

Wearable Smart Shoe Technology for Health Fitness using IOT

Sayali Meshram¹

Student, Department of MCA, YMT College Of Management, Institutional Area, Sector -4, Kharghar, Navi Mumbai, Maharashtra 410210

Abstract - IOT technology nowadays is used for many purposes which make the user's daily life more comfortable. Internet of Things is actually the combination of multiple technologies, realtime analytics, machine learning, commodity sensors, and embedded systems. These physical devices are embedded with electronics, Internet connectivity, and other forms of hardware like sensors. These physical devices can communicate and interact with others over the Internet, and they can be remotely monitored and controlled.

Wearable Smart-Shoe technology which works with the help of IOT consists of embedded features like piezoelectric devices, Arduino, GPRS device (sends alert messages when tapped by foot when in danger). This paper focus on the use of Wearable Smart-Shoe technology for the health fitness purpose. Fitness ratio is calculated and transmitted from hardware component to android device and represented graphically.[1]

Keywords: Internet of Things (IoT), Wearable Fitness Shoe application, sensors, electricity generator, Bluetooth.

1. INTRODUCTION

Recent years have seen a rising in wearable sensors and today several devices are commercially available for personal health care and activity awareness. A recent health care system should give better health care services to people at any time anywhere in an affordable and patient friendly way. In the traditional way the doctors play the major role. For necessary diagnosis and advising they need to visit the doctor. There are two problems related to this approach. Now, Internet Of Things (IOT) has become one of the most powerful communication paradigms of the 21st century. In the IOT environment, all objects in our daily life become part of the internet due to their communication and computing capabilities. Heart rate is one of the fundamental physiological limits, essential for monitoring and diagnosis of patients.

Wearable technology is defined as any compact device, either in the form of a body sensor or head-mounted display, which provides a user information and allows user interaction via voice command or physical input. The purpose of this wearable physical device is to create convenient, portable and hands-free access to computers, thus facilitating or enhancing everyday tasks.

2. LITERATURE REVIEW

Hwang et al. [1] proposed a smart shoe technology design with embedded monitoring electronics system for health fitness applications. This system contains an integrated modern monitoring circuit that can provide fitness and health related information including coordinate tracker, step counter, calorie counter, and biomedical information such as foot oxygen concentration. Donkrajang et al.

[2] proposed a wireless technology of smart-shoe system for monitoring human Locomotion. The proposed smart shoes used zigBee wireless network with restricted scope of development, which are not connected with internet of things (IoT) functionality. As the new technology and requirement in wearable device are being increasing with respect to that the smart shoe, we would improvise the new IoT technology and integrated it into the smart shoe, which not only increase the efficiency of the shoe but also improve the tread of wearable devices. Smart shoe can calculate and analyze all the foot pressure that assists the elderly person to avoid from falling down. The entire smart shoe only checked on the pressure applied by foot on the shoe and these shoes are restricted to only few categories. It does not comes under daily wearable device so we are trying to create this device which not only wear by all age categories of people but also provide them with the information about their health and fitness with respect in addition to generating

Inspite of many researches being done on smart shoe application. Here, in this paper it is reviewed that the fitness data is being calculated and later on transmitted from hardware component to android device. This paper discusses the concept of wearable technology and how it is useful in daily life and how this technology makes the work easier for the user.

3. WORKING OF THE SYSTEM

This Wearable technology allows user to calculate all the daily activity like step count, calorie count, exercise count of the user using that wearable physical device. Accelerometer is responsible to count the total number of step and on the basis of total step count the Shoe application will count the distance, and total calorie burned. All the information retrieved by accelerometer will be send to the Arduino. Arduino will store all the information in hexadecimal format and send this information to android device by using Bluetooth system embedded in that shoe technology and the

user can access all the information in their smart phone using Wearable Smart Smart shoe application.

