

Safety System for Elderly Wandering Person

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Abstract –The wandering of elderly people with dementia is one among the numerous behavioral problems and largest concern for the caretakers. As such, new applications using various technologies like Internet of Things(IOT) provides safety and security to dementia effected people. According to statistical report,3.5 million Indian people aged over 60 are suffering from dementia. Report also states that,count may set to increase around 6 million by 2030.Due to lack of awareness in the society,many dementia patients will go missing and even experience critical incidents leading to death.This designed project presents a GPS module especially for the patients suffering from dementia to track their location in real time. Considering health conditions, a well developed health monitoring technologies were taken into considerations as it provides accurate heartbeat and temperature readings.The caretaker can monitor the location and health condition of a person through an android app.Even alert messages are send to caretaker through GSM module via SMS.This proposed system is highly efficient that ensures safety and is also affordable.The aim of this project is to design a new system which integrates sensors and satisfies different functionality like fall detection, recording pulse rate,to tracking dementia effected people and also to alert their family members.

Keywords– Dementia, GSM modem, GPS, Wandering, Heartbeat, Arduino UNO

I. INTRODUCTION

Alzheimer's is the important cause of dementia-decline in mental ability. Alzheimer's is a chronic neurological disorder that causes brain cells to degenerate and die. Decline in mental ability or memory loss has brought many issues in concern such as,elderly might forget their way home or even fall sick and indulge themselves in some sort of danger like accidents or falls

People with Dementia may become lost while driving or taking public transportation where larger territory might have to be covered to search them out. For care takers, losing the elderly person can cause stress as they will be worried for their safety.With the proliferation of IOT, a device is being implemented which tracks the location and monitors the health status of the person which is the best solution for caretakers and families to prevent the elderly from wandering. In this proposed project,with the help of GPS module we can track the patient both inside and outside the house.

If the device is taken out of a specified range(house) ,the caretaker will be immediately notified through an alert message along with the location link. Alert messages are sent with the help of GSM module present in the device via sim.

Pulse sensor and Temperature sensor is also incorporated to check the health status of the elderly person which will be monitored by the caretaker and the reading can be retrieved whenever the consulting doctor needs it. Pulse sensor is used to record the heartbeat per second and heart beat can be monitored through the app. DHT11 is used to record the body temperature of elderly and can be seen through the app.

Vibration sensor connected to the device is used to detect the fall of the person. Once a fall is detected a alert message is sent to caretaker to further ensure the safety of the patient.

The main idea of our project is to ensure the Safety of elderly people suffering from dementia and tension free life for their families.

II. PROPOSEDSYSTEM

We are developing a wearable device using the internet of things (IOT) technology, in which we ensure the safety of elderly people by keeping track of them when they wander off and also monitor their health conditions though android app by including following features:

- ✓ This system detects the person's location both within and outside the range (i.e house).
- ✓ The caretaker will be immediately notified by an alert message when the elderly person goes missing or out of the house.
- ✓ We can keep track of all the sensor reading through android app.
- ✓ Connection between the device (Arduino UNO) and the app is established by supplying internet through WIFI shield (ESP8266).
- ✓ It also consists of sensors to record heartbeat rate and body temperature of the person.
- ✓ Detects the motion (like fall) and movements of the person.

For the safety of elderly suffering from dementia, we are using Internet of Things (IOT), this technology provides the advance techniques like alerting the caretaker immediately when a person goes out of the home, tracking the location and as well as monitoring the health status. Sometimes when person goes very far away, in spite of getting one's location it is difficult to reach them on time. This problem can be solved by sending the patients location and health status by caretaker to nearby police station or hospital in case of medical emergency. One of the main problem faced by the care takers is to locate the elderly person when they go wandering and cannot find their way back home. So finding them in a larger territory is a tedious task without the knowledge of their exact location. When the elderly is lost, the caretaker cannot predict what kind of health issues they face or what kind of situation they are in. So this system overcomes the problem of wandering .

