IP Based Device Control and Monitoring System Using Raspberry Pi Based On IOT

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Abstract- Many technical communities are vigorously pursuing research topics that contribute to the Internet of Things (IoT). Today, as sensing, actuation, communication, and control become ever more sophisticated and ubiquitous. The basic premise is to have smart sensors collaborate directly without human involvement to deliver a new class of applications. Internet of Things (IOT), in which everyday objects are able to connect to the Internet. A wide-ranging IOT ecosystem is emerging to support the process of connecting real-world objects like roads, architecture, house appliances, and person bodies to the Internet via sensors and microprocessor chips that record and transmit data such as location, movement, and other variables. Along with health-care and wellness, sports and competitive activities constitutes most rapidly growing areas of personal and consumer-oriented Internet of Things technologies. Networked sensors, either worn on the body or embedded in our living environments, make possible the gathering of rich information indicative of our physical and mental health. The benefits, applications, and System-on-Chip (SoC) technical trends in the area of wearable sports and fitness technology is increase. This paper envisages the Internet of Things for Sports as the novel and state of the art framework is capable to gratify the needs of persuasion of current sports culture in a smart and handy way. This systems that deliver care to people in remote locations and monitoring systems that offer an endless stream of careful data for better care decisions.

Keywords – Internet of things, Raspberry pi, sensors system, ESP8266 wifi module, Apache2 (web server)

I. INTRODUCTION

Internet of Things allows public and objects to be connected Anytime, Any spot, with Any object and Anyone using Any path OR network and Any supply" [1]. From the coming of IOT in Auto-ID center of MIT in the beginning 2000, scientific development and research in sensor technology and communication domains has been change a lot on the earth. IOT has the ability to publish all the mentioned earlier studies into a common podium. Sports and recreational activities have always interested part of society. The beginning of Marathon to the latest Olympic Games, sports and recreation have holed up the bonding between human and itself. Current advancement has shown tremendous interest in these activities. Representations of the objects have grow into viable to bring changed rapidly, exclusively after the boom in Information and Communication Technology. Realistic activities, predictive measures, health parameters, and circumstantial information of players and recreationalists have become crucial and essential in present competitive scenario. In this situation, anyone can easily find out the requirement of accumulation of standardized, automated, brilliant, wireless, and sensor input based real time event decision making solution that would attend the long cherished desire of smart involvement. This paper presents Internet of Things for Sports runners, a standard electronics embedded platform architecture to statute the system to work. The paper is presented as follows. Section II present Design and Implementation Section III presents algorithm Section IV present result and discussion Section V concludes the paper section VI future scope.

II. DESIGN AND IMPLEMENTATION

Incorporating loT in our lives has many advantages helping individuals, businesses and on everyday basis. Health, safety, security are some forms in which new concepts are emerging in loT[16]. It can be very beneficial to integrate loT into security systems and this project aims to integrate loT in security systems to detect motion and heart beat for example everyday when you are at work you will be able to monitor activity happens at sport runners podium. The other major advantage that this system will have over the others is that it will make the users system lightweight for example at present these are possible but not without machine-to-machine communication. In this case there is

no need to have machines at both ends to get the desired output. Thus for users this system will prove to be of great use as it has low energy consumption and also comes at a low cost.

The project aims to simplify motion detection and heart beat of sport runners and the interface to be user friendly, which would send data to the browser when motion and heart beat is detected.

