Cardiac Arrest Detector (CAD) Using Artificial Intelligence

DooslinMercyBai, Ameenur Rashid, Elavarasan, Jayasri & Arthi

Professor and Head, Final year Students

Department of Biomedical Engineering, Sri Shakthi Institute of Engineering and Technology, India.

Abstract: *Continuous analysis of heart function is really a necessary factor in the field of healthcare. Persons having variation in heart beat rate can lead to tachycardia, bradycardia, fibrillation and other abnormalities, it is necessary to monitor the heart rate continuously. So that, the patient can live long. Multiple techniques have been developed for quantitative analysis of heart but it can be done only in hospitals and sometimes it fails miserably. Cardiac arrest can be analysed by variation in blood flow rate. The developed system will provide the monitored results of blood flow rate by placing the sensor on the cephalic vein. With the help of artificial intelligence when the flow rate becomes abnormal the person will be notified by alarm and in display. The immediate action can be carried out further. The device can be helpful to persons who are in risk of cardiac abnormalities.*

Key words: Artificial intelligence, Cardiac arrest, Blood flow rate detection

I. INTRODUCTION

Diabetes is one of the major causes of premature illness and death worldwide according to the World Diabetes Foundation; approximately 300 million people in the world today have diabetes, mostly type 2. Each year the number is increasing by 7 million, reaching 438 million in the year 2030 or 7.8% of the adult population. This is the rise of 54% in 20 years. Feet provide stability support while walking, standing and running. The foot has five major functions, it is the foundation for the whole body, it can adopt to uneven ground, it acts has a shock absorber, it provides leverage for propulsion, and it absorbs transverse leg rotation. Loss of anyone of these functions can be detrimental to the patient, and is often noticed in patients with diabetes. Diabetes mellitus, commonly referred to as diabetes was first identified as a disease associated with “sweet urine”, and excessive muscle loss. Elevated levels of blood glucose(hyperglycemia) lead to spillage of glucose into the urine, hence the term referred as sweet urine. Normally, blood glucose levels are highly controlled by insulin, a hormone produced by the pancreas. Insulin regulates the blood glucose level. In patients with diabetes, the absence or insufficient production of insulin causes hyperglycemia. Most common among the neuropathies are chronic sensorimotor distal symmetric polyneuropathy and the autonomic tneuropathies. The lack of protective sensation from sensory neuropathy leads to repetitive trauma resulting in ulceration and is considered as one of the major initiating risk factors in the pathogenesis of diabetic foot ulceration (FU

II. TESTING METHODS

A. Normal Blood Pressure Test

This is the first test performed for the diagnosis of cardiac abnormality. The blood pressure measurements are done with the help of USCOM sensor. The USCOM sensor is a sophisticated continuous wave

Doppler ultrasound device utilizing unique specialized transducers, algorithms to provide a non invasive beat to beat quantitative evaluation of cardiac hemodynamics.

B. Indication Test

CAD's display device clearly displays the name of the abnormality within 15 seconds. The emergence status can be indicated with the sound system . In the case of any abnormalities, the information will be sent to the connected smart devices. Based on these methods the cardiac abnormality was detected earlier even though these methods are simple it has some complexity involved in it.

III. METHODOLOGY

A. USCOM Sensor

The blood pressure of the cephalic vein is measured with the use of USCOM sensor. The pressure value is used to calculate the blood velocity in the basis of haemodynamics.

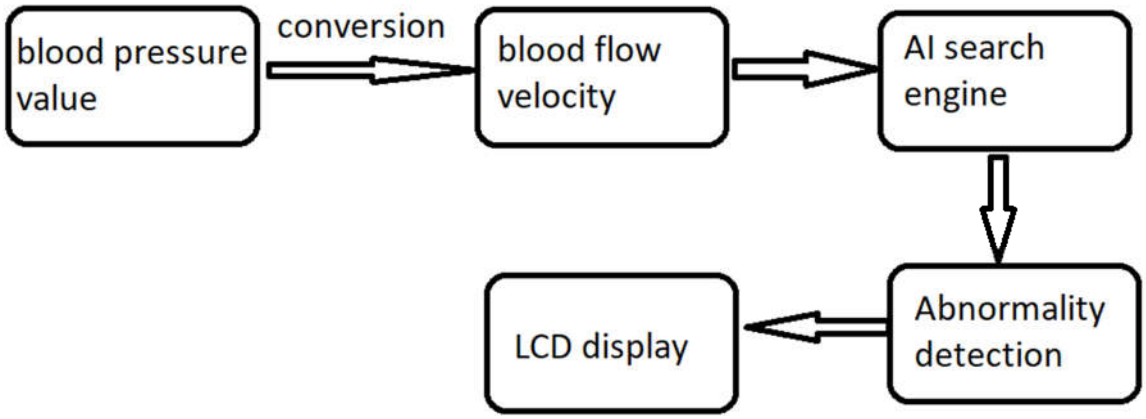

Fig.1 Block Diagram of CAD

The requirements for implementing the detection of cardiac arrest using artificial intelligence are of two types namely, Hardware requirements and Software requirements. The Hardware requirements used are USCOM sensor, Arduino and power supply. The Software requirements used are Arduino IDE.

B. Arduino IDE

Arduino uses a variety of single board microprocessors and controllers which are used for the purpose of building the digital devices and they are provided with a set of analog and digital input and output pins. They are able to sense objects. They are provided with the serial communication interfaces. In general, it is an open source hardware. Most of the Arduino boards are provided with the Atmel 8 bit AVR microcontroller. Arduino microcontrollers are preprogrammed to avoid the complexity. In general, it consists of software and a physical programming.

