ISSN (Online) 2249 - 054 X

International Journal of Computing and Corporate Research

Specialized and Refereed Journal for
Research Scholars, Academicians, Engineers and Scientists

http://www.ijccr.com

VOLUME 2 ISSUE 1 JANUARY 2012

# ELECTRONICS INSTRUMENTS PLAY MAJOR ROLE IN DIAGNOSIS PROCESSES

Mohd. Maroof Siddiqui
Department of Electronics and Communication Engineering,
Integral University, Lucknow, India

**Abstract**

This paper is designed to introduce the reader to how electronics devices & Instruments help physician to diagnose the serious or internal problem. Physician have faces problem to diagnose any serious disease without any electronics instrument which generate report of subject, in which indicate the internal image or scan of particular part of subject. X-Ray Machine, MRI Scan & CAT Scan these machine generate report in the form of internal image or scan of bone of particular part of body, chest & mind after that physician decide what the problem in subject and then the treatment start. Beginning with basic objective of instrumentation system and introduce how any device measure bio signal and convert into electrical or any other form. This paper consist of wide information about the biomedical instruments, material covered in this paper will assist the reader in the development of his or her role as a knowledgeable and effective member of the patient care team.

***Keywords-*** *Characteristics & objective of instruments, Different type of instruments & Scope of biomedical engineering,*

## 1. Introduction

ISSN (Online) 2249 - 054 X
International Journal of Computing and Corporate Research
Specialized and Refereed Journal for Research Scholars, Academicians, Engineers and Scientists
http://www.ijccr.com
VOLUME 2 ISSUE 1 JANUARY 2012

Bio –Medical Engineering is branch of Science in which we invent new machine or instrument, help in the diagnosis process. Use of instruments for the recording or transmission of physiological information, such as breathing rate or heart rate. The functions of these biomedical instruments have become increasingly complex, along with the electronic circuits in them. It has become a trend to miniaturize and integrate the electronic circuits in biomedical systems. For instance, a portable patient monitor is a necessary medical instrumentation for ambulances, physician's offices, surging canters and hospitals. It deals with wide spectrum of Life sciences i.e. plants, animals, Insects or in nutshell all living organisms. Study of only human being out of these is called Medical Science. If we want to study Engineering principles in medical science the resulting subject will be Medical Engineering. If we wish to cover more animals on the earth, the science will be Bio- Medical Engineering.

## 2. Scope of Biomedical Engineering

The study of engineering principles from Biomedical Engineering involves following interests:

To understand mechanisms, efficiencies & physical changes of various subsystems of the body.

To evolve an instrumentation system for diagnosis, therapy and supplementation of body function.

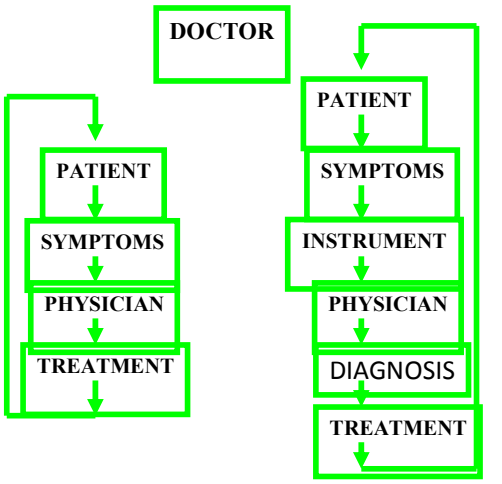
To obtain qualitative & quantitative knowledge through different instruments which can help for analysis of disorders, and further the Biomechanics of the cure process.

ISSN (Online) 2249 - 054 X
International Journal of Computing and Corporate Research
Specialized and Refereed Journal for Research Scholars, Academicians, Engineers and Scientists
http://www.ijccr.com
VOLUME 2 ISSUE 1 JANUARY 2012

To understand Bio-Chemical-Electro – Thermo- Hydraulic- Pneumatic- Physico-Magneto- Mechanic – Dynamic actions and changes of various sub systems of the body in normal states

To understand above actions & changes in various sub systems of the body in abnormal states i.e. in Pathology.