III. SYSTEM ARCHITECTURE

The system consists of Arduino UNO, Thumb heartbeat sensor, Temperature sensor, vibration sensor, GSM, GPS tracker and ESP8266 WIFI shield embedded in node MCU.

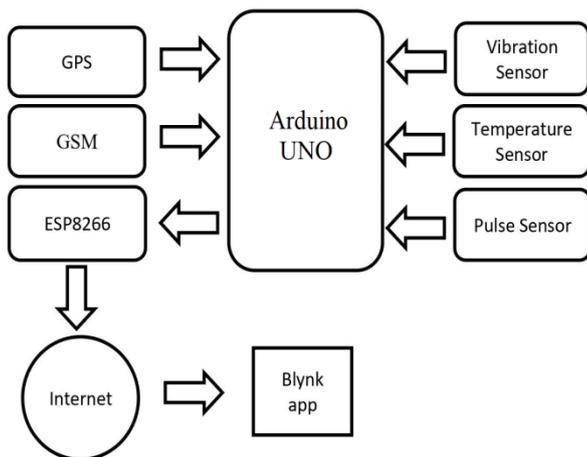


Fig 1. Block diagram of wearable device

A. Arduino :

Arduino makes the application more interactive to the nearby objects and its surroundings. All types of Arduino is a open-source platform used for building electronic projects. It consists of both hardware circuit and software tool, and this software is used to write the code and upload into the physical board through the cable. Arduino IDE uses the simplified version of C++, but this is one of the easiest ways to write the code. Arduino can interact with sensors, motors, internet, smartphone and the TV. Arduino has varieties of boards but the UNO is one of the most popular board in the Arduino family.



Fig. 2. Arduino UNO board

B. Thumb Heartbeat Sensor :

Thumb heartbeat sensor is a plug and play sensor used to record heart beat rate per second. The LED needs to be super bright when someone puts thumb finger inside the cap as the maximum light must pass through the finger and heartbeat is detected by detector. With each heart pulse the detector signal varies. It can be used by students, athletes, game & mobile developers who want to easily incorporate live heart-rate data into their projects. It used to take live heartbeat readings. Noise elimination circuitry is added to keep away the noise affecting the readings.



Fig. 3. Thumb heartbeat sensor

C. GPS Module :

GPS stands for Global positioning system. GPS tracker is a navigation device, used for tracking the location of a person, vehicles and animals. The information that is collected from the device is stored and transmitted through a wireless network or cellular network. The location of the person or vehicle is shown real time on the map. The software used for tracking, will be available on all smart phones. A GPS receiver in our phone listens for the signals sent by satellites to figure out ones location.



Fig. 4. GPS Tracker

D. GSM :

Communication between a System and a computer or an android is established using a GSM module. It enables data transfer due to which messages can be easily sent from one device to another. A sim has to be inserted into the sim card port in modem and can be operated using a mobile device, it can send and receive messages from registered numbers.



Fig. 5. GSM (sim800a)

E. Temperature and Humidity Sensor :

This module detects the surrounding environment of the humidity and temperature. Temperature sensor measures the amount of heat energy or coldness which is generated by any nearby object which produces either an analogue or digital output. It compares the body temperature with the surrounding temperature and gives the reading. Even surrounding humidity is taken in to account. Readings can be monitored through app. DHT11 is the type of sensor used for measuring temperature and humidity.



Fig. 6. DHT11

F. Vibration Sensor :

The Vibration Sensor is predicated on the vibration sensor SW-420 and Comparator LM393 to sense if there is any kind of vibration that is beyond the edge. The brink will be adjusted by the potentiometer placed. When no vibration is detected, this sensor gives the output logic as LOW, the signal indicates LED light, and the other way around. It is used to detect motion of a person carrying this device.