A. System Block Diagram

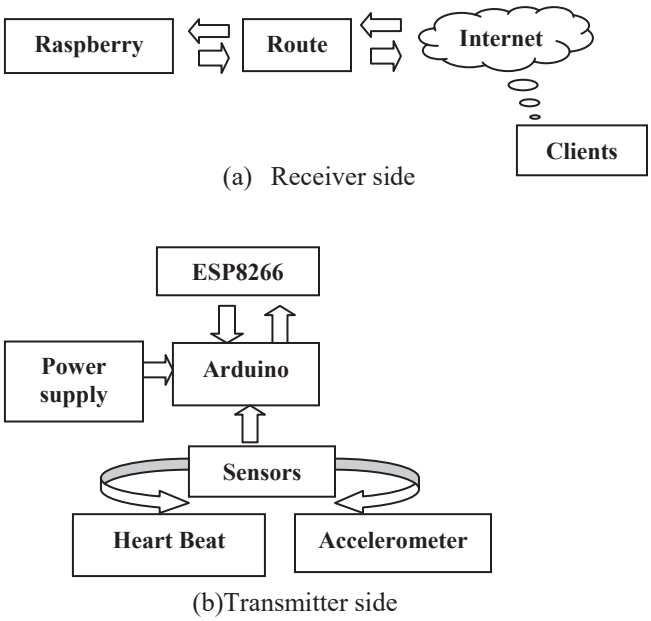

Fig 1: hardware design of system block diagram

As shown in figure 1 System block is divided into two section (a) transmitter and (b) Receiver. System offer high performance and low power consumption. Heart beat and accelerometer are used to sense the heart beat rate and motion of the runners player. ESP8266 consist of 2 GPIO pins, UART communication, low powered 32-bit CPU and a PCB antenna and it run on 3.3v. Arduino run on is 1000mAh and 3.3v. system has 3.3v accelerometer. Heart beat sensor is consist of 5v. These sensing data are send via esp8266 to the web server of raspberry pi. Power unit consist of nickel lithium magnesium hydroxide battery with 5v and 2700mAh rechargeable. Figure 2 show the mobile runners sensing system block scheme and connection between them.

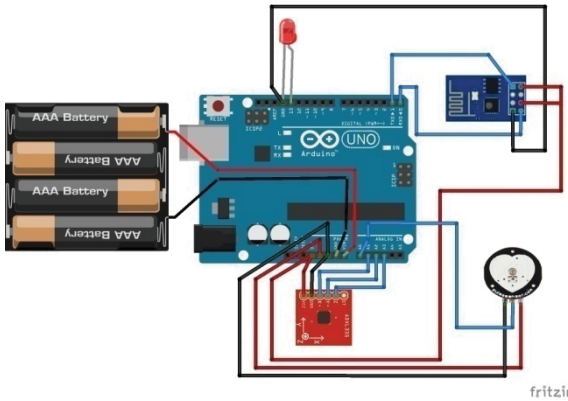

Fig 2: Arduino connection with sensors, esp8266 wifi module and 5v battery power supply

B. Hardware Requirement

Major components used in the proposed have been discussed briefly:

Raspberry pi: Raspberry pi Model B as it offers us with the Ethernet port. The GPIO pins give us the ground Vcc etc. The board works on 3.3V supply we want to connect 5V power supply for it. Raspberry pi use to store the data which is comes from ESP8266 [8][9].

ESP8266 wifi module: The ESP 8266 is a low cost, high performance System on Chip Wi-Fi to serial module that aims to provide mobile podium designers to new systems with embedded Wi-Fi Capabilities at the inexpensive with the higher functionality.

M212 Heart beat sensor: this heart beat sensor is design to give digital output of heart beat when a finger is placed on heart beat circuit. The heartbeat detector is working, the top-most LED flashes with heart beat. This output can be connected to the Arduino to calculate the Beats Per Minute (BPM) rate.
ADXL335 Accelerometer: The ADXL335 is a short, small, low power, complete 3-axis MEMS accelerometer with signal conditioned voltage outputs. The product calculate acceleration with a littlest wide ranging of ±3 g. XYZ direction of runner in accelerometer can be measure using below equation (1),

$$A=Sqrt(y^2 + Sqrt(x^2 + z^2))\ldots\ldots\ldots\ldots\ldots\ldots eqn(1)$$

Arduino: Arduino consist of both physical programmable circuit board and piece of software. Integrated Development Environment (IDE) that runs on computer used to write and update computer code to the physical board.

Nickel lithium magnesium hydroxide (NiMH) battery: series of 4 NiMH battery is used for power supply unit to the system. It provides 5v battery power supply with 2700mAh.

C. Software Requirement

HTML: HTML is a specific type of global language used for painting a web page. HTML stands for Hypertext Markup Language. HTML is the text that used up with new specifications such as formatting, Image multimedia etc.

Apache2 (web server): It is known as Apache HTTP Server that offers the online distribution of website service using HTTP. It is highly suitable web server for different OS such as Linux, Windows, Solaris, Unix, Novell NetWare, Mac OS X, etc. Apache2 is use in this paper for creating web server.

