inhalation anesthetics such as Desflurane, sevoflurane,Isoflurane,Enflurane, Halothane and N20.And Then set the Intubation time and O2 Intubation time.

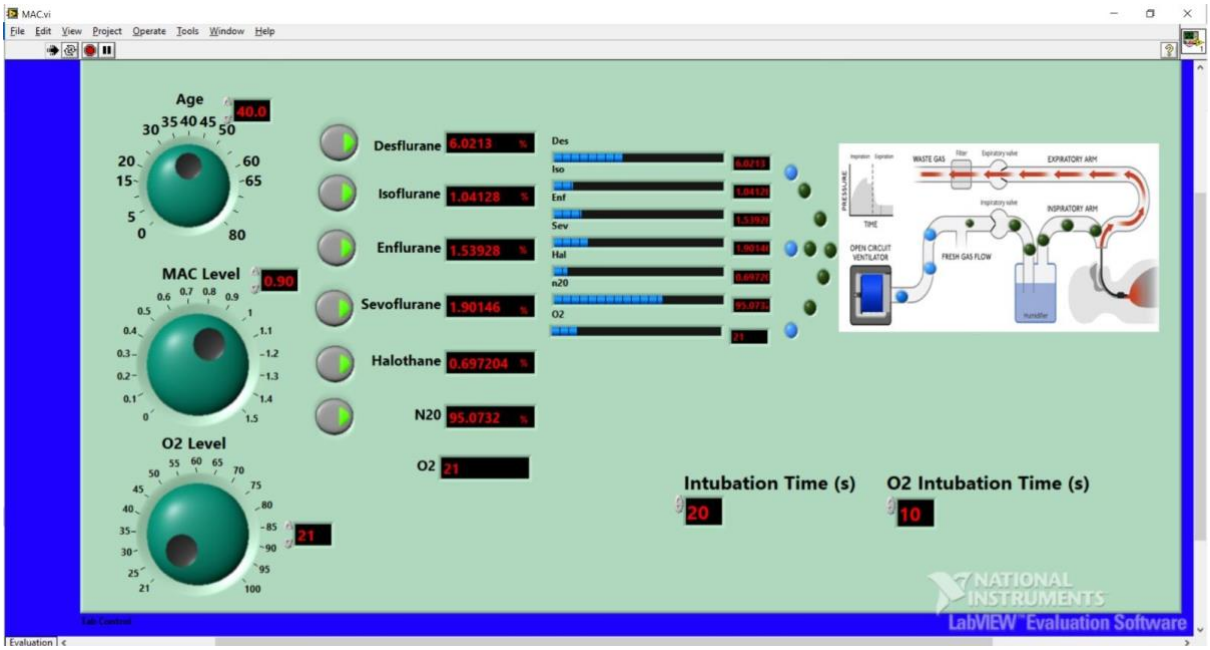

FIGURE 3: INTUBATION OF INHALATION ANESTHETICS

By clicking the run key the Intubation process will start.The inhalation anesthetics and less amount of O2will pass with other anesthetic gases throughout the operation.

