IoT based Healthcare Monitoring System

Boda Priyanka[1]& Mr B Raveendra Nadh[2]
[1]PG Scholar, Dept of ECE (ES) Vardhaman College Of Engineering (Autonomous) Shamshabad,Hyderabad, Telangana,India
[2]Assistant Professor Dept of ECE Vardhaman College Of Engineering (Autonomous) Shamshabad, Hyderabad, Telangana,India

Abstract- Nowadays healthcare technologies are slowly entering into our daily lives, replacing old devices and techniques with newer intelligent ones. Although they are meant to help people, the reaction and willingness to use such new devices by the people can be unexpected, especially among the elderly.A fall event is one of the main factors that influence the physical and psychological health of an elderly person. Injuries related to falls include physical damages like Heart attacks, bone fractures and general connective tissue lesions. A fall has also dramatic psychological consequences, since it drastically reduces the self-confidence and independence of affected people. Healthcare technology using wireless sensors has reached a high level of maturity and reliability and hence these devices are now being deployed in homes/nursing homes for use in managing people's health. In this project, an enhanced fall detection system is proposed for elderly person monitoring that is based on smart sensors worn on the body and operating through consumer home networks. The smart sensors contains temperature sensor, ECG sensor, Blood pressure sensor, MEMS sensorand heartbeat sensor, these sensor values are measured by a microcontroller unit(MCU) and it transmit to the PC through Wi-Fi. It will receive the sensor values and store into the data base. If any sensor value exceeds the limit it will indicate the corresponding person.

Keywords- Raspberry pi, health monitoring, IoT.

I. INTRODUCTION

Now a day's healthcare is a burden factor for systems are struggling with aging population, prevalence of chronic diseases, and the accompanying rising costs. In response to these challenges, researchers have been actively seeking for innovative solutions and new technologies that could improve the quality of patient care meanwhile reduce the cost of care through early detection/intervention and more effective disease/patient management. It is envisaged that the future healthcare system should be preventive, predictive, personalized, pervasive, participatory, patient-centered, and precise, i.e., p-health system. Health informatics, which is an emerging interdisciplinary area to advance p-health, mainly deals with the acquisition, transmission, processing, storage, retrieval, and use of different types of health and biomedical information. The two main acquisition technologies of health information are sensing and imaging. This paper focuses only on sensing technologies and reviews the latest developments in sensing and wearable devices for continuous health monitoring and accessing the information

This invention relates generally to methods and systems for monitoring a person. The present invention relates to interoperability of medical devices. Medical devices are essential to the practice of modern medicine. Physiologic measurements like blood pressure and temperature, x-ray and ultrasound imaging, administration of intravenous medications, and support of critical life functions are all routine procedures that use medical devices. However, at present, each device is designed to stand alone as an island. It is difficult to bring together multiple devices into interoperable (inter-connected) systems to improve patient care To address this issue, the Institute of Electrical and Electronics Engineers Inc. (IEEE) is developing two new point-of-care medical device standards. IEEE P1073.2.2.0—Health Informatics—Point-of-Care Medical Device Communication—Application Profile—Association Control Function—will provide for the establishment, release and disconnection of an association between a medical device agent and a system acting as a manager. In medical device communications, manager systems indicate a set of desired capabilities when requesting an association. Agent systems respond by stating the capabilities they support across the connection. Once an association is established, mechanisms must be in place to break the link. IEEE P1073.2.2.0 is referenced by other application-profile mode standards within the ISO/IEEE 11073 family. The second standards project, IEEE P1073.2.2.1—HealthInformatics—Point-Of-Care Medical Device Communication—Application Profile—Polling Mode—will define a method for retrieving application data with medical devices that communicate through polling protocols. IEEE P1073.2.2.1 will enable "plug-and-play" interoperability for simple medical devices that use for management systems to query devices for all information to be communicated.

