International Journal of Future Generation Communication and Networking
Vol. 13, No. 2s, (2020), pp. 354–360

Real Time Solution towards Emergency Medical Services

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Abstract

Nowadays in Emergency Medical Services (EMS), time is much more than a matter of money it's a matter of life and death. An ambulance-to-hospital fog computing based system is the best example of how mobile technology can help save lives, by providing real time patient information to the hospital via wireless communications and also to improve the hospital OPD response time till patient arrives to hospital. So for the sake of simplicity of safety, feasibility and reliability and latency response we put this idea into practice. This project mainly consist of three units which are Ambulance unit, fog computing system based unit and hospital unit. The main task of all these start after ambulance reporting and patient board in ambulance. After getting primary aid to patient our unit get start by getting the all basic medical parameter like heart beats, body temperature etc. with help of heart beat sensor and Temperature Sensor. While doing this practice for symptoms analysis of patient another unit simultaneously capturing a clear video by using Raspberry PI camera unit. Onwards by using general purpose input output port we interface all these parameter data to Raspberry for the further process. Now by implementing software programmed design in eclipse and java we fetch the data continuously without lagging time and send it towards hospital unit. To established communication between all these we use standard HTTP protocol. In the third unit which is hospital for accessing data sent by fog unit we design a page in java which includes login ID and password for getting live streaming with data. For further analysis on patient's data we can send it on cloud. By using such practice we can save the life of patient and improves the Medical services provided by hospital topatient.

Keywords- *wireless data transfer, live streaming, Fog computing, Emergency medical service, cloud server.*

I. INTRODUCTION

For emergency medical services (EMS), time is much crucial than money—it's a matter of life and death. An ambulance based system is the best example of how technology can help save lives, by providing real time patient information to the hospital via wireless communications, providing remote diagnoses and primary care, and also reducing rescue response time. Telemedicine (definedbytheAmericanTelemedicineAssociation(ATA))ismethodtoexchangemedicalinformationfrom onesitetoanother via electronic communications, to improve a clinical healthservices.

Telemedicine includes various applications and services i.e. from remote health monitoring to education. In addition to usability, organizational aspects and regulations of medical devices , these are of major importance to the technical system realization.

In the tele-consultation centre, two tele-EMS physicians are on call for involved ambulances; a tele-EMS physician supervises only a single ambulance team at once.To collecte videnceon the medical and organizational impact resulting from the use of this telemedicine model, the declared goal of our pilot studies was to conduct them in regular EMS operations. Consequently, the telemedicine system must not hinder patient treatment, making usability a major concern; besides, application of telemedicine must not prolongon-scene time intervals significantly, which was already analysed informer studies. Inaddition to usability, organizational aspects and statutory regulations of medical

ISSN: 2233-7857 IJFGCN

devices are of major importance to the technical system realization.

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II. LITERATURE SURVEY

Mehdi Sookhak, F. Richard Yu, Ying He, [1] Combination of cloud computing and FOG computing is used. In Cloud Computing, the users use the web browsers as an interface, while the software and data are stored on the remote servers and hence it is deviceindependent.
Fog computing has been emerged as a promising solution for accommodating the surge of mobile traffic and reducing latency, which are known as the inherent problem of cloud computing.
So, Fog is cutting edge paradigm of computing which extends the conventional cloud computing to edge of network. This model is characterized by low latency, geographical distribution of devices, mobility and large number of nodes.

Xiaopei Wu, Robert Dunne, Zhifeng Yu and Weisong Shi, [4] EMS(Emergency medical service) systems are public services that provide quick response, transportation as well as appropriate emergency medical care to the emergent patient and STREMS: An efficient smart real-timepre-hospital communication system for EMS. Specifically, a cost-effective wearable physiological sensing solution to support multi- dimensional telemetry monitoring for an ambulance operating at as Basic Life Support, a type of EMS service level without sophisticated medical equipment or paramedics. Then build a cloud-based real-time data sharing platform, enabling automated streaming all gathered pre-hospital data to the hospital prior to ambulance arrival.

Indumathy N, Dr. Kiran Kumar Patil,[5] Sensors collect the patients health parameters such as temperature and blood pressure, heart beat.Sensors monitors the heart rate and shows in digital format and temperature sensor's main application is detection of heat, so it is used as temperature sensor, basically LM35 sensor is used to detect theheat.

