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SOS Smart Reminder and Emergency Detection Device Using ESP8266 and MPU6050

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Abstract

Research indicates that approximately 85% of deaths are caused by heart attacks, strokes, shortnessof breath, and other medical conditions could be prevented through timely treatment. Hence, immediate access to an easily reachable SOS button plays a vital role in providing prompt assistance. Vehicle accidents result in a significant number of fatalities. Delays in reaching the hospital contribute to about 76% of deaths in each vehicle category. An urgent solution is needed:a gadget or technology capable of detecting collisions and promptly alerting their local guardians.This would enable immediate medical assistance, potentially saving lives and reducing the fatalityrate associated with such accidents. The current work is driven by three key factors: the necessityfor a dedicated device to remind patients with chronic illnesses to take their medications at the prescribed times, the absence of a convenient SOS button readily accessible during emergencies, and the delay in communication between accidents and contacting guardians. The authors in this study emphasizes the importance of timely medical care and interventions which significantly decrease mortality rates associated with these conditions. Not adhering to medication schedules and taking incorrect medicines at inappropriate times can have serious consequences. A specialized reminder device that prompts individuals with medication names at specific times is necessary to ensure proper administration and improve health outcomes.

Keywords

Emergency, Mortality, GPS Locator, ESP8266 Microcontroller, Real time communication.

Introduction

The project centers around a highly advanced, multi-functional device that incorporates several features. One notable feature is an integrated SOS button, which can instantly alert pre- registered local guardians. Furthermore, the device possesses fall detection capabilities, enabling it to assess the severity of collisions or accidents. If the intensity surpasses a certain threshold, thedevice notifies the victim's designated contacts and the guardians. To achieve these functionalities, the project utilizes the IoT technology (Internet of Things) [1]. The device will be equipped with a little

microprocessor for taking sensor feedings, running algorithms, and determining the nearesthospital using a GPS tracker and informing local guardians through email [2]. The two other aspects of this device need the use of IOT in this project. The device must link to a mailing, phoning, and texting system through the internet and requires sensors and switches to transfer the data due to the availability of an auto-reminder system and an SOS button for emergency help. Rather than immediate analysis and detection, both study publications offer a way of prediction. They employ data such as traffic data to detect a larger number of autos [3]. They identify accidenthotspots and pre-inform the driver about them in an unusual location or utilizing pre-saved data. What we've created is a full solution with no drawbacks such as data pre-saving, internet access requirements, or the need for high speed. In addition, we have the following two features [4] dueto the fact that the majority of people suffer from a sub-health problem or chronic disease, researchinto sensing and managing personal health is quickly expanding.

i. A medicine reminder reminds a person to take their medicine at the appointed time, which they had previously pre-saved.

ii. There is an SOS button that can be used in the event of an emergency. Despite the fact that these two characteristics existed previously, they were not used in conjunction with an accident detection system. As a result, we've come up with this concept [5].

Methodology

To address the identified challenges, our proposed work focuses on developing a comprehensive solution that integrates advanced technology and user-friendly devices.

i. Medication Reminder Device: We will design and develop a dedicated device specifically tailored for chronic patients. This device will utilize smart technology to remind patients of their medication schedules and provide timely alerts. It will ensure accurate medication administration,reducing the risks associated with non-adherence and incorrect dosing.

ii. SOS Button Integration: Our solution will incorporate an easily accessible SOS button, enabling individuals to request emergency assistance with a single press. This feature will provide a swift and direct means of contacting guardians, ensuring prompt response during critical situations.

iii. Fall Detection and Alert System: We will develop a sophisticated collision detection system that utilizes sensors and algorithms to detect accidents in real-time. Upon detection, the system will promptly send alerts to the designated guardians, enabling immediate medical assistance and transportation to the hospital.

iv. Communication Enhancement: We aim to bridge the communication gap during accidents by implementing an efficient communication platform. This platform will enable seamless and rapid communication between the injured individuals, guardians, and hospitals, ensuring timely response and appropriate medical care.

v. Testing and Evaluation: We will conduct extensive testing to assess the functionality, reliability,and user-friendliness of our solution. This evaluation process will involve user feedback and simulated scenarios to validate the effectiveness and efficiency of the proposed system.

Through this proposed work, we aim to enhance patient safety, improve emergency response times, and mitigate the risks associated with medication mismanagement and delays in reaching medical care. By combining innovative technology with user-centric design, our solution seeks tomake a significant impact in saving lives and improving overall healthcare outcomes.

