

# HEART MONITORING AND HEART DISEASE PREDICTION SYSTEM: SURVEY

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**Abstract:** Due to increase of globalisation the number of deaths due to heart attack tremendously increases. The heart attack or heart stroke occurs eventually and patient unable to understand its symptoms. Researchers have found that body gives signals of inappropriate heart functioning before heart attack. If human being can easily save their life if they will be capture and analyse these symptoms and take a proper medication. Many heart disease detection systems are proposed by researcher. This paper presents the review of heart monitoring and heart disease prediction system. These systems uses internet of things, Bluetooth, GSM module, cloud based server to transfer the detected heart data to doctor. The detailed comparison of each system is performed at the conclusion. These systems generally monitor the parameters like body temperature, blood sugar, heart beats, blood pressure etc.

**Keywords:** Blood pressure, blood sugar, body temperature, heart beat Heart disease, Internet of Things(IoT)

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## I INTRODUCTION & SURVEY

Pranav et al.[1] implemented healthcare monitoring system consisting of ECG Sensors AD8232. ECG sensors monitor vital parameters through remote monitoring of patient. The authors have created android application for continuous monitoring of patient ECG. The heart disease is correctly predicted by various data extraction techniques. Data extraction techniques calculate amplitude and RR interval of ECG wave generated by sensor. This technique uses data mining which reduces reduce time and effort of heart disease detection techniques. Authors have also used IoT technology and data mining algorithms for heart disease prediction.

Shweta Gajbhiye et al. [2] implemented heart attack early prediction using android application. In this system pulse sensors senses the heart rate and oximeter checks level of oxygen in patient body. The data of heart rate and oxygen level received microcontroller will be displayed on LCD module and also send to Wi-Fi module ESP 8266 microcontroller. This microcontroller will further send this data over

internet through Wi-Fi. The android application will be used to monitor the heart rate and oxygen level over Wi-Fi.

Ponugumatla Kalyan et al. [3], M.Ganesan et al. [13], Avinash Golande et al. [16], Yosuf Amr ElSaadany [20] implemented IoT based heart disease prediction and monitoring system using arduino and raspberry pi 3. In this system AD8232 sensor will measure the heart rate and sent it to arduino board. The arduino board send this data to raspberry pi 3 boards. The GPS receiver Ublox NEO-6Mv2 will detect the position of patient and send it to PL2303 USB to TTL module. This module will USB connectors which alters the received USB information to standard serial port information. This serial port information will be further provided to raspberry pi 3 microcontroller. The data of heart rate beats will be stored over a cloud using HTML and Wi-Fi. Because of this the doctor or other concern user can easily retrieve this information through cloud.

Chao Li et al. [4] implemented the implementation of pervasive monitoring system to monitor blood

pressure, ECG, SPO2 level, heart rate, pulse rate, blood fat and blood glucose. The authors did not mention the sensors used for monitoring the parameter. The data of measured by sensor will be sent over Wi-Fi and received by remote user to detect the heart condition at any given time.

Saranya. E et al. [5], Fizar Ahmed et al. [12], Ani R, Krishna S. et al. [14] have implemented an IoT based prediction and diagnosis of healthcare system. The pressure sensor will measure a pressure of blood in patient's body. The LM35 temperature sensor will sense the temperature of body. Heart rate sensor will sense the beat rate of heart. This data will be fed to arduino. Arduino will display this data on LCD module as well send it to GPRS module connected to it. The data will be saved to cloud and doctor will retrieve this data through cloud server.

Shadman Nashif et al. [6] and Mubeen Aslam Momin et al. [15] proposed a cloud based heart disease prediction system. Authors use machine learning technique to detect the heart disease. The analysis of received parameter will be performed by Java based open access data mining platform called WEKA. This algorithm uses two mostly used open access database. In order to analyse heart performance 10 fold cross validation is applied. This method will provide 97.53% accuracy level. The data detected by machine learning will be sent to arduino module. Arduino module will send this data to doctor through SMS using GSM module and also save this data over a cloud. Doctor can observe data stored over a cloud to analyse the patient health. The proposed system will measure the patient health in every 10 second of interval. Hence data on cloud updated after every 10 second. Due to this doctor will get real time data of patient health over a cloud.

Hlaudi Daniel Masethe et al. [7] Performed heart disease prediction using algorithms like J48, Naïve Bayes, CART, and REPTREE. Author will detect the parameters like heart rate, Cholesterol, BP, Blood sugar. Authors use MATLAB for analysis of received parameters.

Hamza Turabieh et al. [8] Performed heart disease prediction using Hybrid ANN and Gray Wolf optimize algorithms. This algorithm will analyse heart

rate, cholesterol, blood pressure and blood sugar. MATLAB tool is used to analyse these parameters.

Sanjay Kumar Sen et al. [9] performed heart disease prediction using Naïve Bayes, SMO, C4.5, K-Nearest neighbour algorithms. This algorithm will analyse heart rate, cholesterol, blood pressure and blood sugar. WEKA tool is used to analyse these parameters.