III. ALGORITHM

Operating system is install in raspberry pi is NOOBS (New out of the box software). There are different stages to install operating system. Make the raspberry pi as a wireless Access point so that no need of any router. There are also some stages to make raspberry pi as wireless access point. HTML page is make which display when open the web server. First login page is display on which first login and then live runner's status page is display on the Screen. Sensors Sense the data which are send in Arduino than send it to the Raspberry Pi through ESP8266 wifi Module.

1) In figure 3 (a) ESP8266 first check the IP address of raspberry pi when its IP is available it request Arduino to get data from the sensors.
2)The propose system collect Runners data through sensors.
3)Collect data may be in the analog form so they converted into digital form using Arduino.
4)These sense data are transmitted to the raspberry pi through ESP8266
5)At the receiver side figure 3 (b) runners relatives doctors and friends can seen live status of the his/her heart beat rate and speed of the runners on the web server of the raspberry pi using login ID and password.

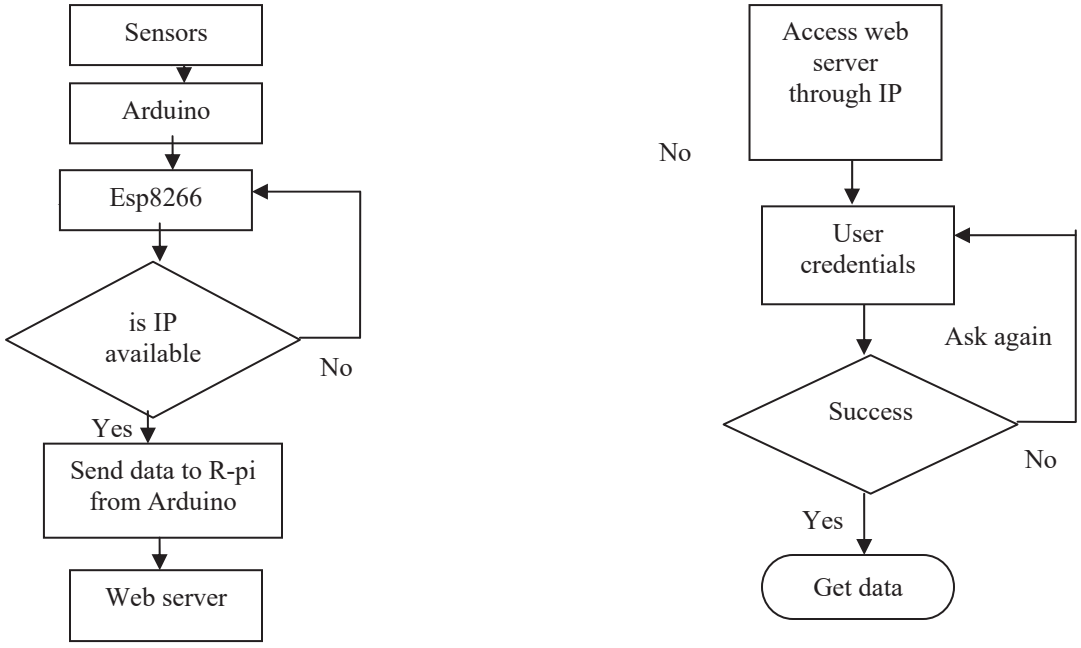

Fig 3: (a). Transmitter side and (b). Receiver side

6)When ID and password is corrected they can show the live status of the runners on webpage from PC, laptop, mobile phone, tablet etc.

III. RESULT AND DISCUSSION

Implementation details and results related to the aspects of smart system i.e. sport player security is discussed here. In this paper, Raspberry Pi is used as a server by connecting to several laptops as clients in the same network. The work was explored in the different scenarios, like client-server communication using raspberry pi Wi-Fi access point. Router is used to create a wireless network communication between the devices. Sensors which are connected with Arduino. Arduino send this sensors data to raspberry pi through esp8266 wifi module.