1) Emergency medical services (EMS) systems are public services that provide quick response, transportation as well as appropriate emergency medical care to the emergent patient. For EMS, every second is critical.Unfortunately; current EMS systems have many challenges: lack effective communication between EMS providers and hospital professionals, less attention on care quality and limited resources of medical equipment and personnel, delay in treatment. Motivated by this, in this paper, we explore the use of video technology to propose EMS using FOG computing: an efficient smart real-time pre-hospital communication system for EMS.

2) Dr. G. G. Sivasankari, Prerana G Joshi,[7] This paper provide the design and implementation of the Live video streaming using Raspberry Pi in IOT devices, with a single board computer which processes the Motion Detection Algorithm written in python as programming environment. The system uses the algorithm to significantly decrease the storage space and to save the cost. The algorithm is implemented on the Raspberry Pi, which provide the live streaming. The live steaming can be viewed from any browser on particular website from computer or even from mobile in the realtime.

Raspberry Pi used for core process, camera for capturing the video and user phone or laptop connected to Wi-Fi to receive and view the live streaming videos. Also as our system requires fast processing speed for live video streaming without any loss. In Raspberry Pi external memory can be connected to enhance its speed which cannot be done in other microcontrollers. Raspberry Pi has GPIO ports as well as camera interfacing ports.

3) Gus,[3]As the Pi doesn't have any GPIO (general purpose input-output) pins that are analog. This absence of analog pins makes connection of analog sensors a little complex. There are several solutions for connecting analog sensors to raspberry PI with lack of analog pins like the one done in the Raspberry Pi LDR tutorial which involved using a capacitor to measure the resistance of the LDR (Light Dependent Resistor). A better solution to this would be to using an analog to digital converter (MCP3008). This chip or integrated circuit requires a little bit of setting. Also the setting of the MCP3008 is done with raspberry pi, this is a much easier process than writing the code from scratch.

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III. PROPOSED SYSTEM.

A. BlockDiagram

The system is designed to monitor different parameter like body temperature, Heart rate of patient. It is FOG-based real-time data sharing platform, enabling automated streaming and updating information on cloud.

Proposed system consists of ambulance unit, fog server unit, cloud server unit and hospital unit. Hardware is placed inside ambulance. Hardware contains Raspberry Pi 3 interfaced with Pi camera and temperature, heart rate sensor to fetch patient's images and data respectively.

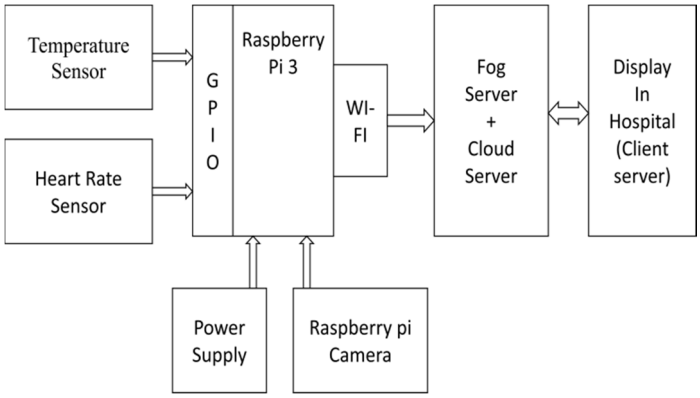

Fig 1: Block Diagram of proposed system

These images are continuously sent on Fog server and sensor data is sent to cloud server. Then as requested these server response to hospital with requested information.

B. Working

To measure different parameters with the help of respective sensors are connected to the GPIO of Raspberry Pi. And Raspberry Pi camera can be interfaced to the CSI interface given on the board itself. So that continuous monitoring of the patients health is recorded and in real time base it is uploaded on the Fog via WIFI which will be used for wireless data sending to the Fog. All the sensor data will be then available on the cloud.

At hospital emergency room physicians and doctors can receive and review the patient's data at a desktop PC by requesting it from FOG or on a mobile device such as a tablet or Smartphone, and make preliminary assessments before the arrival of the patient (i.e. live streaming and current sensor data can be viewed by accessing the data from Fog). The emergency room doctors can also zoom-in to see the wounds, discuss the situation with the emergency medical technicians (EMTs), and instruct the EMTs to administer primary care or emergency medical services, such as first aid.