To obtain qualitative & quantitative knowledge of what drug does to the body (Pharmacodynamics) and what body does to the drug (Pharmacokinetics) during and after prescription of the drug.




A.THE PHYSICIAN B.MODERY PHYSICIAN

## 3. Different type of Instruments use in Diagnosis Process

Some electronic instruments are given below which helpful in diagnosis process

### 3.1 Digital Pulse Monitor

ISSN (Online) 2249 - 054 X

International Journal of Computing and Corporate Research

Specialized and Refereed Journal for
Research Scholars, Academicians, Engineers and Scientists

http://www.ijccr.com

VOLUME 2 ISSUE 1 JANUARY 2012

The Digital Pulse Monitor uses an optical finger sensor to monitor pulse rate and rhythm. It is extremely useful in anaesthesia, general surgery, medicine; exercise testing, sports medicine and Bio-research. Just strap the opto-pulse transducer on the thumb/finger with Velcro straps. Slide power switch ON. The pulse rhythm is indicated by red LED flashes and electronic beeper. The digital meter will display the Pulse in beats per minute

### 3.2 Digital Tele-Thermometer

The Digital Tele-Thermometer is ideal for continuous monitoring of temperature in Anaesthesia, Cardiac Surgery, Hyperthermia, Pyrogen testing and Bio-research. The required numbers of sensor probes at different sites are connected to this instrument. The POWER switch is put on. Select any particular probe by means of the Rotary Channel Selector, and read the temperature on the digital display

### 3.3 The Electromyography

The Electromyography unit records electrical activity of the muscles. The Electromyography unit has a high common mode rejection-ratio and low-noise amplifier. Both needle and surface electrodes are provided. The sensitivity, time-constant and bandwidth are adjustable. The EMG Panel Meter gives indication of average/peak value of the EMG signal. The Notch-filter cuts off 50 Hz mains disturbance. A Peak-Hold switch is also provided. Using optional nerve/muscle stimulators and oscilloscope, nerve-conduction velocity can also be calculated. The EMG wave form can be displayed on an Oscilloscope or recorded by a Tape recorder. Auxiliary attachments like 1, 2 or 4 channel Oscilloscope, stimulator and external loud -speaker can also be supplied as per user's requirements.

### 3.4 Electronic Stethoscope

ISSN (Online) 2249 - 054 X
International Journal of Computing and Corporate Research
Specialized and Refereed Journal for Research Scholars, Academicians, Engineers and Scientists
http://www.ijccr.com
VOLUME 2 ISSUE 1 JANUARY 2012

EEC's Electronic Stethoscope produces powerful and crystal-clear amplification of heart sounds, respiratory sounds and faint murmurs. It has convenient finger-tip Volume Control and a Filter switch to differentiate sound of variable intensity and pitch.Stethmate has special noise-reduction circuitry that minimizes external noises. This handy pocket size unit works on a 9 Volt battery. An auxiliary output is available on STETHMATE for connection to a ECG machine/Cardiac Monitor for Phonocardiogram recording ; or, to an external tape recorder, amplifier/speaker system for group listening.

### 3.5 Electronic Blood Pressure Meter

Bipitone gives accurate and consistent blood pressure readings that conform to values obtained by standard mercury sphygmomanometers Blood pressure measurement is extremely simple using BIPITONE. No stethoscope is required and human errors in auscultation are eliminated. The method used is an electronic adaption of RIVA-ROCCI principle. Special cuff with multiple sensors cover a wide pick-up area to determine the blood pressure easily. BIPITONE is useful to doctors as well as for hypertensive patients to keep a regular check of their blood pressure at home. Wrap the Velcro cuff on the arm; and inflate bladder as usual. Press B.P. ON switch and gradually deflate cuff pressure at rate of 2 to3 mm/Hg. When the Systolic pressure is reached, the electronic beeper and the red LED flashes on the B.P.meter will start. As cuff pressure is further reduced, the beeps/flashes will stop to indicate the Diastolic pressure.

