

An Implementation of Genetic Algorithms in Big Data Processing for Medical Data



G. Renukadevi, K Selvakumar, S. Tamilarasan, S. Venkatakrishnan

Abstract: The large amount of real time medical measurement parameters stored in the SQL server needs processing using a specific algorithm. One of the big data processing techniques is available for medical data is Genetic algorithm. The acquired medical parameters are combined together to predict or diagnose the disease using the genetic algorithm. In this paper, the genetic algorithm is used to process the medical measurements data. The medical parameters are posted temporarily in the Representational Structure (REST) Application Program Interface (API) using a gateway protocol MQTT. The genetic algorithm can easily diagnose the disease using the existing stored parameters. The medical parameters of the patient like ECG, Blood pressure and skin temperature are posted frequently in the cloud server for continuous monitoring, and the huge data is also processed using this proposed method.

Keywords: Big data Processing, Genetic Algorithm, Medical data, REST API, SQL Server, Thermistor, Digital Sphygmomanometer, Node MCU, HTTP Gateway

I. INTRODUCTION

The continuous monitoring of patients' medical parameters is required in the intensive care unit and critical care unit, and all the acquired data is posted in the cloud server to alert the hospital server and to schedule the doctor's visit and consultation. The genetic algorithm is suitable for this application for processing the big data. There are many options to measure temperature with different components, and any component can be used to measure the temperature. The component should provide accurate values with high precision. Here the thermistor is used for measuring the skin temperature. Another measurement is systole and diastole values using the analog sphygmomanometer or Digital sphygmomanometer. The measurement is always analog, but the output representation is digital. The accuracy of the digital output can be increased by increasing the number of bits of representation of digital values.



Fig.1. Digital Sphygmomanometer



Fig.2. Thermistor (Negative Temperature Coefficient)

Proposed Methodology

The sensor data is processed through a microcontroller, and the gateway protocol can be chosen by the module. The gateway protocol may be HTTP or MQTT, which is used to access the web server to post the huge real time data acquired by the sensors.

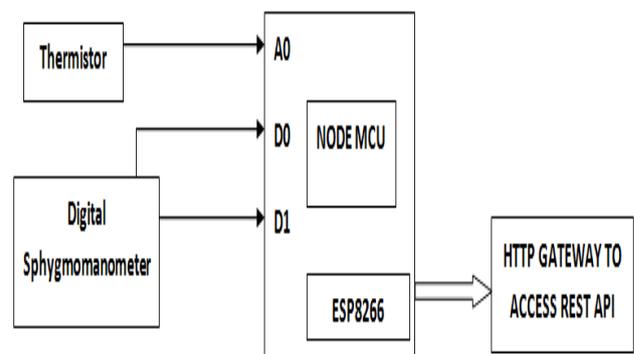


Fig.3. Stage 1 Flow Diagram of Proposed model

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The thermistor is used as a temperature sensor, which is a negative temperature coefficient, and the digital sphygmomanometer is used to measure the systole and diastole values from the human body. The Node MCU is used as a microcontroller to process the sensor data. The temperature is measuring in analog form. So, the data from thermistor is connected to the analog input of the Node MCU. The systole and diastole is also measuring in analog form, but, it is converted into digital by the same device. So, the data is directly applied to the digital pins of Node MCU. The ESP 8266 is used to get the Wi-Fi connectivity, which is available inbuilt in the Node MCU. The HTTP is a gateway communication protocol used to access the REST API. The flow diagrams are shown in figure1 and figure 2.

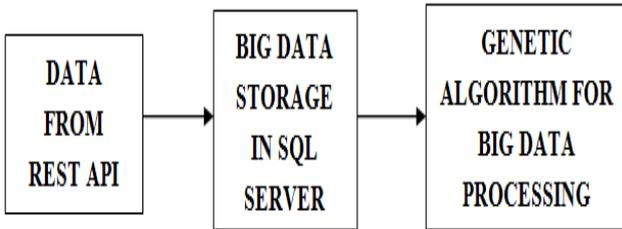


Fig.4. Stage 2 Flow Diagram of Proposed model Results and Discussions

The table 1 shows the continuous monitoring of the patients' data posted in the web server. The data is updating for every 15 seconds. So, the huge data is posted and stored in the SQL server for a day. The genetic algorithm is used to manage and process the data, which is suitable to alert the hospital server as well as scheduling the tasks for the medical practitioners.