Fog Unit Ambulance unit

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Hospital unit

Fig 2: Architecture of communication between ambulance and hospital

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IV. RESULTS

Following are expected results after successful completion of project shown below:

A. Heart beat sensor interfacing with Raspberry Pi3

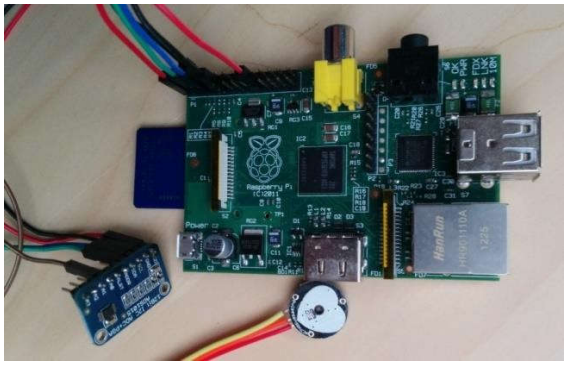

Fig 3: Heart beat sensor interfacing with Raspberry Pi 3

Above is the image of output from heart beat sensor which will be using while collecting the heart rate of patient. Heart beat sensor will show the digital output.

B. Temperature sensor interfacing with Raspberry Pi3

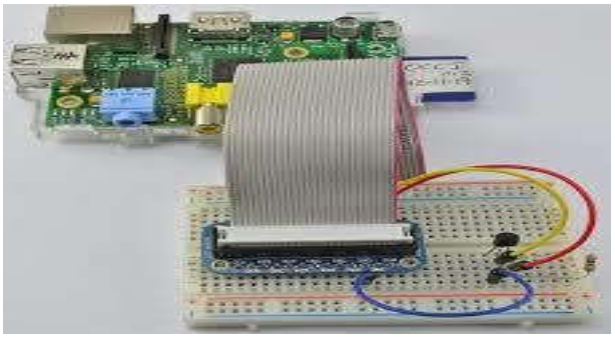

Fig 4: Temperature sensor interfacing with Raspberry Pi 3

LM35 sensor will be used to detect the temperature of body & will give the output in analog form.

C. Camera interfacing with Raspberry Pi 3Camera

Raspberry PI 3 has a camera interfacing port. Camera is interfaced with it and it will capture images continuously with correct framerates.

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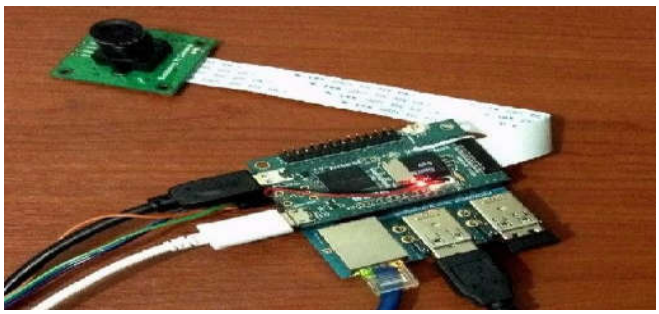

Fig 3: Camera interfacing with Raspberry Pi 3 Camera

As live streaming will be done by camera capturing images continuously and will be uploaded.

V. CONCLUSIONS

The Fog computing has been emerged a new computation paradigm in which the computational resources have been deployed along the edge of the network with the aim of reducing latency. In accordance with the resource restriction of Fog computing, a limited number of clients are able to use the fog computing simultaneously. Because of this advantage traffic on the network/server reduces which results in fast datatransfer.

In this project, by observing health parameters of patient through sensors, we aim to provide real time patient information to hospital using FOG computing. Hence we aim to provide an improved emergency care in pre-hospital arena.

VI. FUTURE SCOPE

More sensors like ECG, eye blinking, blood pressure measuring etc. can be interfaced for full body health monitoring of patient to improve analysis. Also audio communication system can be introduced in proposed system and a live screen can be installed inside ambulance so that communication between technician (in ambulance) and expert (at hospital) can establish for better understanding of situation. A technology can be introduced to receive acknowledgment that ambulance and hospital are intouch.

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ISSN: 2233-7857 IJFGCN