There is a clear trend that the devices are getting smaller, lighter, and less obtrusive and more comfortable to wear.Although physiological measurement devices have been widely used in clinical settings for many years, some unique features of unobtrusive and wearable devices due to the recent advances in sensing, networking and data fusion have transformed the way that they were used in. First, with their wireless connectivity together with the widely available infrastructure, the devices can provide real-time information and facilitate timely remote intervention to acute events such as stroke, epilepsy and heart attack, particularly in rural or otherwise underserved areas where expert treatment may be unavailable. In addition, for healthy population, unobtrusive and wearable monitoring can provide detailed information regarding their health and fitness, e.g., via mobile phone or flexible displays, such that they can closely track their wellbeing, which will not only promote active and healthy lifestyle, but also allow detection of any health risk and facilitate the implementation of preventive measures at an earlier stage. The objectives of this paper are to provide an overview of unobtrusive sensing and wearable systems with particular focus on emerging technologies, and also to identify the major challenges related to this area of research.medical data using a first medical data collection appliance coupled to a network, the first appliance transmitting data conforming to an interoperable format, wherein the medical data is transmitted using a first wireless protocol;translating the medical data to a format compatible with a second appliance and sending the translated medical data to the second appliance using one of the first protocol and a second wireless protocol; andStoring data for each individual in accordance with the interoperable format.

II. EXISTING SYSTEM

A person performs daily activities at regular interval of time. This implies that the person is mentally and physically fit and leading a regular life. This tells us that the overall well-being of the person is at a certain standard. If there is decline or change in the regular activity, then the wellness of the person is not in the normal state.Elderly people desire to lead an independent lifestyle, but at old age, people become prone to different accidents, so living alone has high risks and is recurrent.

A growing amount of research is reported in recent times on development of a system to monitor the activities of an elderly person living alone so that help can be provided before any unforeseen situation happened.

A. PROPOSED SYSTEM

An intelligent home monitoring system based on wireless sensors network has been designed and developed to monitor and evaluate the well-being of the elderly living alone in a home environment. Wellness of elderly can be evaluated for forecasting unsafe situations during monitoring of regular activities. The developed system is intelligent, robust and does not use any camera or vision sensors as it intrudes privacy. Based on a survey among elderly we find that it has a huge acceptability to be used at home due to non use of the camera or vision based sensors. The intelligent software, along with the electronic system, can monitor the usage of different household appliances and recognize the activities to determine the well-being of the elderly.

III. ARCHITECTURE AND WORKING THEORY

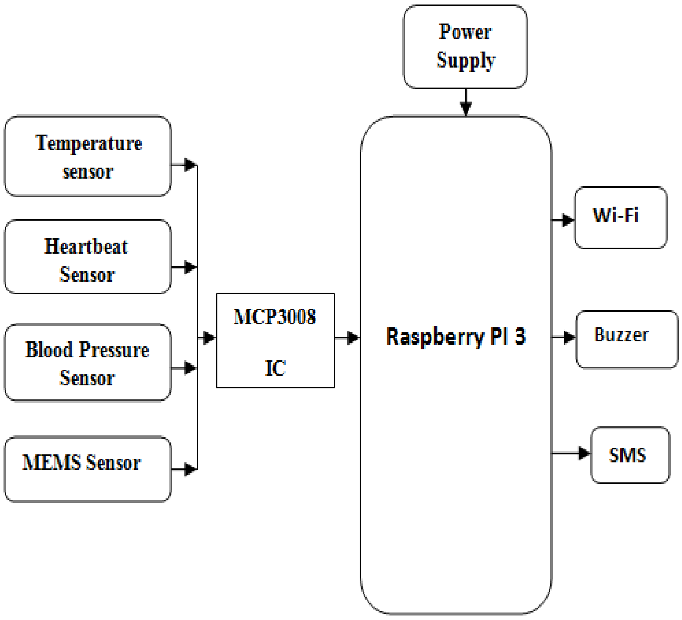


Fig.1: Block Diagram

A. MONITORING SECTION

The overall structure of the system consists of two important modules: i) Wireless Sensor Network (WSN) with WI-FI modules and ii) Intelligent health monitoring software system to collect sensor data and perform data analysis. Exploration of the sensor data involves measuring the wellness and detecting behavioural changes of an elderly. Fig.1 depicts the block diagram of the wellness measurement system. Block diagram of Computer Based Wellness Measurement system A. Design of the Sensing Units: The WSN setup used for monitoring smart home consists of fabricated electrical sensing units. These are installed at an elderly home to monitor their daily activity behaviour in terms of object usages and execute effectively process. The electrical sensing units connected to various household appliancesin this proposed system we implement a health monitoring platform such as temperature and in addition to this gives an alert message to caring persons or hospitals by using Wi-Fi technology.

