Smart Watch for Health Monitoring

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ABSTRACT: Wearable technology is a broad term that refers to any device that may be used to monitor humans or animals. Wearable devices, device sensors, Bluetooth, Zigbee, 3G/4G/5G communication protocols, cloud computing, data fusion methods, and large-scale data are all included. One of the uses of wearable technology is smart watches, which are progressively becoming a popular device. A smart watch is a computerized wristwatch that becomes better with time. Many smart watches have been created, however they all have certain limitations, such as networking, cost, and display unit, which are the main issues with these smart watches. To address these issues, the researcher suggested this cutting-edge smart watch. Voice recognition system, alert system, LCD display screen, controller, and different sensors such as temperature sensor, blood pressure sensor, accelerometer, humidity sensor, and pedometer are all included in this gadget. This device is both functional and affordable, allowing individuals to buy it for themselves and their children. This gadget is very useful in an emergency since it shows temperature, blood pressure, and other vital information on the screen. These timepieces have a promising future since they may be further customized by incorporating new technologies and mechanics.

KEYWORDS: Blood Pressure Sensor, Global Positioning System, Humidity Sensor, Smart Watch, Temperature Sensor.

1. INTRODUCTION

Wearable refers to anything that can be readily and appropriately worn by humans. Wearable technology has an impact on people's daily lives [1]. On a daily basis, people do a variety of activities, including making choices, eating, studying, walking, and interacting with others. New technology is used in many aspects of our lives, such as communication (through social media) and buying (through e-commerce websites). Wearable technology refers to electronic gadgets that are connected to the body or incorporated into equipment that serve to enhance our daily lives. The IBM Linux watch was the first smart watch (SW) to be released in 2000. Over the last fifteen years, SWs have improved and expanded their capabilities. Pebble Smart-watch was first launched in 2012 on a website with various financing sources, and it has been gaining popularity in the popular media ever since. Over the past two years, more than 20 SWs have been launched, and the Apple Watch is expected to be unveiled in early 2015.

Smart watches may also be used to promote healthcare by including various sensors within the device [2]. In-person surveys may assist uncover patterns of behavior by allowing self-monitoring of personal activities, receiving feedback based on activity measurements, and promoting bidirectional contact with health care professionals and family members. In-service watches have the potential to make healthcare more accessible to people in their daily lives. Intelligent timepieces, on the other hand, are a newer technology that is still being researched. Watches were originally solely used to keep track of time. However, a smart watch is today a computer-enhanced wristwatch with features that go beyond timekeeping. Early versions can do basic tasks like calculations, translations, and games, but today's intelligent watches are fully functional computers [3]. Watches have undergone many changes as a result of sensor and new technology adaptation. However, smart watches, like any other technology, have certain difficulties, such as networking, energy and heat, display, and mobile input, to name a few [4].

Researchers created this gadget to address these issues. Sensors such as humidity, temperature, blood pressure, and pedometer, as well as a controller, LCD display screen, voice recognition system, and an emergency button, are all included in this gadget. This gadget is both effective and inexpensive. This is something that even low-income people can afford. Mobile phones may be used to control this gadget. The networking, display input, and power issues are all addressed by this device. These smart watches are extremely useful in the present COVID-19 scenario since they can be used to show the user's temperature, blood pressure, and calories by using different sensors.

2. LITERATURE REVIEW

Matin Kheirkhahan et al. discussed about a framework based on smart watches for real-time and mobility monitoring [5]. In order to convey your health information in real time, smartphones and smart watch technology transmits and monitor landscapes to patients and research participants. Smart-watches include a range of sensors for physical activity and location data collection. This combination enables the collected data to be transmitted to a remote server and so the physical activity and social activity may be monitored in real time. The aim of this project was to build an intelligent monitoring system for Real-time online assessment mobility evaluation and monitoring. A wristwatch application and server will be included in the proposed ROAMM framework.