AKM Jahangir et al. [10] proposed the system which can analyse the heart beat using pulse sensor and body temperature using temperature sensor LM 35. These parameters will be given to arduino. Bluetooth chip will send this data to android application. The doctor can analyse this data on his smart phone using android application.

Do Tha nh Thai et al. [11] have proposed a new lightweight approach using SR algorithm. This approach removes noise arises during collection of ECG signal. This approach helps for precise diagnosis and prediction of ECG signal.

Samradhi Mittal et al. [17] presented a technique which use the association rule to predict the heart attack. In this technique data is priory collected for experimentation purpose and system is designed using this collected data. The resulting data contains the class table and attributes as an outcome of prediction. They used a regression analysis based method to measure outlier and its removal.

Aieshwarya. B. Chavan Patil [18] have implemented a similar technique using AVR 328 microcontroller. This microcontroller acts as a gateway communication medium between sensors and LCD module. It also sends the data provided by sensor to Wi-Fi module. This project uses temperature sensor, heartbeat sensor, ECG sensor. Also the buzzer connected with microcontroller alert care taker in emergency situation of patient.

Sehan Kim [19] implements a Farm as a Service integrated system. This system supports other high level application services by monitoring the farm.

Maryam Yahyaie [21] examined an IoT based model for predicting heart attack. This model uses ECG of patient to analyse the heart condition. This model also send the data of ECG pattern over the internet.

Abderrahmane Ed-daoudy et al. [22], Vijaykumar V. Nagre et al. [23], Cheryl Ann Alexander et al. [24] performs heart disease prediction using big data mining technique. This system uses sensors and mobile device for real time monitoring of patient health parameters. This system predicts the disease and provides a suitable medication for it. The server helps to store the data and medical history of patient which is required to provide proper medication in

emergency situation. This system simultaneously handles multiple patients in hospital as well as in public health care unit.

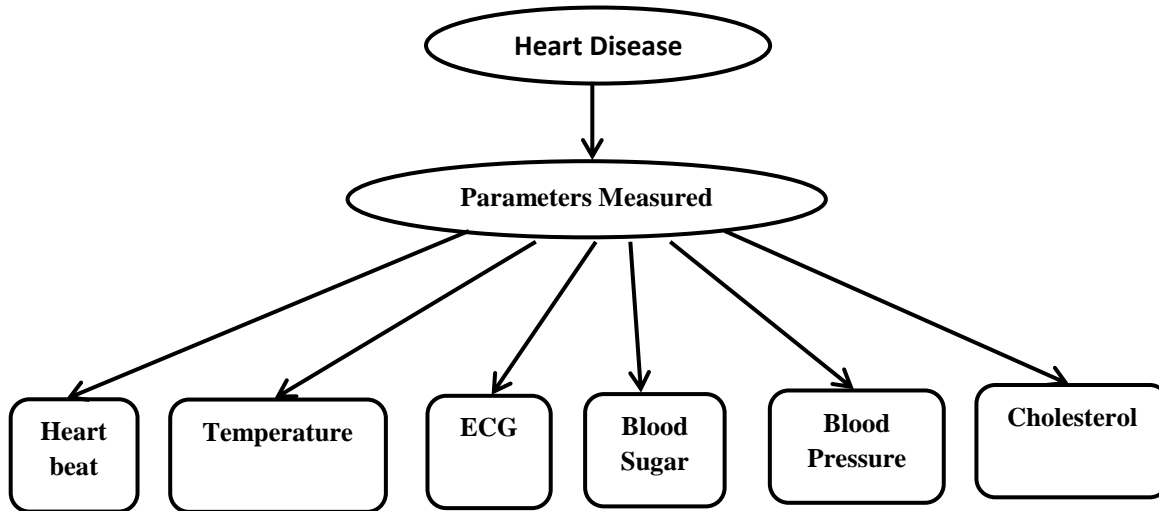
Murali Subramaniyam [25] presented a critical role of IoT on prediction of wake up stroke. It measures physiological parameters and risk factors associated with stroke while sleeping condition of patient. It uses data mining technique to predict the disease of patient.