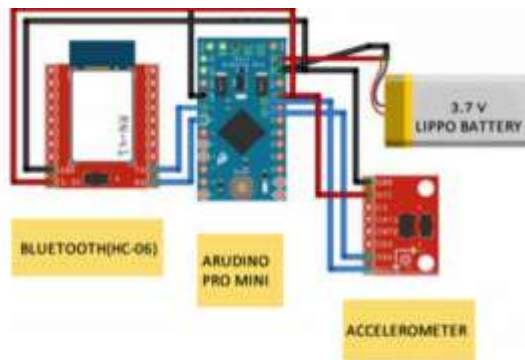


Fig-1: Wearable Smart shoe application

Piezoelectric device placed in the smart shoe sole on the top so that it will be pressed when a user walked around and the super-capacitor and USB external port is connected to the bottom of the shoe sole from USB port so that any user who is using that smart shoe technology can charge USB Devices.

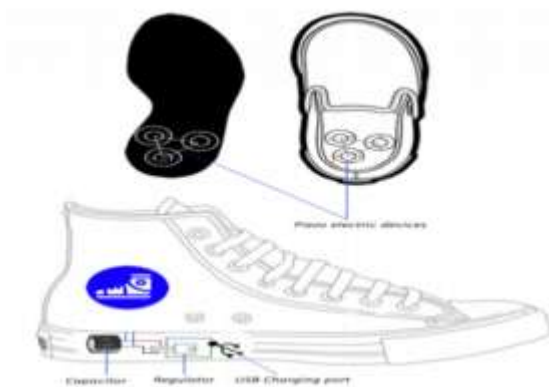


Fig-2: Shoe design with electricity generating and charging

GSM Safety Module is placed in right side of shoe which is being connected to a Arduino Uno board and a button is connected to the Arduino. If the button is pressed the for a while, the information of the user will be sent to various devices whose IMEI number is stored in the GSM module. The message received by the no of users consist of geographical location of the user or we can say patient and can be displayed in Google map.

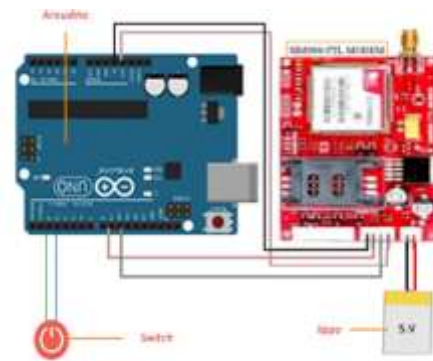


Figure 5 GSM safety module

Fig-3: GSM Safety module

4. The Role of Wearable Monitor for Health

October 2016 · Advances in Science and Technology

Wearable monitor for health care fitness was proposed in the late 1990s. Physiological monitoring in daily life has considerable potential for preventing and predicting diseases, without significant discomfort or inconvenience to the user. Over the past 25 years, wearable monitoring systems have been developed for health fitness in daily life.

5. SIGNIFICANCE OF RESEARCH

This technology is widely used nowadays that is IOT. But the wearable device technology is not used or we can say not completely developed in India. In other countries it is used at a larger rate. Wearable technology nowadays in modern generation are called as incorporating a microprocessor and an internet connection. Here in this paper it is shown how the wearable technology works and how it useful in today's modern generation. Here in this paper we have explained the wearable smart shoe technology using IOT. Also this wearable device technology counts the step counts, exercise count and shows how fit that person is.

6. RESEARCH METHODOLOGY

In this research paper IOT technology is used. This wearable smart shoe technology contains the following embedded systems:

Arduino: It is an open source physical computing platform based on simple I/O board and a development environment that implements the wiring language. Arduino is a system that read analog signals from the pulse and temperature sensors and creates the data packet to convert the signals into digital form.

GPRS: GPRS device (sends alert messages when tapped by foot when in danger).