Daniel Gloppestad Bajer [6] proposed that system was created such that the phone is in charge ofretrieving its own sensor readings as well as those from the watch, and evaluating the data to determine whether or not there has been a fall. Such analysis is based on three separate ways combined (two based on smart phone sensors data and one on the smart watch), as will be discussed later in the Fall Algorithm paragraph. Joseph Santiago [7] proposed system is divided into two parts. The first is a pendant-like wearable gadget, and the second is a mobile application that runson a smartphone. Bluetooth will be used to communicate between these two devices. For fall detection, the pendant contains a motion sensor [8]. The necklace sends an alert to the cell phone when a person falls. The cell phone then phones and messages a person of interest, telling them ofthe event's location. Cismas Alexandru [9], Proposed MPU6050 is an excellent motion sensor; automobile sensors are designed to minimize vibrations while also providing extremely precise readings. The data fusion algorithm that uses acceleration, deceleration, and tilt angles has a highsuccess rate [10]. There has never been a false positive or a missed collision in any of the tests conducted so far Crash detection is a crucial function for motor cycle riders, and when combined with E-call. It can reduce the time between the accident and the arrival of emergency service. S. Mohana Gowri [11] proposed an Arduino uno microcontroller is used to plan the proposed framework. The hard-ware gadget will be placed near the vehicle's dashboard in the suggested framework. An eye flicker sensor, vibration sensor, beat rate sensor, GPS, GSM, buzzer, battery, switch, power supply, and bell switch will be included in this gadget. Rajvardhan Rishi [12] designed an AMS system will play an important role. GSM technologies are utilized in situationswhere the vehicle / police service must take rapid action to reduce the severity. In the future, a dashboard will be established to keep all accident information [13], which will be accessible to friends, main road hospitals (rescue teams), and government agencies. The AMS system will lookup OBD (On Board Diagnostic) data, which will make things easier. In [14] author proposed when the detection threshold is met, the notification system is activated. The GPS module calculates thelocation of a vehicle accident, and then the GSM module sends an accident message to the familymembers. The latitude and longitude obtained from the GPS are sent to the server via GPRS, andthe server determines the nearest hospital by using the [17] haversine formula to calculate the greatcircle distance.

Hardware Components

i. NodeMCU ESP8266: A cheap open source IoT platform is NodeMCU. Hardware based on the ESP-12 module and firmware running on Espress if Systems' ESP8266 Wi-Fi SoC were initially supplied .NodeMCU is used to read data from the sensors, process it and send the data to cloud. Also With the help of the Wi-Fi connectivity, NodeMCU can be used to remotely control the bin operations such as opening and closing of the lid or starting and stopping of the bin's motor.

ii. Arduino UNO: The Arduino Uno is an open-source microcontroller board created by Arduino.cc and first made available in 2010. It is based on the Microchip ATmega328P microprocessor. A

variety of expansion shields and other circuits can be interfaced with the board's sets of digital andanalogue input/output (I/O) pins. Arduino uno is used as an object detection sensor. It is used to measure the distance of the object from the sensor.

iii. MCU6050 Sensor: MPU6050 is a Micro Electro-mechanical system(MEMS) it consists of three-axis accelerometer and three-axis gyroscope. It helps us to measure velocity, orientation, acceleration, displacement, and other motion like features.

iv. GPS Locator: The Neo 6M GPS module is a well performing complete GPS receiver with a built-in 25 x 25 x 4mm ceramic antenna, which provides a strong satellite search capability. Withthe power and signal indicators, you can monitor the status of the module.

v. Buzzer: The Arduino buzzer is a versatile component commonly used in electronic projects for generating audible signals or tones. The Arduino buzzer is a compact electronic device that can produce a wide range of sounds and melodies when connected to an Arduino microcontroller .It operates by rapidly oscillating a small internal diaphragm or piezoelectric element, creating vibrations that generate sound waves.

vi. Panic Button: The panic button Arduino project is designed to provide a quick and easy way to trigger an emergency response. The panic button Arduino project involves connecting a physical button to an Arduino microcontroller, allowing users to trigger an immediate emergency responsewhen pressed. When the panic button is pressed, the Arduino sends a signal or activates a specific code, which can be programmed to initiate various actions such as sounding an alarm, sending notifications, or activating emergency protocols. The panic button Arduino project is commonly used in personal safety devices, home security systems, and workplace emergency systems to quickly summon help or alert authorities in dangerous situations

Results and Discussion

After receiving an emergency message, the output screen of the device can display relevant information and provide visual cues to the user. The exact representation on the output screen may vary based on the device's design and interface capabilities. However, here is a general descriptionof how the output screen may look:

i. Alert Notification: Prominent visual and textual alert.

ii. Emergency Details: Nature, sender, time, location.

iii. Action Instructions: Clear response prompts.

iv. Contact Information: Emergency responder details.