**II COMPARISON OF HEART DISEASE PREDICTION METHODS**

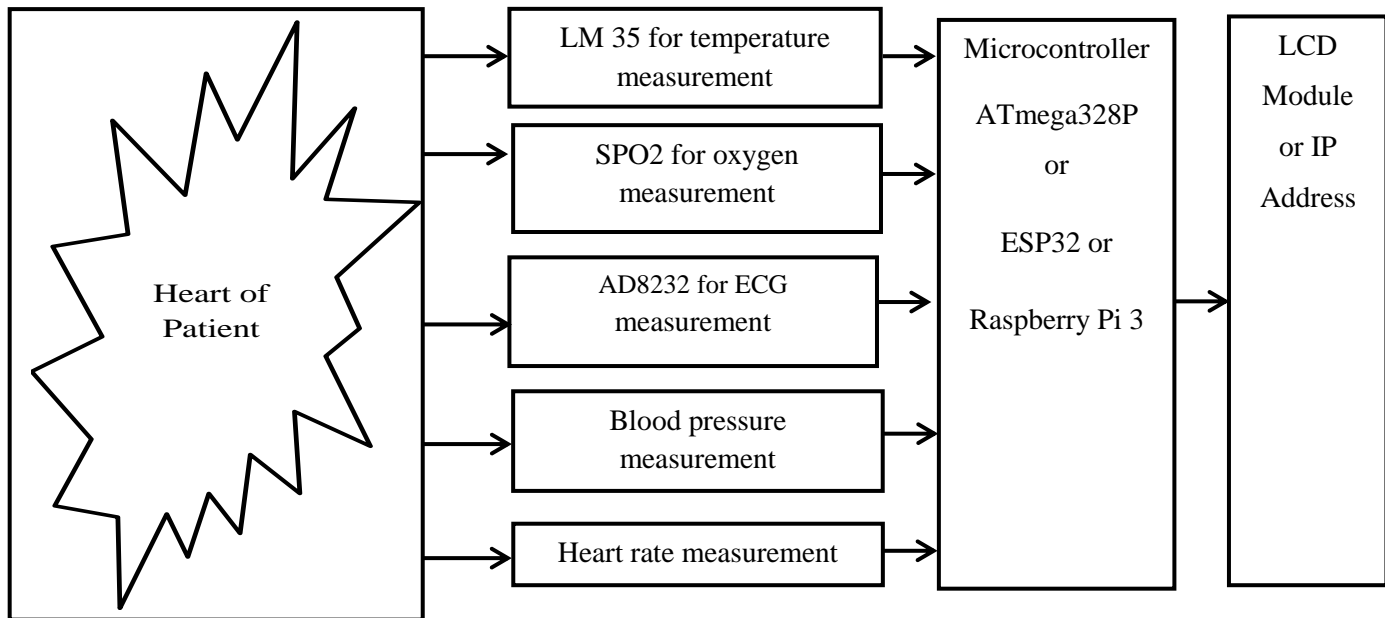
Reference	Parameters detected	Sensors used	Controller Used	Transmission Device	Algorithm or software Used
1	ECG	AD8232	ESP32 board microcontroller	-	MATLAB
2	Heart beat, oxygen level of body	MAX30100	ESP32 board microcontroller	ESP8266 Wi-Fi controller	Not mentioned
3	ECG	AD8232	Atmega328p and raspberry Pi 3	Cloud	Arduino IDE
4	Blood pressure, blood fat, blood glucose, heart rate, ECG, SPO2	-	-	-	-
5	Heart beat, body temperature	Heartbeat sensor, LM35	AT mega328	Cloud	Arduino IDE
6	Heart beat	Heartbeat Sensor	ATmega328P	Cloud, GSM module	Java Based Open Access Data Mining Platform
7	Heart beat, cholesterol, blood sugar, ECG	-	-	-	J48, Naïve Bayes, CART, REPTREE, MATLAB
8	Heart beat, cholesterol, blood sugar	-	-	-	Hybrid ANN and Gray Wolf optimize algorithms and MATLAB
9	Heart beat, cholesterol, blood sugar	-	-	-	Naïve Bayes, SMO, C4.5, K-Nearest neighbour algorithms, WEKA tool
10	Body temperature, ECG, heart rate	Body Area Sensor, LM 35, pulse sensor	Arduino Mini	Bluetooth chip	Arduino IDE

### III SCHEMATIC REPRESENTATION OF VARIOUS HEART DISEASE PREDICTION METHODS

The figure 1 above shows the various parameters measured by various papers to detect heart disease. These parameters includes Heartbeat, temperature, ECG, blood sugar, blood pressure, cholesterol.



The sensors given below measures the parameter of heart using microcontroller



**Figure 2: - Block diagram of Heart Monitoring System**

As shown in figure 2 above, the heart of patient is connected with various sensors. The output of these sensors is provided to ATmega328P microcontroller. The response received by microcontroller will be

displayed on LCD module and also stored to cloud. The data stored to cloud can be observed by opening the allocated IP address through internet over a remote location.

#### IV CONCLUSION

The common parameters to detect the heart disease are heart rate, ECG, blood pressure, blood sugar and temperature. In most of the cases ATmega328p microcontroller is used to detect these parameters. In few cases ESP32 board microcontroller is used. The detected parameters are generally transmitted using ESP8266 Wi-Fi controller, Bluetooth module, GSM module or stored over a cloud. The software used for programming is Arduino IDE or MATLAB. In some rare cases the algorithm is used like J48, Naïve Bayes, CART, REPTREE, Naïve Bayes, SMO, C4.5, K-Nearest neighbour algorithms. Finally these paper end with comparison of all proposed methods of heart disease detection.

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