Andre Henriksen et al. researched an analysis of Consumer wrist-worn wearable's using Fitness trackers and smartwatches [6]. The consumer market releases new fitness trackers and smartwatches each year. These gadgets have diverse sensors, algorithms and mobile applications. In addition to current methods for the recovery of health data in research, the data acquired in private may be combined with recent advancements in mobile sensor technology. In addition, data acquired from such devices can be used in the diagnosis and treatment of patients. An overview of device sensor support and device applicability in research projects is required with a growing number of different brands. In this paper, the author proposed an analysis of wrist worn wearable's by using various fitness trackers that are given to various people.

Rasha M. Al-Eidan discussed a review on Wearable wrist-worn [7]. Wearable equipment must be described as equipment integrated in clothing, watches or accessories. Wrist-worn gadgets have become prominent among other wearable devices as a kind of wearable device. This article contains a thorough investigation of wearable computer technology as an area of research, and a methodical examination of current work especially on wearable braces. This study focuses on wearable, wrist-wearing studies since systemic literature reviews in this field are not available. The literature reveals that wearable research covers three areas, namely user interface and interaction studies, user studies and studies of activity/impact recognition. This study ends with obstacles and open directions for investigation.

Research Questions:

- How this gadget is better than the existing smart watches?
- What components are used in this smart watch? Explain.

3. METHODOLOGY

The primary goal of this article is to create a smart wearable device that can perform various functions. Temperature sensor, Humidity sensor, Blood Pressure monitoring, Steps measuring sensor (Pedometer), Heart Beat measurement sensor, Accelerometer, LCD display screen, Controller, Emergency Button, and Alert system are all included in this device.