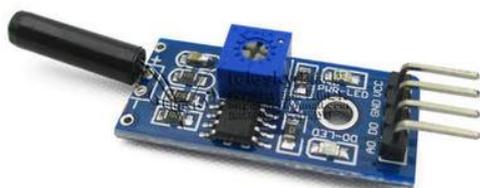


Fig. 7. Vibration switch SW-420

G. Node MCU (ESP8266) :

Node MCU is a micro-controller board which provides WIFI that enables to connect all the nearby devices to the internet. In this project we are using node MCU of type ESP8266 which provide WIFI to connect the system with the blynkapp. Blynk app requires internet connection with the system to view all the sensor's reading in the app. ESP8266 provides stable internet connection to the app.



Fig. 8. Node MCU (ESP8266)

H. Android app :

It is a replacement platform that permits us to quickly build interfaces for controlling and monitoring our hardware projects in an android device. Once we download the blynk app, we will be able to connect it to our device WIFI through ESP8266 and can also develop project dashboards, placement of the buttons and in designing the UI.

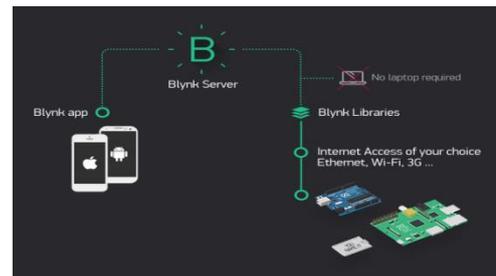


Fig. 9. Blynk App

IV. METHODOLOGY

The designed system provides security and safety of dementia patients by monitoring their location and health status. When the Power supply turns on, the device will be automatically activated. The main objective to design a system for elderly person are as follows:

- Tracking location
- Motion detection
- Monitoring health
- Caretaker is immediately notified through app and SMS.

Tracking Location:

When the elderly person's location is detected outside of the provided range, the caretaker will be alerted by an SMS that will be sent to his number with the help of GSM module. Range is taken into account when phone's hot spot gets disconnected from the WIFI of the device. The

system sets the area of the elderly person to the micro-controller and requests the location to the mobile networks. Once the required location data is retrieved, caretaker will immediately receive the location link to their phone.

In case of wandering if caretaker notices sudden pulse drop, fall or decrease in body temperature, he/she will immediately take the person's location and scan nearby hospital number. Once it is done caretaker will send alert message to the hospital.

All the sensor's data are stored and displayed in the app as the app is connected to the device using WIFI shield (ESP8266).

