



A Review Paper on Medical Electronics
Application with Use of Electronics Engineering

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July 7, 2020

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ABSTRACT

In today's Scenario Technology is coming day by day to improve and enhance the valuable aspects to full fill the requirements of commercial and industrial applications. Quantum electronics is also a part of technology to implement and design equipments for field of medical application. In the era of engineering; electronics engineering is providing various techniques to modify the medical treatment. In the field of medical application sensors are mostly used for detection and analysis of human body disease and these medical application sensors are designed by using Electronics engineering. By using medical electronics surgeons can do medical treatment and evaluation of diseases in more effective way.

Keywords

Medical electronics, Sensors, Medical equipments, Electronics devices.

1. INTRODUCTION

Medical equipments and measuring instruments can be designed by medical electronics tools which results in low cost medical treatment. To detect and treat of chronic diseases, preferment of biometric equipments and artificial organs are developed with integration of technologies [1]. Medical electronics are field of new innovative science and industrial advancement. The essential factor of research and evolution of medical electronics are the requirement to provide low cost medical diagnosis and treatment for rapidly increase in population. The future growth of electronics industry depends on medical electronics. The basic structure of medical technology system incorporates biosensor, microsystems, integration and wireless sensor interface [2]. In medical electronics health related problem are resolved by medical equipments; which are designed by medical electronics engineers. Medical electronics engineers also called the doctor of the equipments. Those equipments and devices can be used for analysis purpose by multispecialty hospital surgeon's or doctors. The working operation and maintenance are depending on the technology which are designed by medical electronics engineers. The combination of health-related problems and measurements are solved by elements of biological and medicine science engineering. Most of the researches are concerned with health management, artificial organs, body part replacement systems, instrumentation electronics, delivery care system and medical information systems [3].

2. NEED OF MEDICAL ELECTRONICS TECHNOLOGY

Medical electronics and medical device are providing important technologies like stethoscope, x-ray and electrocardiography [4].

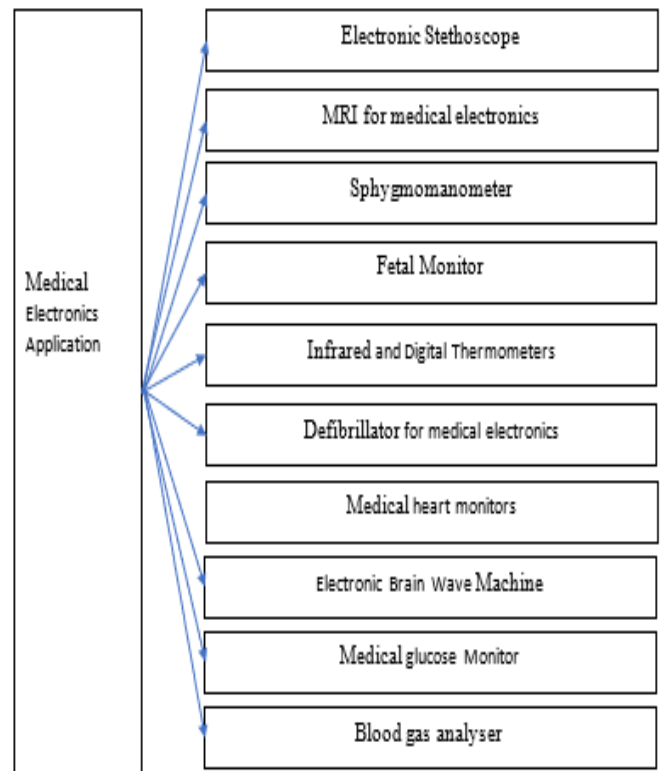


Fig 1: Medical electronics applications

2.1 Electronic Stethoscope and Sphygmomanometer

The physician can hear the sound of internal body by which they analyse the functioning and malfunctioning of organs of human body. The engineers have designed a device for actual analysing concept which graphically produces the more effective and quantitative value with display parameters. The given voice print of body is helpful to diagnosis the disease and after monitoring provide required treatment [5]. The electronics stethoscope is more sensible and mostly used in medical diagnosis for betterment of treatment. Another parameter related to body are Blood pressure that is measured

by Sphygmomanometer. Those patients in whose body pacemaker have been installed blood pressure must be measured in routine and provide the treatment for every prerequisite [6].

2.2 Magnetic Resonance Imaging electronically

In the field of medical electronics, the imaging techniques are widely used to identify the inner object of body for diagnose determination. Magnetic Resonance Imaging are containing huge amount of diagnosis application [7]. The image produced from magnetic resonance formed in atoms known as hydrogen atoms, which are differentiated in pulse. Those pulses are created from electromagnetic erection to collision to axis and get the outcomes [8].

2.3 Electronic Brain Wave Machine

The disease of brain like brain death, sleeping disorder and un-healthiness are diagnosed by electronics brain wave machine, which record the electrical movements of the scalp with electroencephalography by collecting the neurons from brain. Such type of electronic instruments and devices are mostly used in the field of medical for the treatment of mental problems [9].

2.4 Electronic Blood Glucose Monitor and Infrared digital Thermometers

The blood sugar of human body affected due to medications, dissimilar foods, and environmental infections. The testing of blood sugar named as diabetes by electronics device are known as electronic blood glucose monitor [10]. As per the requirement of people portable devices are designed by which sugar level can be measured by using single strip type machine called glucometers. The diseases due to low and high level of blood sugar are heart disease, nerve damage and kidney disease etc. The common factor of body is temperature which is also required for measurement instrument [11]. The measurement of temperature by the infrared thermometry concept is using Bluetooth and combination of hardware and software, which can transmit and receive the data collected from measured temperature [12]. The received data of

measured temperature can be amplified for further analysis. The infrared temperature sensor signal is amplified and sent by the mobile technology to the particular place for treatment. By this technique one can observe the patient's temperature for long time and provide the effective treatment. Simultaneously [13].

