AN ECONOMICAL LOCALLY FABRICATED DIGITAL HUMAN PULSE RATE MONITOR

Abdul Ghaffar & M.Y. Hussain
Department of Physics,
University of Agriculture, Faisalabad

A low cost and handy human pulse rate monitor was designed and fabricated in the Department of Physics, University of Agriculture, Faisalabad using locally available material. The tests of the unit proved it a reliable diagnostic tool for occasional or continuous human pulse rate monitoring and it can easily be used by practitioners without any prior training.

INTRODUCTION

There is a variety of medical instruments being used for diagnostic, therapeutic or research purposes. These instruments help a medical doctor by augmenting his sense while examining a person. The human body consists of certain organs which reveal any kind of abnormality in one's health. One of these organs is human pulse. Its rate of palpitation provides information of immense importance which add to the clinical assessment of a patient. Conventionally, pulse is read from radial artery at the level of wrist. Its rate of palpitation is noted manually with the help of a clock. But finding the pulse is often difficult among elderly, young children as well as weak and feeble patients. Manual way of feeling of the pulse is required. White (1977) stated that although the carotid artery is probably the easiest artery to palpate yet this technique does not always yield accurate results.

Although, an electrocardiograph (ECG) gives accurate results regarding heart and pulse rate but this is not used by every physician because of its high cost and inability to use it. Keeping this in mind, a human pulse rate monitor was fabricated locally at the Department of Physics, University of Agriculture, Faisalabad with the material available in the local market.

MATERIALS AND METHODS

It consisted of a sensor/transducer, three digit LED display and a relevant electronic circuitry. A common stethoscope was coupled through a rubber tubing with a union to a dynamic directional microphone working as a sensor/transducer. Stethoscope picked the heart beat sound and the microphone converted it into analog electrical signals which were fed to the electronic circuit of the unit and were converted from analog signals to digital ones. These digital signals were read through LED digital display and were a measure of heart rate.

RESULTS AND DISCUSSION

A typical set of the data collected by using this monitor for the determination of heart rate of a selected group of 12 people among the many is as follows:

The data shows that manually and monitorially observed heart rate differed just within ± 2 digits except the last reading which can be due to an error in manual observation. The observed difference is so much insignificant and negligible that it cannot affect the judgement of the doctor made

Heart rate observed manually (Pulse minute^{-1}) X_1	Heart rate reading obtained by using the monitor (Pulse minute^{-1}) X_2	Difference $d = X_1 - X_2$
72	70	+2
65	63	+2
67	68	-1
85	84	+1
88	90	-2
71	70	+1
69	68	+1
77	75	+2
76	77	-I
80	82	-2
87	85	+2
90	93	-3

on the basis of the pulse rate, read by the monitor. Furthermore, the heart beat noted in both the methods is almost the same as the calculated paired t-value observations with 5% level of significance was 0.30 as compared to the corresponding value in the Table which was 2.201. This fact provides conclusive evidence that both the methods are quite similar to each other.

CONCLUSION

The monitor is fit as a heart rate monitor and the pulse rate determined with it is reliable as the monitor will perform consistently whereas the observations taken manually may differ from person to person as well as by the same person at different times dependent upon mood, mental concentration, etc.

Performance or monitor: It is a light weight handy tool. Its super most- advantage is that it does not require any prior training to use it. As far as its cost is concerned, it is very cheap having approximate values of Rs, 600.00. The cost would reduce further if it is made in bulk quantity on commercial basis. It does not require any regular maintenance. It is mad

accidental fall of this unit would not cause any damage to it.

Recommendations: This unit is completely reliable, consistent and trustworthy for diagnostic purposes, A medical practitioner can use it confidently for occasional as well as for continuous pulse rate monitoring.

REFERENCES

Born, D.G., J. Araujo and T.R Thomas. 1984. A procedure for evaluating portable heart monitors. Behavioural Res. Methods and Instruments, 16 (1): 7-11.

Davies, A.B., P.M.M. Cashman, V.B. Subramanian and E.B. Raftery. 1983. Simultaneous recording of arterial blood pressure, heart rate and ST segment in the ambient patient: A new system. Med. BioI. Engg. Computers, 21 (4): 410-417.

Hovorha, G. 1985. Heart rate monitor utilises single chip electron. Engg. 57 (697): 39.

Miranda, M.C. 1984. A heart beat meter with a visual display. Rev. Esp, Electron, 31 (357-358): 36-40.

Ryan, T.P. and RH. Britt. 1985. Digital heart rate monitor derived from the arterial pressure pulse. J. Biomed. Engg. 7 (4): 310-312.

Skeen, J. 1982. Portable 3-digit heart rate monitor. Electron. Aust. 44 (7): 62-68.

White, J.R 1977. EKG changes using carotid artery for heart rate monitoring. Med. Sci. Sports, 9: 86-94.

Yonezawa, Y., I. Ninomiya, N. Nishiura and G. Matsushita. 1983. A precision digital instantaneous rate meter with a wide range. IEEE Trans. Biomed. Engg. 30 (9): 612-615.