Table 1. Continuous Monitoring of Temperature, Systole and Diastole for Patients

[1] Time	[2] Skin Temperature	[3] Diastole	[4] Systole
[5] Patient 1			
[9] 12.59.30	[10] 97.2	[11] 85	[12] 135
[13] 12.59.45	[14] 97.1	[15] 85	[16] 135
[17] 13.00.00	[18] 97.1	[19] 84	[20] 134
[21] 13.00.15	[22] 97.2	[23] 84	[24] 134
[25] 13.00.30	[26] 97.3	[27] 84	[28] 134
[29] Patient 2			
[33] 12.59.30	[34] 98.4	[35] 94	[36] 144
[37] 12.59.45	[38] 98.3	[39] 93	[40] 143
[41] 13.00.00	[42] 98.2	[43] 93	[44] 143
[45] 13.00.15	[46] 98.1	[47] 93	[48] 143
[49] 13.00.30	[50] 98.1	[51] 92	[52] 142
[53] Time	[54] Skin Temperature	[55] Systole	[56] Diastole

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"result" : "map_reduce
"timeMillis" : 27,
"counts" : {
  "input" : 60,
  "emit" : 15,
  "reduce" : 1,
  "output" : 1
}
"ok" : 1
  
```

Fig. 6. Consolidated Output of the Genetic Algorithm

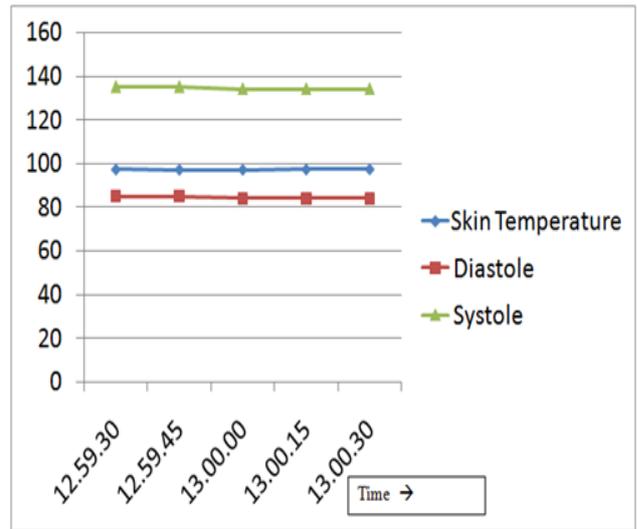


Fig.5. Medical parameters for Patient 1

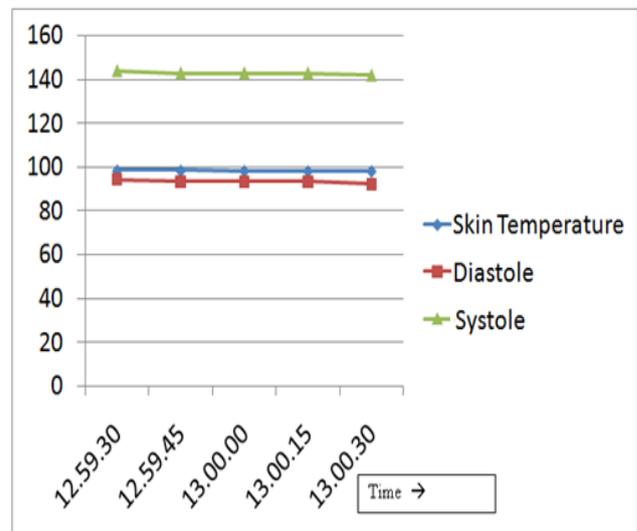


Fig.6. Medical parameters for Patient 2 Conclusions

The medical parameters of different patients are updating in the cloud server for every 15 seconds if continuous monitoring is needed and base on the posted data, the genetic algorithm diagnosing the disease and predicting the future data. The genetic algorithm easily processed the big data produced and stored in the SQL server in this proposed method.

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Dr. K. Selvakumar is currently working as a Professor in Department of Information Technology, Annamalai University . He has more than 20 years of teaching experience and a year of industrial experience. His area of Interest includes Cryptography and wireless networks. He has also published papers in many international and national journals and also attended many international conferences. His interests further extend on Intelligent systems, Routing

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