V. RESULT

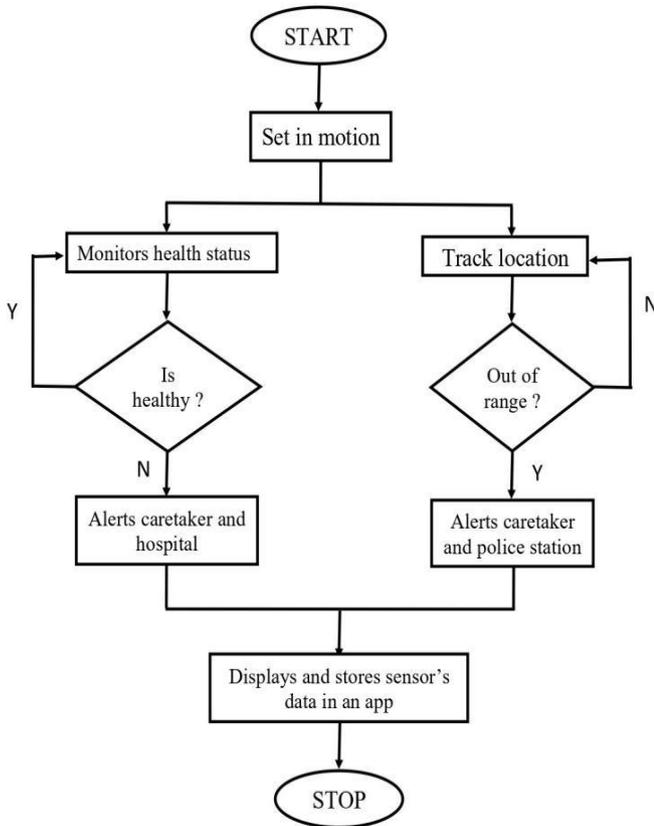


Fig. 10. Flowchart of the designed system

Considering the safety of dementia patients, caretaker on receiving the location link scans the nearby police station and phone number. Once that is done caretaker can send the location along with its details as an SMS to them through GSM module.

Motion Detection:

When the elderly person wanders off, he/she can face serious issues like traffic accidents, fall and Dehydration. In such cases this designed system immediately detects the fall with the help of vibration sensor and sends alert message to caretaker along with the location. Further caretaker can take any action to ensure safety of the person.

Monitoring health:

Heart Beat Sensors is used to record number of heart beats per second. App is considered to be the monitoring unit where each pulse rate of the person is recorded and displayed to the caretaker. If the normal heart beat rate per minute decreases beyond 120, then immediate alert message will be sent to the caretaker. The temperature sensor measures the temperature and converts into electrical signal which is further processed by Arduino and its software. It is further monitored through the app. If the temperature reading crosses the range of 36 - 40 degree Celsius scale, then it will send an alert message to the Caretaker. Caretaker can monitor health status through the app.

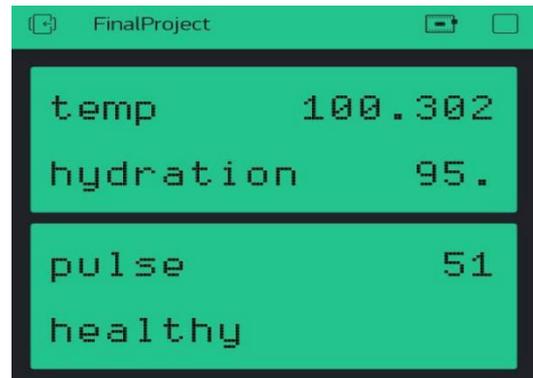


Fig. 11. Pulse and temperature readings

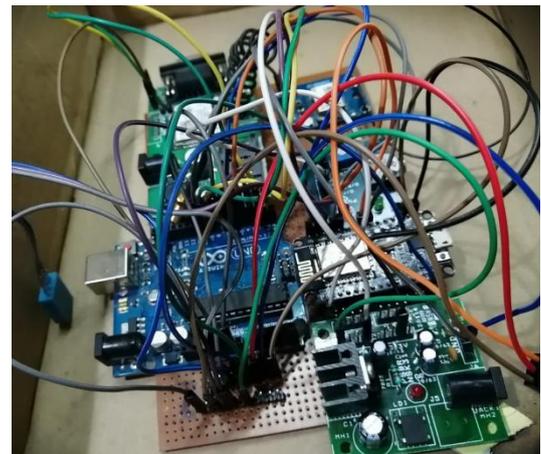


Fig. 12. System prototype

VI. CONCLUSION

The system designed provides safety of the elderly person suffering from dementia. The proposed design will accommodate critical issues faced by dementia affected elderly person within the recent past and helps them. This paper showcases the design in regard to the critical issues faced by dementia affected elderly nowadays and will help them technologically with compact equipment and new ideas. In the system it includes mechanisms like motion detection such as fall, recording body temperature, sending an alert SMS along with the location of the elderly using GPS/GPRS and also monitoring all the sensors' reading through an app. This method helps the dementia affected elders within the country to get over their fear in regard to their safety and security.

ACKNOWLEDGEMENT

We are so much thankful for our project guide, Prof. Priyadarshini M who supported us during the project completion and also helped us to improve the manuscripts significantly.

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