Receiver section consists of Smartphone application or personal computer. The created web browser consists of sensor values.The project is implemented using the software tools like python language and PHP. In Python, project code is written to read and send the sensor values to the server and send to the receiver section.The block diagram consists of Raspberry Pi3 board is interfaced with the temperature sensor, blood pressure sensor, heartbeat sensor and MEMS sensors. A buzzer is connected for giving alert and in case if the temperature, blood pressure value exceeds the buzzer is on and Whenever MEMS value greater than given value the buzzer is on and it transmit to the PC through Wi-Fi. It will receive the sensor values and store into the data base. If any sensor value exceeds the limit it will indicate the corresponding person and given alert through a buzzer. Data are transmitted to the mobile phone through Wi-Fi.

IV. HARDWARE MODULES

A Raspberry Pi is a thirty five dollar, credit card sized computer board which when plugged into an LCD and attachment of a keyboard and a mouse, it is able to complete the functions of any regular PC can Like a PC, it has RAM, Hard Drive (SD Card), Audio and Video ports, USB port, HDMI port, and Ethernet port. With the Pi, users can create spread sheets, word-processing, browse the internet, play high definition video and much more. It was designed to be a cost friendly computer for users who needed one. There are two models, Model A and B. Model B is the faster containing 512MB of RAM as well as the ability to over clock.

Fig.2: Raspberry Pi 3

A. Temperature sensor

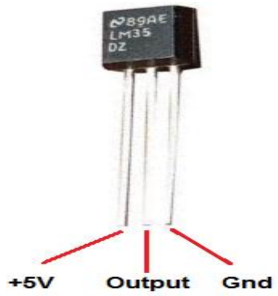


Fig.3: Temperature sensor LM35

TheLM35 pin diagram is shown in the fig.3. As a temperature sensor, the circuit will read the temperature of the surrounding environment and relay temperature to us back in degrees Celsius. The LM35 is a low voltage IC which uses approximately +5VDC of power. This is ideal because the arduino's power pin gives out 5V of power. The IC has just 3 pins, 2 for the power supply and one for the analog output. The output pin provides an analog voltage output that is linearly proportional to the celsius (centigrade) temperature. Pin 2 gives an output of 1 millivolt per 0.1°C (10mV per degree). So to get the degree value in celsius, all that must be done is to take the voltage output and divide it by 10- this give out the value degrees in celsius.

B. HEARTBEAT SENSOR

The Heartbeat Sensor provides a simple way to study the heart's function.This sensor monitors the flow of blood through ear lobe. As the heart forcesblood through the blood vessels in the ear lobe, the amount of blood in theear changes with time. The sensor shines a light lobe (small incandescent lamp) through the ear and measures the light that is transmitted. The clip can also be used on a fingertip or on the web of skin between the thumb andindex finger. The signal is amplified, inverted and filtered, in the box. Bygraphing this signal, the heart rate can be determined, and some details of the pumping action of the heart can be seen on the graph.Bloodflowing through the earlobe rises at the start ofthe heartbeat. This is caused by the contraction of the ventricles forcingblood into the arteries. Soon after the first peak a second, smaller peak isobserved. This is caused by theshutting of the heart valve, at the end of theactive phase, which raises the pressure in the arteries and the earlobe.