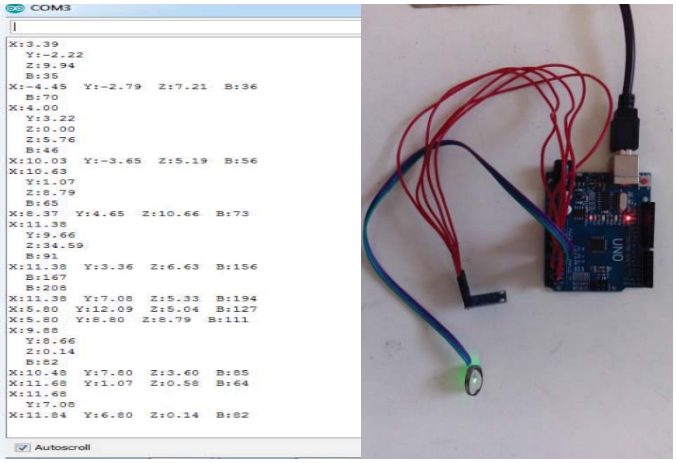

Fig 4: Connection of Arduino with sensors

Figure 4 show the connection of Arduino and sensors. Sensors send data to the Arduino IDE. The figure 5 shows intermediate values between Arduino router and ESP8266. Heart beat sensor and motion step Result is shown in figure 5. The above figure 5 shows the sample digital values obtained from sensor.

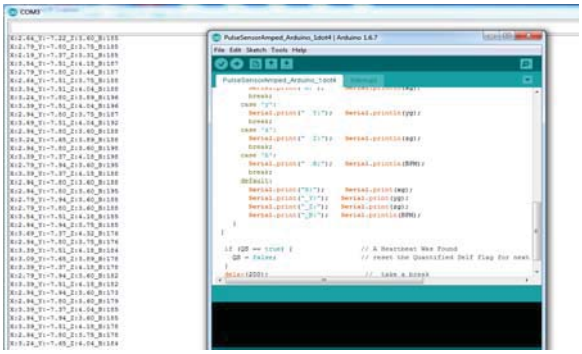

Fig 5: Arduino serially send data to the ESP8266

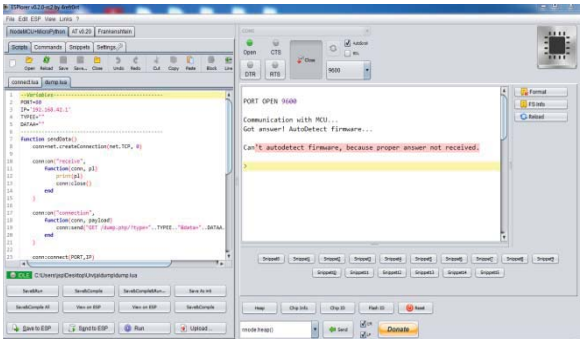

Fig 6: ESP8266 Connection with raspberry pi

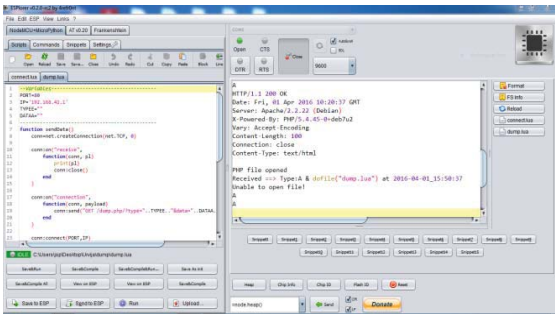

Fig 7: Raspberry pi give IP Address to ESP8266

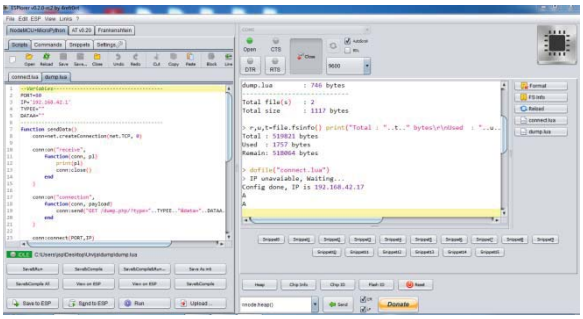

Fig 8: ESP8266 send data to raspberry pi

Figure 6 showing ESP8266 locally connected to the raspberry pi. Esp8266 first check the connection of raspberry pi, if raspberry pi network available than esp8266 send ip address to raspberry pi to connect with raspberry pi which is shown in figure 7. After detecting wireless connection with raspberry pi, esp8266 is used to send data to raspberry pi as shown in Figure 8. Figure 9 shows data are generated form in order to be transmitted to raspberry pi. The original text file data are shown in Figure 9.

