Health Prediction Using Wearable Technology

Wearable Technology, wearable, fashionable technology, wearable gadgets, tech togs, or fashion electronics are smart electronic devices (electronic device with micro- controllers) that can be incorporated into clothes or worn on the body as implants or accessories. Wearable Technology is a sweeping term for gadgets that can be worn on the body, either as an accessory or as part of material used in clothing. There are numerous kinds of wearable innovation yet probably the most prominent gadgets are action trackers and Smart Watches. One of the real highlights of wearable innovation is its capacity to connect with the internet, allowing data to be transferred between a system and the gadget. This capacity to both send and receive information has pushed wearable technology to the front line of the Internet of Things (IoT). This paper discusses about the changing technological advancements happened in the past decade and how the technology of Wearable Smart Watches changed from being a bunch of Fashion accessories to an important Health Care Equipment. In this paper I have also discussed about how we can predict a disease using a prediction algorithm and merging it with the Wearable Technology such as Smart Watches.

Introduction

Wearable technology (also called wearable gadgets) is a classification of technological gadgets that can be worn by a customer and frequently incorporate following data identified with well-being and wellness. Other wearable tech gadgets include devices that have small motion sensors to take photos and sync with your mobile devices. The Health Care industry has got a huge benefit and a wide variety of opportunities with the introduction of these wearable gadgets such as the Fit-bit, Xiaomi Mi Band etc. These Wearable Smart bands allows their users to track their Heart Rate, calculate steps, and also connects to their Smart Phones providing the Notification Alert features. Talking about Health Care, these gadgets can also keep a track of your sleep and sleeping pattern. Therefore, the concept to Health Prediction can be really beneficial for the upcoming generations. Looking at the Sleeping habits and eating preferences of today’s generation, if there is a device on their wrists which reminds them of their Sleep time and what to eat and what food to avoid, this may bring a huge change in the lifestyle of the people. Making use of a Health Prediction Algorithm and Implementing that concept in these Smart Watches, where the User’s Heart Rate, Sleep Pattern and Steps are Calculated and analyzed and based on that analysis, there is a predictiondone using the Algorithm which tells the user what all diseases he/she may catch in future, if they continue this type of a lifestyle.This type of technology will make the present as well as the future generations more health conscious and therefore the practice of unhealthy food consumptions and bad habits can be stopped.

Related works

Wearable Medical Monitoring Systems Based on Wireless Networks.

Ting Liang and Yong J. Yuan have surveyed that the last decade has witnessed a rapid increase of interest in new sensing and monitoring devices, including wireless wearable mobile devices and sensing networks for medical health applications. Their paper states that s current

wear- able mobile medical monitoring systems (WMMMSs) with emphasis on devices based on textile and wireless sensing networks. These monitoring systems consist of various types of small physiological sensors, transmission modules, and processing capabilities. Also they have suggested that in addition, WMMMSs have a potential to change the health care model by providing inexpensive wearable unobtrusive solutions for continuous medical health monitoring. In their paper a great number of system implementations are compared according to different classifications. Besides, their systems also act as an effective approach to identify the technological advantages and disadvantages of the current state-of-the-art in wearable devices solutions. According to their research and projects that had been discussed, WMMMS have the potential to revolutionize healthcare by providing low-cost solutions for ubiquitous, real-time, unobtrusive mobile health monitoring.

Enhancing Physical Education with Exergames and Wearable Technology

Renny Lindberg, Jungryul Seo (et. Al.) have surveyed that Increases in the numbers of obese and over- weight children are a major issue in post-industrial societies because obesity can lead to severe health-related problems. In addition, many challenges affect the quantity and quality of physical education (PE) provided by schools. They came up with a concept of Exergame that combine exercise with gaming have been recognized as a possible method for motivating children to become physically active and to makePE more fun. Furthermore, Exergame that utilize wearable sensors devices allow players' movements to be tracked for estimating the efficiency of exercise. In this study they developed a game the Running Othello 2 (RO2) Exergame, where players wear a smartphone and a smart wrist band to compete in a board game enhanced with physical and peda- gogical missions. In physical missions, the game uses inertial sensors and a heart rate meter to detect the physical activities of players. The pedagogical part of the game is based on the South Korean PE curriculum. They evaluated RO2 with61 South Korean third grade elementary school students, out of which 32 learned Curriculum topics by playing the game. Rest of the 29 students comprised a control group who studied the pedagogical content using handouts. The results indicated that learning with RO2 was more efficient, the players were engaged, and their heart rates increased.

Finally, we discussed how RO2 supports the educational affordances of wearables and they explained how exergames using wearables can overcome some of the challenges faced by PE. They finally concluded that the learning effect was stronger with the game than the traditional studying method, but the longitudinal learning effects of the game still need to be verified. Improvements can be made to the study design and the system employed, but our results may be useful for educational technology researchers and PE experts who are interested in combining wearables, educational content, and gaming.

Integration of wearable devices in a wireless sensor network for an E-Health application

Pedro Castillejo, Jose´-Ferna´n Mart´?nez (et. Al.) has surveyed that Applications based on Wireless Sensor Networks for Internet of Things scenarios are on the rise. The multiple possibilities they offer have spread towards pre- viously hard to imagine fields, like e-health or human phys- iological monitoring also an application has been developed for its usage in scenarios where data collection is applied to smart spaces, aiming at its usage in firefighting and sports. This application has been tested in a gymnasium with real, non-simulated nodes

and devices.