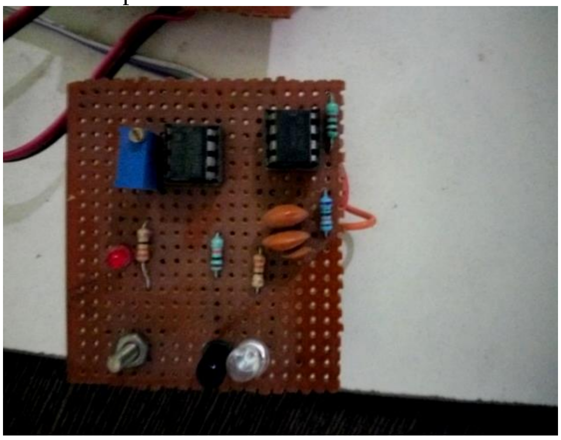


Fig.4: Heartbeat sensor

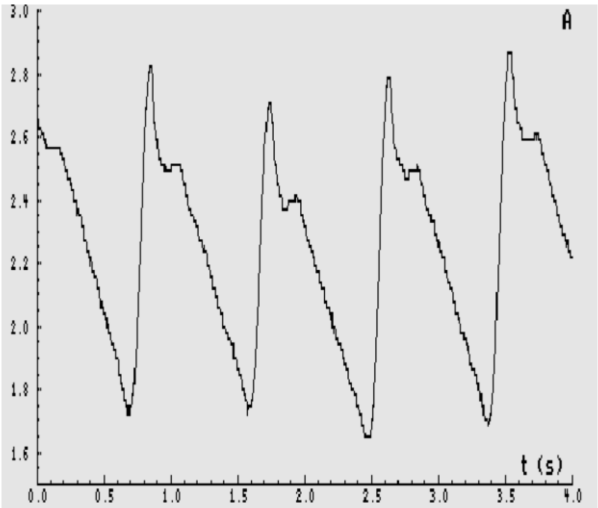


Fig.5:A sample measurement taken for the heartbeat sensor

C. **BLOOD PRESSURE SENSOR:**

The Blood Pressure Sensor is to design for to measure the human blood pressure through arteries and it is non-invasive sensor. The technique for utilizing the oscillometric for to measure the systolic, the diastolic and the mean arterial pressure. Blood Pressure Sensor is to be connected to the Sphygmomanometer that allows user to the monitor the blood pressure against through arteries for heart pumps**.** The pressure sensor measures the pressure sensor through the sensor. The force required to stop the fluid flowing for through the blood and it will be expanding and it calculates.

Fig.6: Sphygmomanometer

D. MEMS SENSOR

ME MSsensor is a powerful yet simple design and analysis tool for researchers, engineers and students working in the field of Micro Electro Mechanical Systems or MEMS. MEMS is a highly specialized inter-disciplinary field of engineering which engages in the development of micro mechanical sensors, actuators and other micro devices. Unlike some numerical analysis and finite element analysis software which require extensive programming skills and knowledge of the system to create a successful model, MEMS Solver has readymade models and its associated mathematics wrapped up into one ME Solver is used in some of the most technically advanced nations and universities and also in some of the least known nations in the MEMS technology map. ME Solver attempts to deliver MEMS knowledge and technology at affordablerates.The wearable sensor system, it is also called the Smart Wristlet and the fall detection service's has provides for 24hour. The system that collects the data to the multiple channels and it reflect the wearer's activity. MEMS accelerometer is used for to monitor the fall detection for the patients and by using this we can avoid risk for the patients.

The sensor is connected for the body when the patients will be fall down it will detect and send SMS to the doctor. In MEMS sensor have a 3-axis that contains the X, Y and Z axis. It will detect the feature 0 g at the 3 axis. The fall detection algorithm has threshold technique. MEMS accelerometer has a 3-axis acceleration signals. It generated high voltage and it is used to detect person fall and the signal will interrupt pin of microcontroller with high priority.

