System to Assist Elderly and Enhance Their Independence

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Abstract

This project is designed to help the elderly enhance their independence if they wish to stay in their homes as they age. A non-invasive monitoring system will be placed around the home of an elderly person. The system will be connected to an Android app that has two main features. The first feature allows authorized personnel to have access to live feed data which shows the location of the person in the house and the details of each sensor, while the second will send notifications in case of an emergency.

Introduction

"Aging in place" is defined as a person preferring to stay at their home as they age. As we age, the idea of giving up our independence and moving to another home or facility can come with both emotional and physical stress. However, aging at home comes with many disadvantages. As people grow older their physical and mental health declines, which encourages families to send their loved ones to an assisted living facility or nursing home. Older adults represent a vulnerable group as staying at home may turn out to be challenging when care needs to increase, particularly towards the end of their life. Our monitoring system will use emerging technologies to assist the elderly in their own homes despite their challenging physical and mental needs. This project will use different sensors to collect data and identify various household activities by an elderly resident.

Methods and Materials

A. PIR Sensors
The PIR motion sensors will be used to monitor both the location of the person as well the time spent inside a room or outside the house. The PIR sensors will be placed on the entrance of the house and the entrance of every room.

B. Temperature Sensors
The temperature sensors will be placed in different locations of the house to monitor temperature changes in the house.

C. Pressure Sensor
The pressure sensor will be placed on couch in order to help monitor the elderly person's health.

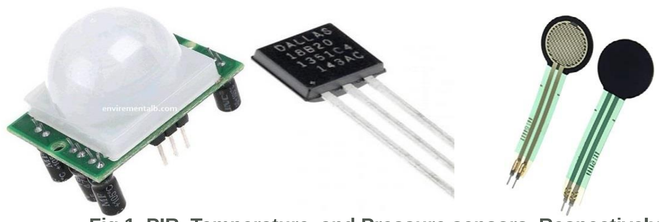

Fig 1. PIR, Temperature, and Pressure sensors, Respectively

D. Hardware Integration
The monitoring system will use the three different types of sensors connected to a Raspberry Pi which will be used as the primary power source. The Raspberry Pi will send the signals from the sensors to Google's Firebase.

E. App Integration
Data from the sensors will be updated in real-time in Firebase, which can be viewed in detail by using an Android App named "Enhance Living Alone." The app will display details of all the sensors as well as the resident's current location and will allow the user to set custom timers for warning and emergency notifications

Results

The system sends real-time data from the sensors to the Google Firebase database. The app allows authorized users to receive notifications of unusual activity in the home and check the sensors' activity as well as the location of the resident in the house.

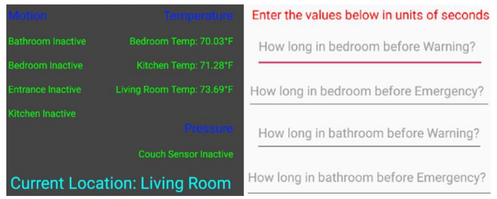

Fig 2. App display

Discussion

The system was placed and tested in a one-bedroom model wooden/acrylic house. For demonstration purposes the app was tested with warning notifications being sent after only 10-40 seconds.

Conclusions

Using the three different types of sensors, we were able to create a monitoring system without any video or audio recording devices. The safety of an older adult wishing to stay in their home can be assured without taking away the resident's privacy. In the future this system can also be used for people with disabilities or health problems who wish to stay at home and enjoy their privacy.

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