3.1 Design:

The block diagram of various components utilized in smart watches is shown in Figure 1. Photovoltaic cells offer power/energy to the whole system since solar radiation may be directly transformed into electrical energy. The temperature of the environment is measured using a temperature sensor. The blood pressure is monitored using a Blood Pressure Sensor. An emergency button is located on the device's side. If an issue happens, pushing the button will alert the hospital and police departments. A controller will be in charge of collecting all of the data given by the various components and displaying it on the LCD display panel. A voice recognition system is placed in this gadget so that the user may interact with it and provide instructions such as playing music. Figure 2 depicts the functioning flowchart of several components.
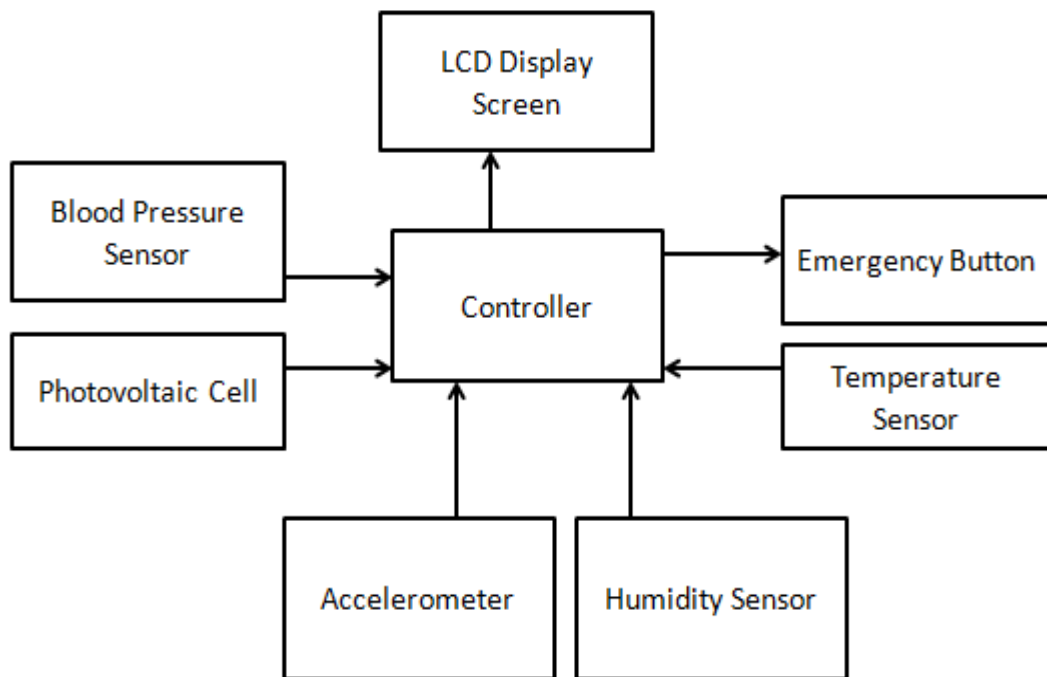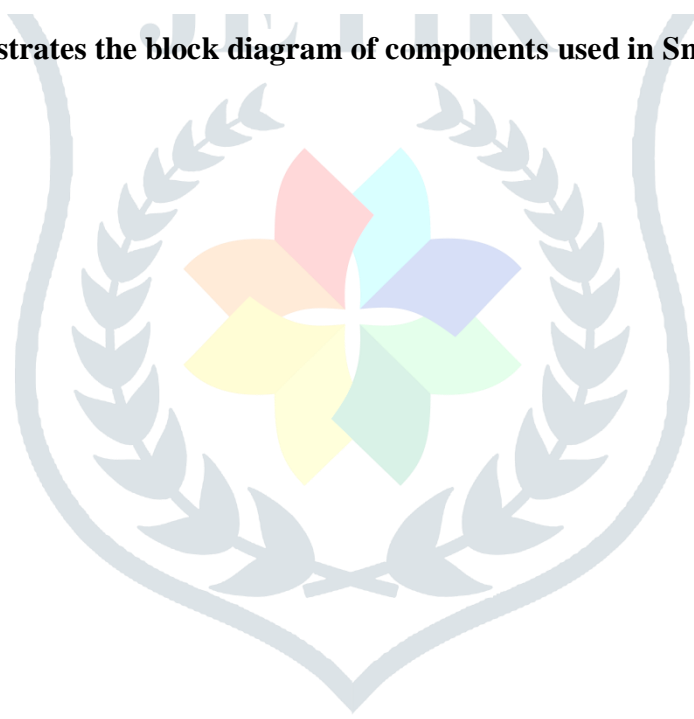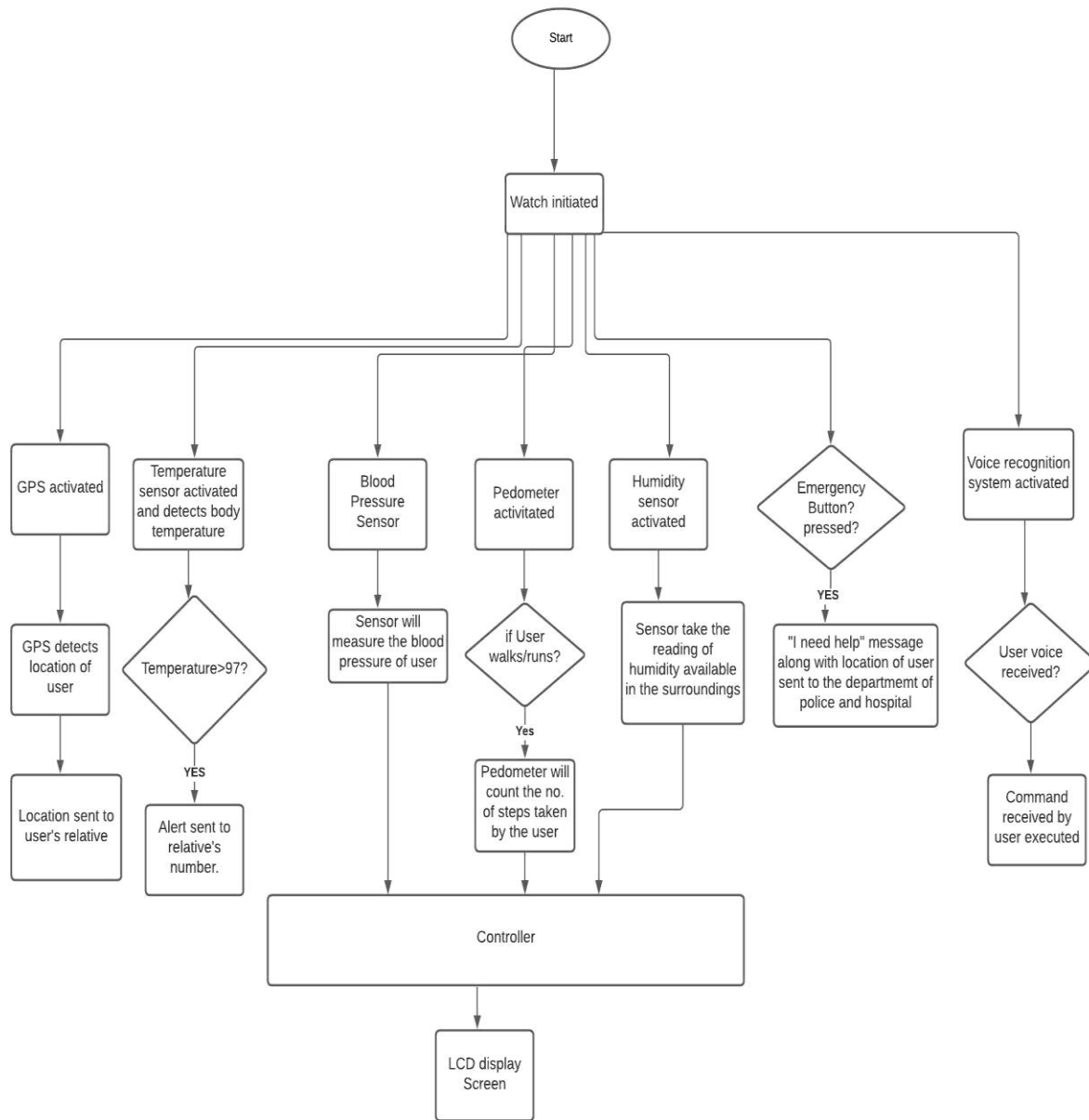
Figure 1: Illustrates the block diagram of components used in Smart Watches.