A Graphic User Interface has also been implemented to suggest a series of exercises to improve a sportsman/woman s condition, depending on the context and their profile. They concluded that this system can be adapted to a wide variety of e-health applications with minimum changes, and the user will interact using different devices, like smart phones, smart watches and/or tablets. In this article they have presented some feasible e- health application scenarios based on a WSN: one is for firemen/women monitoring, and the other one for sports performance in an indoor scenario as a gymnasium. With the data and the user's profile, the application suggests to the user a series of exercises to improve his or her fitness condition. If a hazardous level of any vital parameter is reach (e.g.: heart rate), an alarm is issued and alerts the user to stop doing the exercise.

Study on the Use of Wearable Devices to Control Objects in Virtual Reality

Hsin-Fu Chien , Nien-Tsu Hu (et. Al.) Have surveyed on the design of a wearable inertial navigation device that is based on a MEMS chip and a Bluetooth wire- less transmitting module and that uses the object-controlling technology of the Unity game engine to write a game script for a treasure hunt in an ancient Chinese virtual reality world. The wearable device proposed in this paper utilizes an ATmega168 chip as the main controller, which cooperates with a three-axis accelerometer and gyroscopic sensor to detect the forward, backward, and rotating movements of game players. They concluded that the purpose of their study was to use an eight-bit RISC microcontroller chipset to detect the actions of game players and use motion-sensing interaction technology to control 3D character models in virtual reality. In the study, they also used an electronic compass to detect the directions of rotation of the players and utilized a three-axis accelerometer to detect the movements of the players.

Wearable Medical Devices- Design Challenges and Issues

D.Hemapriya, Pavithra Viswanat (et. Al.) Have surveyed that A Wearable Medical Device is defined as a device that is autonomous, non-invasive and that performs a specific medical function such as monitoring or support over a prolonged period of time The term wearable implies that the device is either supported by the human body or clothing. This decade has seen a tremendous growth in the use of wearable medical devices and these fall into three categories namely, wearable monitoring devices, wearable rehabilitation devices and wearable medical aids. Their paper focuses on the design issues and challenges for wearable medical devices which will be available in the market for people to purchase and use them. Health care and related services are growing by leaps and bounds in terms of introduction of sophisticated equipment's in hospitals, health care training and expertise, more emphasis on R & D in Medical technology and improvised infrastructure in hospitals. They have also attempted to give an awareness to the engineering fraternity about wearable devices and the challenges ahead.

Methodology

The Methodology used is based on an experiment made using some sensors and wearable devices. The Data set used to analyze, comprises of body motion and vital signs recordings for

ten volunteers of diverse profile while performing 12 physical activities (Table 1). Shimmer2 [BUR10] wearable sensors were used for the recordings. The sensors were respectively placed on the subject's chest, right wrist and left ankle and attached by using elastic straps (as shown in the figure in attachment). The use of multiple sensors permits us to measure the motion experienced by diverse body parts, namely, the acceleration, the rate of turn and the magnetic field orientation, thus better capturing the body dynamics. The sensor positioned on the chest also provides 2-lead ECG measurements which are not used for the development ofthe recognition model but rather collected for future work purposes. This information can be used, for example, for basic heart monitoring, checking for various arrhythmias or looking at the effects of exercise on the ECG. All sensing modalities are recorded at a sampling rate of 50 Hz, which is considered sufficient for capturing human activity. Each session was recorded using a video camera. This data set is found to generalize to common activities of the daily living, given the diversity of body parts involved in each one (e.g., frontal elevation of arms vs. knees bending), the intensity of the actions (e.g., cycling vs. sitting and relaxing) and their execution speed or dynamicity (e.g., running vs. standing still). The activities were collected in an out-of-lab environment with no constraints on the way these must be executed, with the exception that the subject should try their best when executing them.

Using the above Box Plot Analysis we can predict the whole data set, like the Maximum Value in the given Data Set is 2.41 and the Minimum Value is 1.29, and the Quartile Deviations are Q1: 1.71 , Q2: 1.89 , Q3: 2.09 respectively.Fig. 2. Line Diagram of Acceleration from the left-ankle sensor from X axis and Z axisAs we can see that the 2 sensors placed at the Left Ankle of the volunteer from 2 different axis have given the above results. Where the Blue line represents the X axis and Orange Line represents the Z axis. Looking at the Line Graph, we can clearly say that the sensor on the Left Ankle when observed from the X axis gave higher output than when observed from the Z axis.

Conclusion

In this Paper we have seen how that evolution of Wearable Gadgets like Smart Watches and Fitness Bands have changed the face of Health Care industry now. The Fitness Bands keeping a track of almost every activity we do in our everyday lifestyle. In this paper we have proposed that using the technology of Wearable Gadgets along with the Prediction Algorithms for various diseases, we can predict a person's lifestyle and what kind of disease he/she is about to catch in their future. In the future there is a huge scope of this technology and even further research can be done in this area for further advancements. Thus, we can conclude that Predicting diseases with the help of Wearable technology will make people healthier and fit in the future.