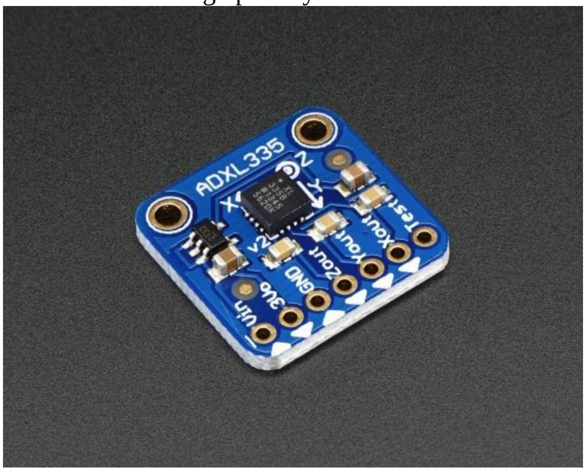
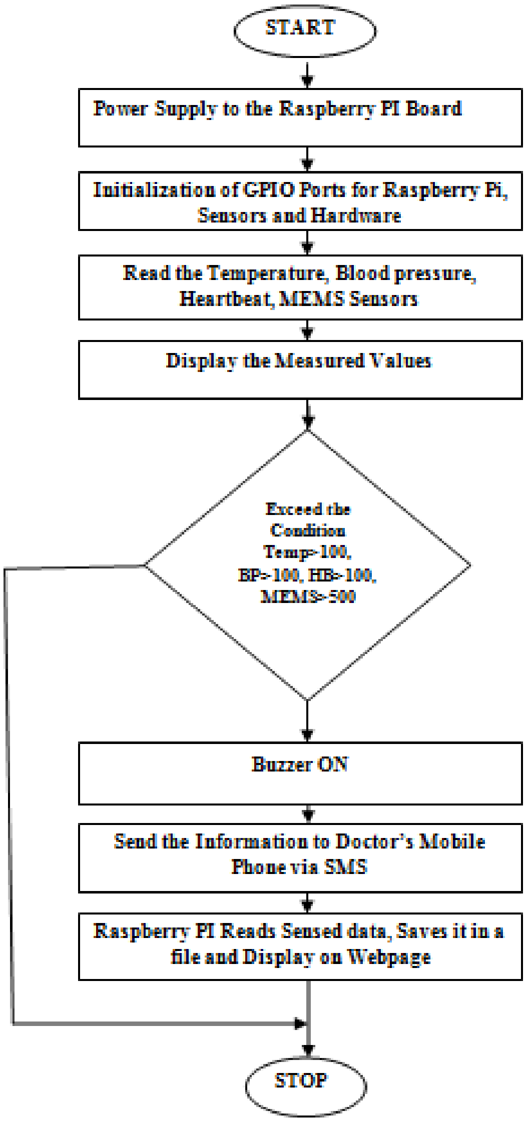


Fig.7: MEMS Sensor

E. **FLOWCHART OF THE PROJECT**



V. RESULTS

The below diagrams shows the health monitoring system hardware equipments, output sensors readings and shows the created webpage output on smart phone& PC.