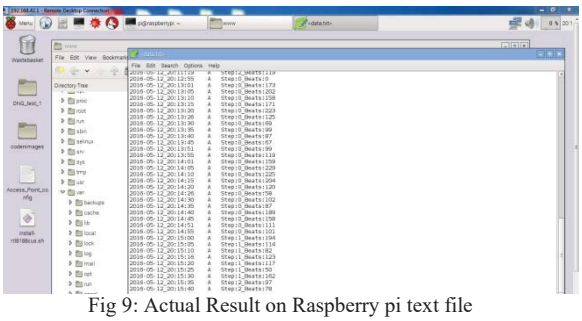

Fig 9: Actual Result on Raspberry pi text file

Actual sensor results from Raspberry pi shown in figure 9. The above figure 9 screen shot show exact value of sensor and it's obtain from programming language for sensor. The below figure 11 shows varied Heart beat and Motion obtained from LAN network. The same data obtain within LAN network in any PC.

After configuring raspberry server site, users can now connect to the RASPBERRYPI network. It is necessary for users to login before they can browse the file as it has been configured in the server site.

This is important to improve data integrity and privacy of the file, so that unauthorized users cannot gain access. Using login ID and password doctors or relatives can show the live status and data of runners sensors. Figure 10 shows login authentication for RASPBERRYPI network. Figure 11 shows the data that is stored in the RASPBERRYPI folder such as live status of sport runners real time data. When client sends a request message to server localhost, the server processes the request and reply back to the client. Figure 11 shows the runners sensors data displayed in the localhost server through web browser.

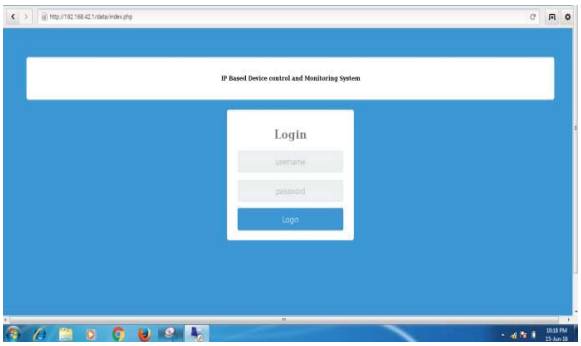

Fig 10: login page.

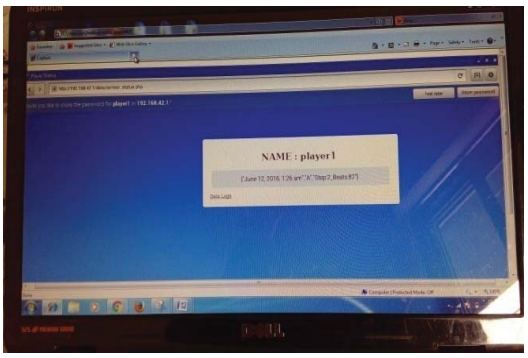

Fig11: Sensors data at Doctors or Relatives Desktop

The Heartbeat, Motion steps display at doctor's or Relatives desktop is shown in figure 11. Past sensors data on the same status page you can show to click data log as shown in figure 12.

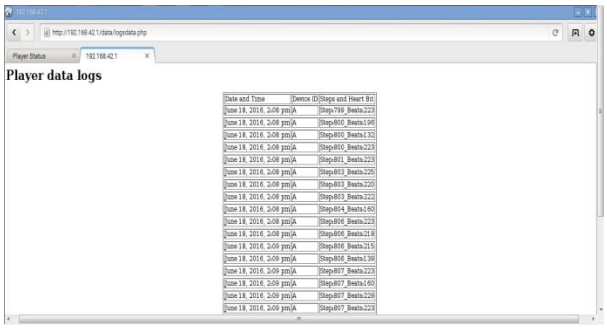

Fig.12: data log of past sensors data on desktop

V.CONCLUSION

In this paper proposed a mobile monitoring system, which is able to continuously monitor the Runner's heart beat and speed. The entire system consists of a router node to acquire the runner's physiological data. The transmitted data from the esp8266 node is received by the raspberry pi node. The raspberry pi is makes as a router access point which connected to the server. The server nodes designed to update the data using LAN which helps is easy way to monitor the sport runners at their racing time and helps doctors to take immediate actions.

VI. FUTURE SCOPE

We used the accelerometer sensor, heart beat sensor to obtain runners conditions instead of those possible to use temperature sensor, pressure sensor and here we use sport health monitoring application only instead of this field use industrial, irrigation and electronic display applications. We done only LAN network to continuously see the runners condition. we buy the web site it's possible to see runners condition in world wide.

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