Bluetooth: Bluetooth module and the user can access all the information in their smart phone using Smartshoe application

Piezoelectric device: Piezoelectric devices will be placed in the shoe sole on the top

Table -1:

Location	2015	2016	2017	2020
Asia Pacific	30.4	99.8	155	194.67
Central and Eastern Europe	5	17.5	28	45.85
Latin America	1.83	12.6	18	26.08
Middle East and Africa	4.09	14	21	25.42
North America	38.65	127.1	217	180.96
Western Europe	16.5	54.3	88	127.64

Friday	15771	437	97	27
Saturday	13305	369	143	43
Sunday	15328	412	163	48

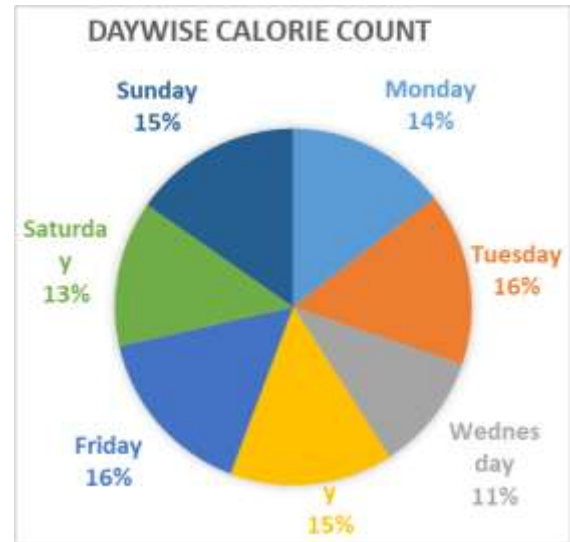


Chart -2: Day wise calorie count

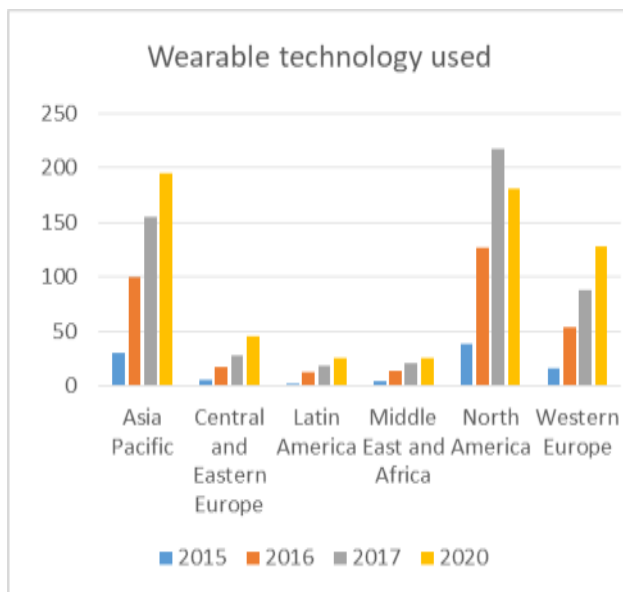


Chart -1: Country wise sale of wearable device for the year

Table -2:

location	Step count	Step calorie	Exercise calorie	Exercise duration
Monday	14547	390	120	37
Tuesday	15776	434	108	31
Wednesday	10731	294	127	36
Thursday	14834	401	79	26

7. CHALLENGES

The most important challenge was to monitor the progress of the plans adopted by the patients. In most cases, the patient will start with a plan and give up in the middle. The important challenge is to motivate the patients to continue through the plan workout.

Also the challenge is to show the proper calculation of the fitness ratio which may contain the step count.

The technology should display proper readings of that wearable device.

8. REQUIREMENT

The patients wanted an wearable device application for healthcare fitness institutions providing health fitness for the elderly patients, which will help these organizations to reduce their operational costs. The application should be able to count the health fitness parameters of patients recorded using wearable devices.

9. BENEFITS

We integrated numerous IoT medical diagnostics devices available in the market that help in monitoring blood pressure, glucose level, pulse rate, weight and other health parameters. We also configured mobile devices (like Chumby) in order to handle various use cases of the elderly patients. We developed an application that integrates all these devices (mobile application and wearables) and provides a dashboard that displays the medical statistics for the elderly.[2]

10. SOLUTION

This wearable smart device application helps the users or we can say patients to reduce the number of home visits. This in turn reduces their operational costs. Health parameters recorded by any devices are now updated instantly in the application used by doctors. Physicians could monitor patient conditions remotely and suggest appropriate medicines. Data is secured at higher rate and kept confidential. Doctors can view consolidated reports on each individual without any time delays. Using this wearable technology that consists in IOT, the work becomes easier and the following result or output is displayed faster.