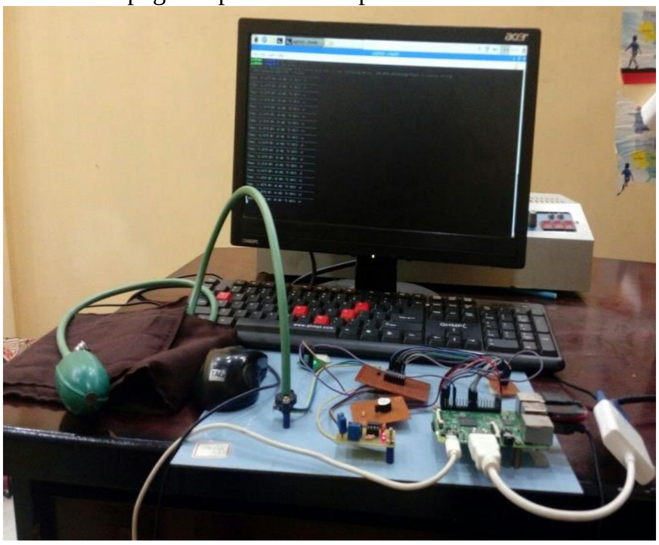


Fig.8: Project Setup

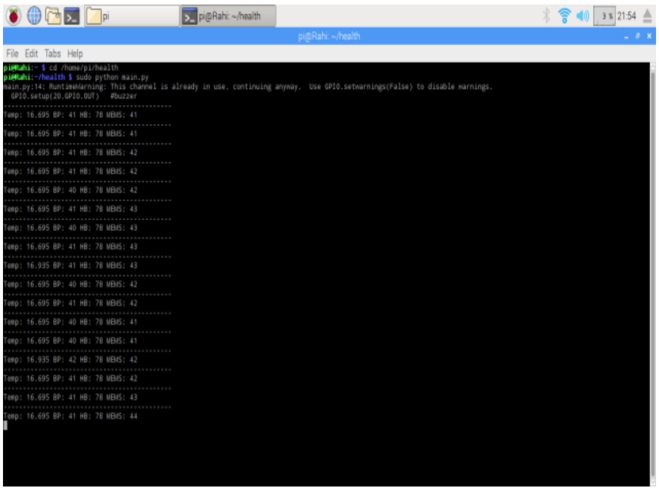


Fig.9: Pi Window when main code running

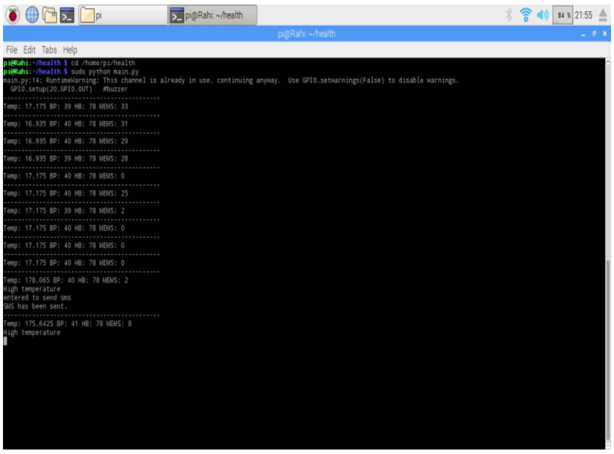


Fig.10: when the temperature is high

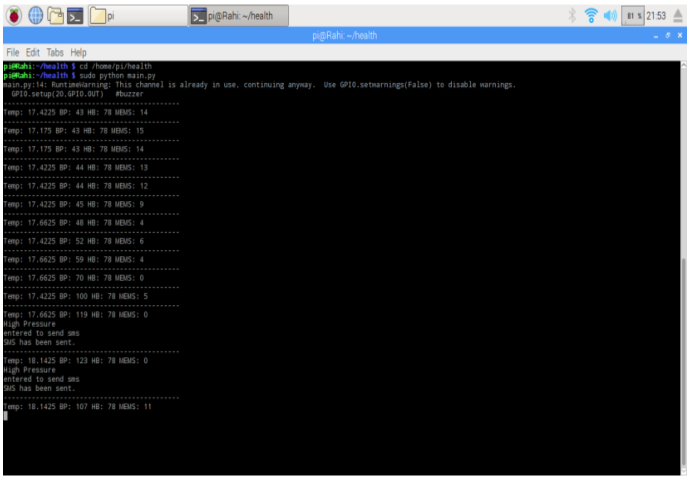


Fig.11: when high blood pressure

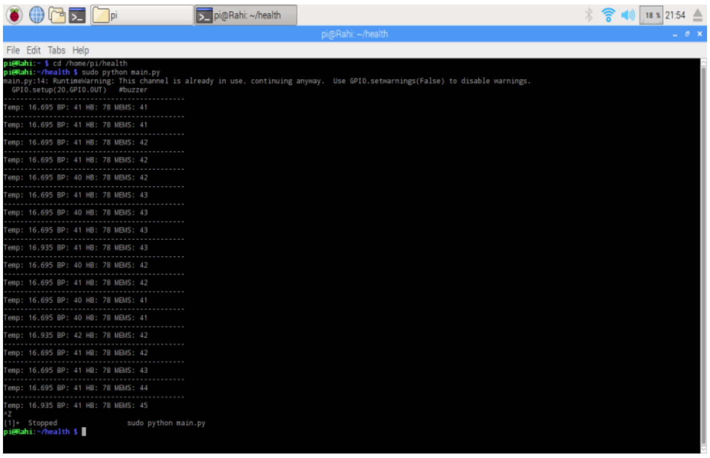


Fig.12: Heartbeat Sensor Reading

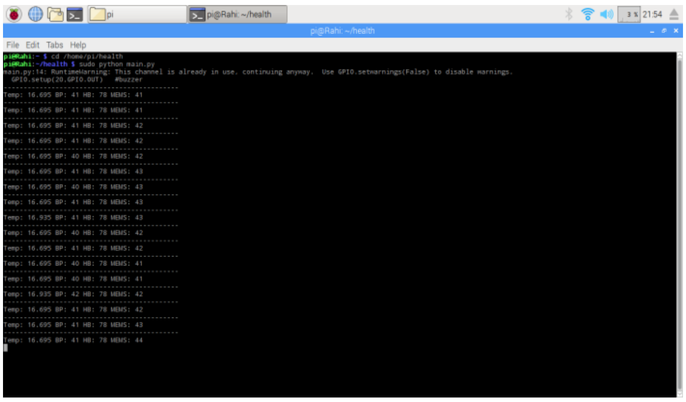


Fig.13: MEMS Sensor Reading

Fig.14: created webpage output on smart phone

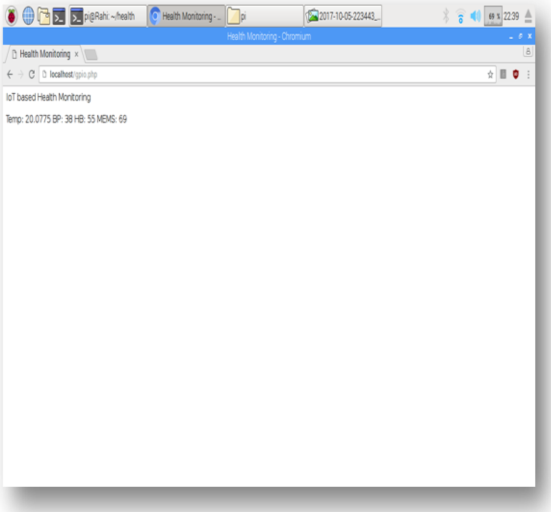


Fig.15: created webpage output on PC

VI. CONCLUSION

We presented an interactive embedded measurement of daily activities through usage of household appliances sensor data. Predicting the behaviour of an elderly person was based on past sensor activity durations. Combination of sensing system with time series data processing enabled us to measure how well an elderly person is able to perform their daily activities in real-time. So far, the forecasting process was able to rightly measure the wellness indices related to use of non-electrical appliances. Hence, some of the basic elderly daily activities such as sleeping, toileting, dining and relaxing are rightly assessed care takers and hospitals by the wellness measurement system., most of the electrical appliances usage durations are predefined; validation for activities such as preparing food is limited. However, additional data processing method such as sensor sequence activity pattern analysis was able to rightly measure the occurrences of activities such as preparing breakfast, lunch, dinner and snacks. The next step will be to devise a robust forecasting method including outliers in the wellness of old and ill people measurement and alerting system.

VII. REFERENCES

[1]. UN, “World Population Aging 2013,” 2013, pp. 8–10.