### 3.6 CT Scan

X-ray computed tomography (CT) is a medical imaging method employing tomography

ISSN (Online) 2249 - 054 X
International Journal of Computing and Corporate Research
Specialized and Refereed Journal for Research Scholars, Academicians, Engineers and Scientists
http://www.ijccr.com
VOLUME 2 ISSUE 1 JANUARY 2012

created by computer processing. Digital geometry processing is used to generate a three-dimensional image of the inside of an object from a large series of two-dimensional X-ray images taken around a single axis of rotation

Many other electronics instruments help in the diagnosis process.

## 4 Basic Objectives of the Instrumentation

Any instrumentation system generally should achieve one of the following major categories for meeting the basic objective

**Information gathering**: Instrumentation is used to measure natural phenomena and other variables to aid man in his search for Knowledge about himself and the universe in which he live

**Diagnosis:** For The detection and hopefully the correction of some incorrect behaviour of the system being measured the measure means are
made. This type of instrumentation may be classified as troubleshooting equipment.

ISSN (Online) 2249 - 054 X
International Journal of Computing and Corporate Research
Specialized and Refereed Journal for Research Scholars, Academicians, Engineers and Scientists
http://www.ijccr.com
VOLUME 2 ISSUE 1 JANUARY 2012

**Evaluation:** Measurements are used to determine the ability of a system to meet its functional requirements.

**Monitoring:** Instrumentation is used to monitor some process or operation in order to obtain continuous or periodic information about the state of the system being measured.

**Control:** Instrumentation is sometimes used to automatically control the operation of a system based on changes in one or more of the internal parameters or in the output of the system

## 5 Basic Characteristics of the Instrumentation

**Sensitivity:** The sensitivity of an instrument determines how small a variation of a variable or parameter can be really reliably measured.

**Linearity:** The degree to which variations in the output of an instrument follow input variations is referred to as the linearity of the device.

**Accuracy:** It is a measure of systemic error. Errors can occur in a multitude of ways. Although not always present simultaneously, the following errors should be considered.

1. Errors due to tolerances of electronic components.
2. Mechanical errors in meter movements.
3. Component errors due to drift or temperature variations.
4. Errors due to poor frequency response.

**Signal to Noise Ratio:** It is important that the signal to – noise ratio be high as possible.

ISSN (Online) 2249 - 054 X
International Journal of Computing and Corporate Research
Specialized and Refereed Journal for Research Scholars, Academicians, Engineers and Scientists
http://www.ijccr.com
VOLUME 2 ISSUE 1 JANUARY 2012

**Stability:** In control engineering, Stability is the ability of a system to resume a steady state conditions following a disturbance at the input rather than be driven into uncontrollable oscillation.

**Simplicity:** All systems & instruments should be as simple as possible to eliminate the chance of component or human error.

## 6 Conclusion

This paper has presented a unique vision of the instruments which are used in biomedical field and play major role in diagnosis process. It aims to promote technology innovation to achieve a reliable, and efficient outcome from the various instruments. With a common digitalized platform, these latest instruments will enable increased flexibility in control, operation, and expansion; allow for embedded intelligence, essentially foster the resilience of the instruments; and eventually benefit the customers with improved services, reliability and increased convenience. Since this initial work cannot address everything within the proposed vision, more research and development efforts are needed to fully implement the proposed vision through a joint effort of various entities.

**Reference:**

1. Khandpur R.S. Biomedical Instrumentation TMH
2. Cromwell/ Biomedical Instrumentation And Measurements /PHI
3. Sakshi Rana Bio-Instrumentation , Dhanpat Rai & Co.