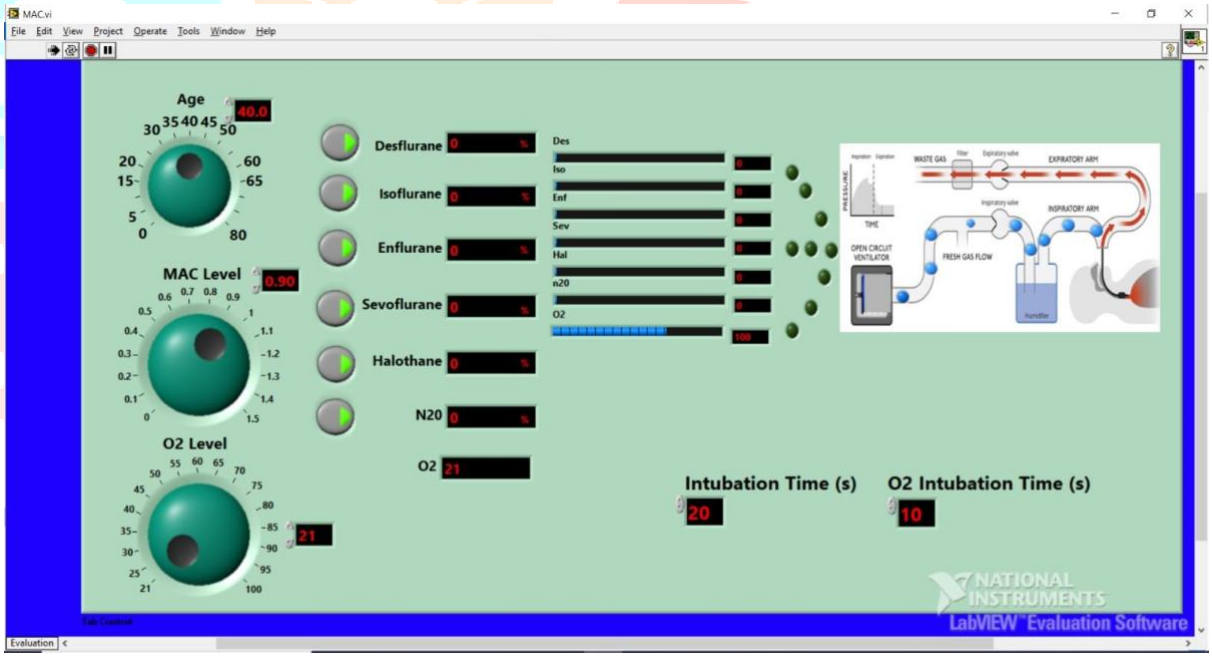

FIGURE 4:O2 INTUBATION

After the Intubation process of all other anesthetic gases ends. The O2 intubation takes place and the O2 level will be increased to bring the patient to normal state. By this the entire process will be over.

The Automatic Anesthesia controller designed using LabVIEW software to control anesthesia levels during the course of surgery. The anesthetist want to set the age limit and MAC value in the system. The proposed system does not require the physical presence of an anesthetist to monitor the doses of anesthesia to be given during the surgery. By removing human error, this also improves precision.

CONCLUSION:

The system is more adaptable overall because to the use of LabVIEW. Contemporary technologies have been created to support better and more pleasant living, which implies a world free from disease. Since EVERY DROP COUNTS FOR LIFE and PREVENTION IS BETTER THAN CURE, "Automatic Anesthesia Control System using LabVIEW" is one of the most effective defence mechanisms.

REFERENCES:

1] Srinivasa Naidu.N ; Kavya Sai.M ; Meghana.P.V.S ; Sai Praneeth.M ; Manoj Kalyan.N . (2019) . Microcontroller Based Anesthesia Injector . JASC: Journal of Applied Science and Computations.

2] Dietrich Beck;Holger Brand;Christos Karagiannis;Christian Rauth. "The First Approach to Object Oriented Programming for LabVIEW Real-Time Targets," IEEE Trans. Nucl. Sci., vol. 53, no. 3, pp. 930–935, June 2006.

3] Gokilavani.R ; Gokulapriya. M ; Jasmine Christy. A.R ; Jeeva. R. (2019).ANESTHESIA CONTROL SYSTEM WITH MULTI SENSOR USING ARDUINO. International Journal of Innovative Research in Advanced Engineering (IJIRAE)34

4] S.Krishnakumar ; J. Bethanney Janney ; W. Antony Josephine Snowfy ; S. Joshin Sharon ; S. Vinodh Kumar . (2018) . Automatic anesthesia regularization system (AARS) with patient monitoring modules. International Journal of Engineering & Technology

5] Prashanth C ; Mohammed Salman ; Rohan K.R ; Govinda Raju. M ; Roopa. J. (2014) . Computerized Anesthesia Infusion System . International Journal of Electrical, Electronics and Computer Systems (IJEECS)

6] Chandana R;Kaveen V;Gajalakshmi M;Dr. Joshi Manisha S(2021).AUTOMATIC ANESTHESIA CONTROL SYSTEM.International Journal of Engineering Applied Sciences and Technology,Vol. 5, Issue 9, ISSN No. 2455-2143, Pages 247-249.

7] Mallikarjuna M;Deepashree Devaraj;Pavan k;Vinod S;Karthik Reddy B M.Automatic Medical Fluid Infusion System using LabVIEW Real-Time.International Journal of Computer Applications (0975 – 8887).International Conference on Electronic Design and Signal Processing (ICEDSP) 2012

8] J. G. C. Lerou.Nomogram to estimate age-related MAC.British Journal of Anaesthesia 93 (2): 288–91 (2004).DOI: 10.1093/bja/aeh186 Advance Access publication June 25, 2004.

9] Nadja Bressan; Ana Castro; Susana Bras; H elder P;Oliveira; L ´ enio Ribeiro; David A; Ferreira ´Lu´ıs Antunes; Pedro Amorim; Catarina S. Nunes.Synchronization Software for Automation in Anesthesia.Proceedings of the 29th Annual International Conference of the IEEE EMBS Cité Internationale, Lyon, France August 23-26, 2007.

10] Guerin Smith; Jason R. D'Cruz; Bryan Rondeau;Julie Goldman.General anesthesia for surgeons, PMID:29630251, Review, August 2020.