Figure 2: Illustrates the working flowchart of all the components of Smart Watches.

3.2   Instruments:

i.   *Controller:* A controller is in charge of presenting all of the data, such as blood pressure, temperature, number of steps taken each day, and so on, which is supplied by different sensors. When the emergency button is pushed, it also sends signals to the police department and the hospital. Figure 3 illustrates the module of controller used in this system.

**Figure 3: The above diagram shows the module of Controller used in this device** [8]**.**

ii.   *Blood Pressure Sensor:* Blood pressure is measured using a blood pressure monitor and a non-invasive method. It resembles a sphygmomanometer, except instead of a mercury column, a pressure sensor is used to monitor blood pressure.

iii.   *Pedometer:* Pedometers are designed to detect vertical movement in the hip, allowing the number of steps to be counted and a distance to be calculated [9]. It is installed within the device and sends data to the controller, who then displays it on the LCD display screen as shown in Figure 4.

Figure 4: The above diagram shows the no. of steps counted by pedometer [10]**.**

iv.   *Photovoltaic cells:* A solar cell, also known as a photovoltaic cell, is an electrical device that converts light energy directly into electricity via a physical and chemical process. These cells are in charge of the device's power supply.

v.   *Temperature sensor:* A temperature sensor is a device that measures the temperature of an object. This may be the temperature of the air, the temperature of a liquid, or the temperature of a solid. A temperature sensor is installed within this gadget, and it is used to detect the user's temperature. If the user's temperature exceeds the specified temperature, an alarm is sent to the user's relative.