2.5 Defibrillator for medical electronics

In field of medical engineering number of tools are used to diagnosis the human body for treatment. Defibrillation is a process used in very sensitive condition of heart like cardiac arrhythmia, pulseless ventricular tachycardia. The process of use of healing shock to the heart is known as defibrillation. The electric charge is required to reverse the fibrillation [14].

2.6 Fetal Monitor and Medical heart monitors

The heart rate monitoring of baby during the pregnancy tested is done by fetal monitoring. An electronic fetal monitor contains a Doppler device which perform like stethoscope known as fetoscope [15]. An electronic device known as transducer is used to wide and stretchable bands around abdomen for monitoring the heartbeat of baby. During the monitoring contraction also tracked by another band around the abdomen. The transducer is connected with electronic machine during the monitoring wired as well as wireless.

3. CONCLUSION

As per the need of medical electronics in present scenario drastic change is coming in technology. The advancement in medical electronics are providing the hand to hand medical facilities by using electronics engineering in the field of medical electronics. The medical engineering is coming with sensor technologies. The advancement of electronics devices results the technologies like Wireless brain sensors, 3-D printing, Health wearables, Artificial organs, Precision medicine, Telehealth, Robotic surgery etc which are helpful for development of medical advancement. In coming years medical electronics provide the virtual technologies for diagnosis and treatment.

4. REFERENCES

- [1] J. Fayn and P. Rubel. "Toward a personal health society in cardiology", *IEEE Trans. Inf. Technol. Biomed.*, vol. 14, no. 2, pp. 401–409, 2010.
- [2] Z. Wang, P. Ran, Q. Chen, "Application and development of Internet of things in medical service," *Chinese Journal on Internet of Things*, vol. 2, no. 3, pp. 1-10, 2018.
- [3] L. Zhang, X. Yang, "The Application of Bar Code in Hospital Medical Equipment Management," *Chinese Journal of Medical Device*, vol. 10, no. 5, pp. 1-2, 2007.
- [4] Y. Hao and R. Foster, "Wireless body sensor networks for health-monitoring applications," *Physiol. Meas.*, vol. 29, no. 11, pp. R27–R56, 2008.
- [5] G. Ogedegbe and T. Pickering, "Principles and techniques of blood pressure measurement," *Cardiology Clinics*, vol. 28, no. 4, pp. 571–586, 2010.
- [6] C. Arteta, J. S. Domingos, M. A. F. Pimentel, M. D. Santos, C. Chiffot, D. Springer, A. Raghu, and Gari D. Clifford, "Low-Cost Blood Pressure Monitor Device for Developing Countries," *MobiHealth 2011, LNICT 83*, pp. 335–342, 2012.
- [7] C. A. McKenzie, E. N. Yeh, M. A. Ohliger, M. D. Price, and D. K. Sodickson, "Self-calibrating parallel imaging with automatic coil sensitivity extraction," *Magn. Reson. Med.*, vol. 47, no. 3, pp. 529–538, March 2002.
- [8] D. R. Elgort, C. M. Hillenbrand, S. Zhang, E. Y. Wong, S. Rafie, J. S. Lewin, and J. L. Duerk, "Image-guided and -monitored renal artery stenting using only MRI," *J. Magn. Reson. Imag.*, vol. 23, no. 5, pp. 619–627, May 2006.
- [9] touryan, P., Gerson, a. and Parra, L. (2003) 'High-throughput image search via single-trial event detection in a rapid serial visual presentation task', *First International IEEE EMBS Conference on Neural Engineering*, 2003. *Conference Proceedings.*, pp. 7–10. doi: 10.1109/CNE.2003.
- [10] W. V. Tamborlane et al., "Continuous glucose monitoring and intensive treatment of type 1 diabetes," *N. Engl. J. Med.*, vol. 359, no. 14, pp. 1464–1476, 2008.

- [11] S. Ivanov, C. Foley, S. Balasubramaniam, D. Botvich, "Virtual Groups for Patient WBAN Monitoring in Medical Environments", IEEE Transactions on Biomedical Engineering, Vol. 59, Issue: 11, 11 July 2012.
- [12] R. Nicole, "Title of paper with only first word capitalized," J. Name Stand. Abbrev., in pres M.U.H. Al Rasyid, B-H. Lee, A. Sudarsono, Taufiqurrahman, "Implementation of Body Temperature and Pulseoximeter Sensors for Wireless Body Area Network", Sensors and Materials, International Journal on Sensor Technology, vol. 27, Number 8, September 2015.
- [13] Chen, W., et al., Continuous Estimation of Systolic Blood Pressure Using the Pulse Arrival Time and Intermittent Calibration, Med. & Biol. Eng. & Comp. 38(5), 569-574,2000.
- [14] Bobrova Y. O., Zhivolupova Y. A. Automatic detection of abnormal fetal states by means of a personal monitoring system //Soft Computing and Measurements (SCM), 2017 XX IEEE International Conference on. – IEEE. P. 782-784, , 2017.
- [15] Woon-Seng Gan, "Applying equal-loudness compensation to the adaptive active noise control", Applied Acoustics, vol. 61,pp.183187,2000.