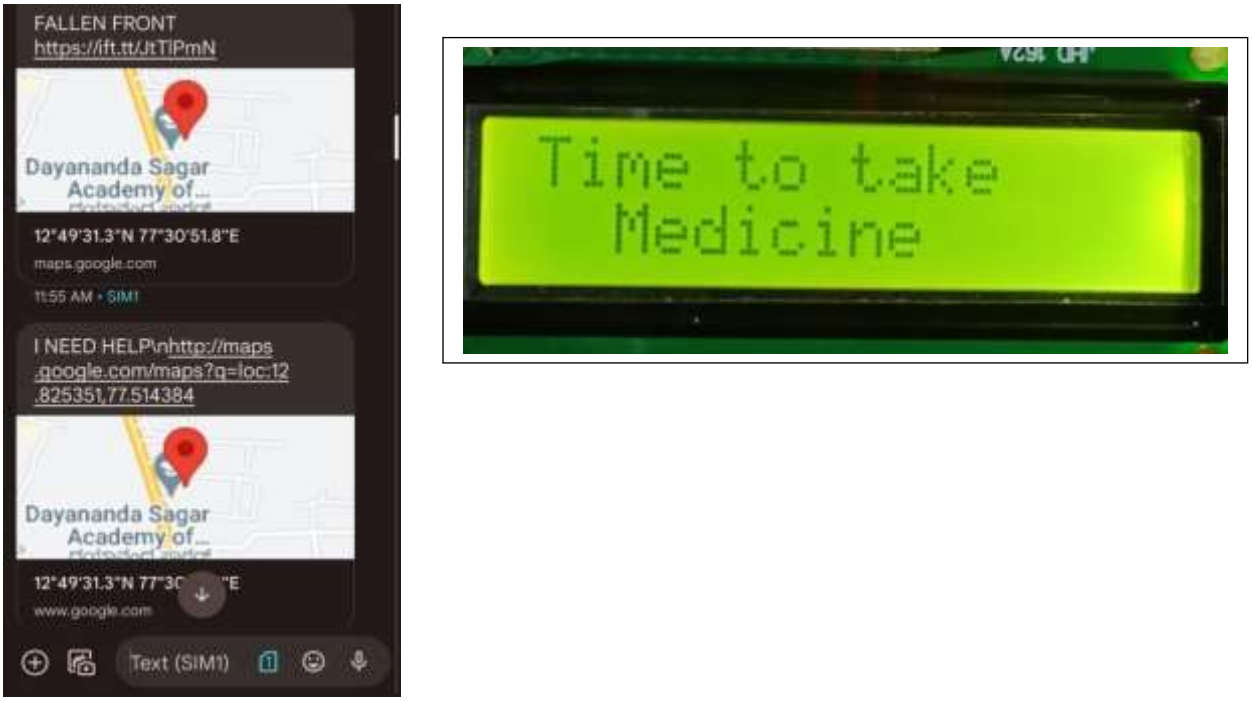

Figure 1. Emergency Message Received by The Device

Conclusion

In conclusion, this project addresses the challenging task of monitoring the health of home patients, especially the elderly, and ensuring their safety in life-threatening situations. The development ofa multifunctional device that serves as a medication reminder, SOS device, and accident detection system has been proposed. By combining these essential features into a single device, we aim to provide comprehensive support to chronic patients, the elderly, and individuals in need. The device serves as a reminder for medication schedules, ensuring timely administration and reducing the risks associated with medication mismanagement. It also acts as an SOS device, allowing immediate communication with predefined emergency contacts in critical situations. The incorporation of accident detection capabilities adds an additional layer of safety. The device automatically detects accidents or collisions and promptly informs both the nearest hospital and the victim's family or designated guardians via email. This efficient reporting system reduces the response time to accidents, potentially saving lives by ensuring timely medical assistance. The project's innovative approach and the integration of advanced technology have the potential to greatly enhance patient care, improve emergency response times, and ultimately contribute to better health outcomes. The development of a device with a proactive "brain" capable of autonomously detecting and responding to accidents demonstrates the project's commitment to leveraging technology for the

benefit of individuals in need. As future work, further research and development can be pursued to refine the device's functionalities, improve its accuracy in accident detection, and explore additional features that promote patient safety and well-being. Overall, this project represents a significant step towards addressing the challenges of monitoring and ensuring the health and safety of home patients in everyday life.

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