vi.   *Humidity Sensor:* It's a device that detects and measures water vapour. Based on our robust, capacitive technology, these humidity detectors provide accurate dew point and absolute humidity readings by integrating relative humidity (RH) and temperature (T) data. Figure 5sss depicts the humidity sensor module utilized in this device.
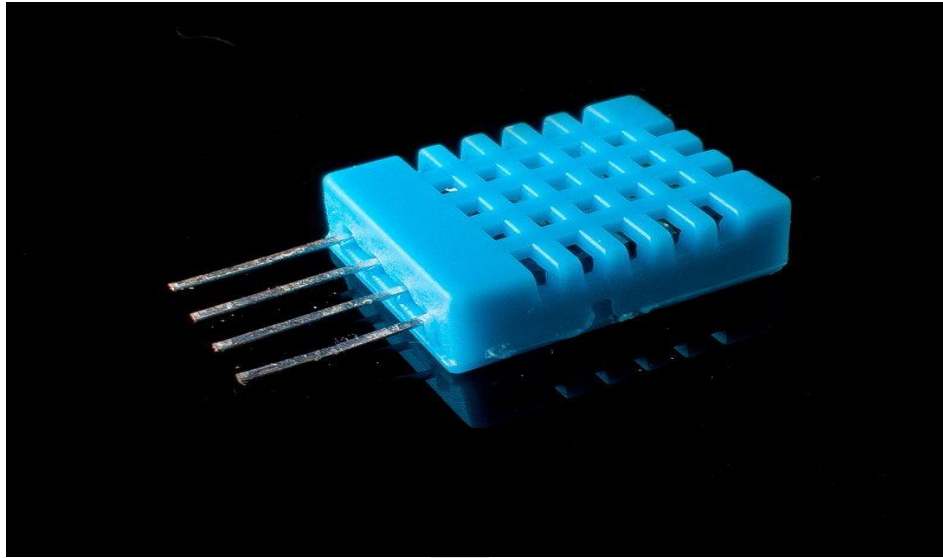
Figure 5: Illustration of the module of humidity sensor used in this device [11]

vii.   *Emergency Button:* In this device, an emergency button is provided to notify the departments of police and health if any incident occurs. This button is placed at the right side of the watch.

viii.   *LCD display Screen:* A LCD display Screen is responsible to show different functions like Blood pressure, no. of steps done in a day, heart rate, time etc. to user.

ix.   *Global Positioning System (GPS):* GPS is a 30+ satellite around the Earth navigation system. We know where it is because it sends out signals continually. These signals are listened to by a GPS receiver on your phone. When the recipient estimates its distance from four or more GPS satellites, it can see where it is.

3.3   *Data Analysis:*

When the watch is turned on, all of the sensors and other components are turned on. The temperature sensor will detect the user's body temperature, and if it is higher than the specified temperature, an alarm will be sent to the user's relative with its position. The blood pressure and humidity sensors will monitor the pressure and humidity in the environment and send the results to the controller. When the user begins walking or running, the pedometer activates and begins counting the number of steps done by the user. The sensor will then transmit its data to the controller. When the emergency button is pushed, an alarm is sent to the police and medical departments. The gadget has a speech recognition system installed so that the user may command it. When all of the data has been delivered to the controller, the controller will show it on the LCD display screen.

4. RESULTS AND DISCUSSION

In the day-to-day lives of people, smart watches play an essential role in monitoring a variety of health indicators. People nowadays are much too preoccupied with their health problems, which are a significant worry. Smart watches allow you to keep track of your health without putting in a lot of work or time. There are many timepieces on the market nowadays that can do a variety of functions. However, they have difficulties since the price of these watches is very expensive, and individuals with little income cannot buy them. Furthermore, networking is one of the issues with current watches. This gadget was suggested by the researcher to solve these issues. This gadget is both effective and inexpensive, making it accessible to the general public. Voice recognition system, LCD display screen, Controller, and different sensors like temperature sensor, blood pressure sensor, accelerometer, humidity sensor, and pedometer are all included in this gadget. This gadget has an emergency button that will notify the police department if an issue happens. This gadget will aid in the reduction of crime. These devices have a bright future since new technology can be utilized to customize them.

5. CONCLUSION

Wearable technology has been widely used in the twenty-first century. Our lives have been redesigned to provide us more options and freedom. They have changed our world into an ever-increasingly linked global society, allowing us to explore new ways of living. These smart watches are extremely useful in the present COVID-19 situation since they can detect our temperature and inform the user's relative if the temperature is higher than the

specified temperature. Researchers suggested a device that includes a voice recognition system, an alert system, an emergency button, an LCD display screen, a controller, and different sensors such as a temperature sensor, a humidity sensor, a blood pressure sensor, an accelerometer, and a pedometer in this study article. When compared to other comparable devices, this gadget is both effective and affordable. It is readily affordable for both children and adults. Different processes and technology, such as artificial intelligence and machine learning, may be used to further customize these watches. As the risks grow and technology develops, more innovations and upgrades will be required to meet emerging issues.

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