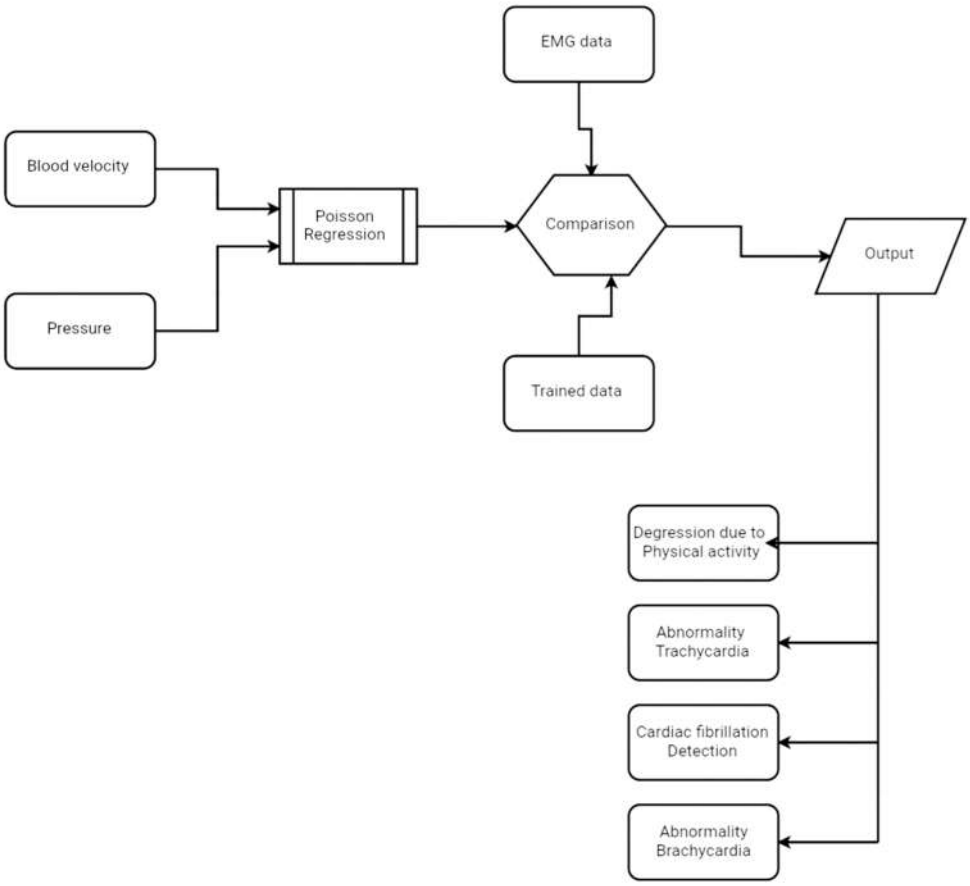

Fig.2 Functional pattern of CAD

C. Artificial Intelligence

CAD is based on the variation of the blood flow rate caused by the deposits in the coronary artery. The non probabilistic binary classifiers in support vector machines is utilized .The analyzed data from the regression analysis is used for the binary classifiers. In the regression analysis, it is of interest to characterize the variation of the dependent blood flow rate, around the prediction of regression function, using the probability distribution of certainty.

The non linear model of Poisson regression would provide the outcome of certain number of events and the results were plotted in the Quantile- Quantile plots determine the two samples from the same distribution family, comparing the standard blood flow velocity and analyzed data.

To obtain the predictive performance, ensemble learning were used. Ensemble learning are the combination of the two models of input

*blood flow in the physical activity

*blood flow in the procardiac and cardiac stages.

Parallel ensemble learning is the method where the independence errors can be dramatically reduced by averaging the values with the help of Random Forest.

In accordance with our descriptive statistics and visualization, CAD identify the signs of heart disease at various stages through ensemble learning homogeneous techniques, where the specific values of blood flow rate is kept as the base learners.

C. Display

CAD's display device clearly displays the name of the abnormality within 15 seconds. The emergence status can be indicated with the sound system . In the case of any abnormalities, the information will be sent to the connected smart devices like multi-para monitor in ICU and smart phones .

IV. RESULT

This paper gives a different way of approaching the cardiac arrest. The cardiac arrest can be detected at the earlier stage itself compared to the prior detection methods. By using the USCOM detector in which the moisture sensor and pressure sensors are attached and we can represent the sensor values in IoT in which the peak pressure values indicates that the patient has higher risk of cardiac abnormality.

TABLE 1 Different values of blood flow velocity

S.NO	TEMPERATURE(degree Celsius)	HUMIDITY(%)	PRESSURE 1 (S1,S2)	PRESSURE 2 (S3,S4)	PRESSURE 3 (S5,S6)	PRESSURE 4 (S7,S8)
1	24.73	45.68	0.66	0.41	0.71	0.64
2	26.90	38.01	0.64	0.67	0.77	0.52
3	29.39	42.78	0.64	0.64	0.45	0.72
4	23.85	54.05	0.97	0.51	1.23	0.66
5	30.43	44.01	0.43	0.42	0.97	0.41
6	32.05	53.47	0.71	0.84	0.51	0.55
7	31.48	48.57	0.66	0.96	0.66	0.41
8	34.12	56.64	0.41	1.20	0.51	0.62
9	27.04	61.00	1.21	0.44	0.72	0.71
10	29.59	59.71	0.84	0.61	0.66	0.72

V. CONCLUSION

In this paper the CAD is developed for the purpose of detection of cardiac arrest at the earlier stage itself without any discomfort to the patients. It alleviates the patients from the pain of detecting the disease. The earlier detection of the disease leads to early treatment which avoids the higher risk factors. The blood pressure value differs according to the factors such as gender, age, weight, history of diabetics. And the pressure given to the sensor differs according to the capacity of each and every individual.

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