11. RESULT

Wearables, with the help of improved technology have been developed greatly and considered reliable tools for long-term health fitness monitoring. These are applied in the observation of a large variety of health monitoring indicators in the environment, vital signs and fitness.

12. CONCLUSION

The Wearable device Smart-Shoe technology is in higher demand by the consumer market with its no of various features embedded in it. The proposed system consists of embedded features as: 1) piezoelectric devices 2) Arduino 3) GPRS device (sends alert messages when tapped by foot when in danger). In this paper, we demonstrated how the fitness data can be calculated and later transmitted from hardware component to android device in forms of graphical and normal data representation. In the future, extending multi-functional Smart Shoe related applications can be created.

13. REFERENCES

- [1].Tehrani K. Wearable Technology and wearable devices: Wearable Magazine 2014. See <http://www.wearabledevices.com/what-is-a-wearable-device/> (last checked July 2015).
- [2]. Ortega G, Wolf A, Baumgaertner M and Kendoff D Usefulness of a head mounted monitor device for viewing intraoperative fluoroscopy during orthopaedic procedures. *Archiv Orthopaedic Trauma Surg* year 2008; 128: 1123-1126
- [3] Hwang, Po-Yu., Chia-Ching Chou, Wai-Chi Fang, Ching-Ming Hwang, Smart shoes design with embedded monitoring electronic system for healthcare and fitness applications, *Proc. IEEE International Conf. on Consumer Electronics*, Year 2016, 1-2.
- [4] Donkrajang, W., Watthanawisuth, N., Mensing, J. P., Kerdcharoen, T., A wireless device smart-shoe system for monitoring human locomotions, *Proc. IEEE International Conf. on Biomedical Engineering*, Year 2011, 54-58.

[5]Andrean Gatto, Emanuele Frontoni, Energy Harvesting system for smart shoes, *Proc. IEEE International Conf. on Mechatronic and Embedded Systems and Applications*, year 2014, 1-6.

[6]Tnreenet Thepudomn, Thara Seesaardan, Wathang Donkrajang, Teerakiat Kerdcharoen, Healthcare shoe systems for gait monitoring and foot odor detections, *Proc. IEEE International Conf. on Consumer Electronics*, year 2013, 81 - 82.

[7]Kyoungchul Kong, Masayoshika Tomirzuka, Smooth and continuous human gait phase detection based on foot pressure patterns, *Proc. International Conf. on Robotics and Automation*, Year 2008, 3678 - 3683.

[8] V. Uma Maheswari, S. Shoba Rani, D. Divakara Reddy, B. Lakshmi, E-Bazaar Innovation Using Iot Device in Cloud Subscription Management. *International Journal of Civil Engineering and Technology*, 8(8), year 2017, pp. 1155-1158

[9] B. Durga Sri, K. Nirosha, P. Priyanka and B. Dhanalaxmi, GSM Based Fish Monitoring System Using IOT, *International Journal of Mechanical Engineering and Technology* 8(7), year 2017, pp. 1094-1101.

[10] Hariharr C Punjabi, Sanket Agarwal, Vivek Khithani, Venkatesh Muddaliar and Mrugendra Vasmatkar, Smart Farming Using IoT, *International Journal of Electronics and Communication Engineering and Technology*, 8(1), year 2017, pp. 58-66.

[11] S. Nithya, Lalitha Shree, Kiruthika and Krishnaveni, Solar Based Smart Garbage Monitoring System Using IOT, *International Journal of Electronics and Communication Engineering and Technology*, 8(2), year 2017, pp. 75-80

14. BIBLIOGRAPHY

A Guide to the Internet of Things Infographic (from INTEL):

<http://www.intel.com/content/www/us/en/internetof-things/infographics/guide-to-iot.html>

An Executive's Guide to the Internet of Things Infographic(from Forbes): <http://www.forbes.com/sites/baininsights/2016/05/19/an-executives-guide-to-the-internet-of-thingsinfographic/#5b2fcc3f239>

Burrus, Daniel, "The Internet of Things is Far Bigger than Anyone Realizes," *Wired Magazine*, at <http://www.wired.com/insights/2014/11/the-internet-of-things-bigger/>