[2]. R. Weinstein, “RFID: A technical overview and its application to theenterprise,” IEEE IT Prof., vol. 7, no. 3, pp. 27–33, May/Jun. 2005.

[3]. P. Gope, T. Hwang, “Untraceable Sensor Movement in DistributedIoT Infrastructure,” IEEE Sensors Journal, Vol. 15 (9), pp. 5340 –5348, 2015.

[4]. P. Gope, T. Hwang, “A Realistic Lightweight Authentication ProtocolPreserving Strong Anonymity for Securing RFID System,” Computers& Security (Elsevier Journal), Vol. 55, pp. 271–280, 2015.

[5]. P. Kumar,and H. Lee, “Security Issues in Healthcare ApplicationsUsing Wireless Medical Sensor Networks: A Survey.” Sensors (Basel,Switzerland) 12.1 (2012): pp. 55–91.

[6]. D. Malan, T. F. Jones, M. Welsh,S. Moulton, "CodeBlue: An Ad-Hoc Sensor Network Infrastructure for Emergency Medical Care,"Proceedings of the MobiSys 2004 Workshop on Applications ofMobile Embedded Systems (WAMES 2004); Boston, MA, USA. 6–9June 2004.

[7]. K. Lorincz, D. J. Malan, T. R. F. Fulford-Jones, A. Nawoj, A.Clavel, V. Shayder, G. Mainland, M. Welsh, "Sensor Networksfor Emergency Response: Challenges and Opportunities", Pervas.Comput. vol.3, pp.16–23, 2004.

[8]. A. Wood, G. Virone, T. Doan, Q. Cao, L. Selavo, Y. Wu, L. Fang, Z.He , S. Lin, J. Stankovic, "ALARM-NET: Wireless Sensor Networksfor Assisted-Living and Residential Monitoring," Department ofComputer Science, University of Virginia; Charlottesville, VA, USA:2006. Technical Report CS-2006-01;

[9]. S. Pai, M. Meingast, T. Roosta, S. Bermudez, S. Wicker, D. K. Mulligan, S. Sastry, "Confidentiality in Sensor Networks: TransactionalInformation," IEEE Security and Privacy Magazine. 2008

[10].J.W.P. Ng, B.P.L Lo, O. Wells, M. Sloman, N. Peters, A. Darzi,C. Toumazou, G. Yang, "Ubiquitous Monitoring Environment forWearable and Implantable Sensors (UbiMon)," Proceedings of 6th International Conference on Ubiquitous