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IoT Project Report

IoT based Emergency alert system.

CONTENTS

1. INTRODUCTION

1.1 ABSTRACT :

The project aims at enhancing the security of people anywhere and everywhere by creating and analysing a system that makes use of an emergency push-button service. The system involves notifying the family members or close relatives of the user around the globe as soon as the button is pressed (for instance, during emergency situations). The system involves making use of the microcontroller ESP32 chip, which is a Wi-Fi compatible chip, and AWS(Amazon web services). The underlying concept used for making the system is the Internet of Things. IoT is a giant network of connected things and people—all of which collect and share data about the way they are used and about the environment around them. It makes use of the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. On clicking the device, AWS sends the live location of the user to the nearest police station or to the family members whose mail is saved in the system. The device at the receiver should be connected to the internet in order to receive data from the transmitter. The microcontroller is programmed for reading location from satellite and sending SMS/mail to the guardian. This security system is used to intimate the parents/concerned person as well as police about the current location of the user who is in an emergency and crisis. This process of sending and receiving positional data is done by some means of GPS modules or receiver. This system also finds a wide variety of uses in the mechanical industry. It can be used in factories to pinpoint the exact location of dysfunctional machine parts, or in automobile vehicles during emergency situations. Similar works exist that make use of the emergency panic button and various types of location-tracking services. However, the existing systems usually contain too many components, thus making them heavier and less portable, or do not possess Wi-Fi capability, thus rendering them unreliable in various situations. On the contrary, our proposed system aims to work

on these shortcomings and thus create a system that consists of lesser components, supports Wi-Fi capability and is much more reliable, sturdy and cost-effective

1.2 OBJECTIVE :

The main objective of this project is to **notify family members or close relatives of the user** as soon as the button is pressed (for example, during emergency situations). The underlying concept used for making the system is Internet of Things.

1.3 MOTIVATION :

Many times people regret not having someone to help at the right time during an emergency. Sometimes it could be a life and death situation. Due to increasing crimes such as abductions, murders, assaults etc., the personal security of individuals is constantly being threatened. Many environmental accidents or terrorists are causing death of many human casualties and considerable materials' losses. There is a regret that if these accidents were discovered early, many lives would be saved. So there is a need to design and implement a real-time alarm system to minimize losses in human life and economic damages is crucial. The challenge of the alarm system in general is to translate the emergency event to a signal. transferred as SMS (short message service) from machine to machine without human entrance and inform the respective authority through wireless technologies with minimum time as possible.

The increasing crime rates and accidents in the last decade require us to be attentive with our life safety. No one can prevent the accident but can reduce the losses caused by it. Some of these accidents are natural like earthquakes, flooding and some done by someone like fire, explosion, car accident, burglar, etc. Many countries have been seeking to develop alarm systems that have the ability to send early audio or visual signals to alert the individuals involved that there is an emergency. Despite many advancements in

technology, there has not been much improvement in the security of individuals. Real time information is critical when dealing with life or death situations. In such a case, the IoT emergency button enables the user to call for help in emergencies.

Vulnerable people such as the elderly or the disabled can wear the Button around the wrist or the neck and use it to call for help. It can further be placed in rooms with a high risk of accidents to ensure that the Button is always in reach in an emergency and users can get help when they need it. It helps them gain more independence and security.There are countless use cases for this button. When enabled with live location tracking ,the button can be placed in the car to call for help in case of small accidents by just pressing a button. This feature can be used for kids and women's safety. The button can also be configured to count or track items ,start or stop something ,order services ,or even provide feedback. This system can easily be attached to automobile vehicles. Since the system is miniature, it can easily be incorporated into vehicles and can be used by the drivers to send emergency messages with their locations to their loved ones, mechanics, or any other intended recipients. Since the system is extremely sturdy and reliable, it would be ideal in helping the users during emergencies. Thus, such an inbuilt system in vehicles would provide extra security to the users. Such systems can also be attached to the various machines in a large factory. The system could be programmed to initiate a trigger as soon as a machine part stops functioning properly. This would allow an alarm to be triggered to notify the factory’s workers/caretakers/owners and pinpoint the exact location of the IoT (Internet of Things) Based Emergency Push-Button System damaged machine part.

2 . SOFTWARE & HARDWARE DESCRIPTION

2.1 HARDWARE DESCRIPTION

- **ESP32**

  ESP32 is a series of low-cost, low-power systems on chip microcontroller with integrated Wi-Fi and dual-mode Bluetooth. It is a successor to the ESP8266 microcontroller with a significant upgrade in features and supports multiple programming environments. It can perform as a complete standalone system or as a slave device to a host MCU, reducing communication stack overhead on the main application processor. The ESP32 supports three types of I/O modes with each GPIO Pin: Digital, Analog and Internal Sensors.

- **NEO-6M GPS module**

  Neo-6m GPS module is a well-performing GPS receiver with a built-in ceramic antenna, which provides a strong satellite search capability. With the power and signal indicators, the status of the module can be monitored. The heart of the module is a NEO-6M GPS chip from u-blox. It can track up to 22 satellites and achieves the highest level of sensitivity.The GPS module will be powered with 3.3V power supply. It communicates with the ESP32 via serial communication using the TX and RX pins available on the 4 pins header. It is mainly used for satellite navigation and it calculates Speed and fetch Position on land, air or sea, for accurate Maps and Tracking System.

- **LED**

  A light Emitting Diode (LED) is an optical semiconductor device that emits light when voltage is applied. When the button is pushed, acknowledgment is given in the form of LED

- **Push Button**

The push button is a digital button that can easily be used with microcontrollers like ESP32, Arduino, etc. The button sends digital signals to the microcontroller, and it sends the value ‘0’ whenever it is pressed.

- **Breadboard**

2.2 SOFTWARE DESCRIPTION

- **Arduino IDE**(Integrated Development Environment)

  Arduino IDE is an open source for integrating electronics. It is a text editor like a notepad with different features. It is used for writing code, compiling the code to check if any errors are there and uploading the code to the boards.

- **AWS IOT**

  AWS IoT Core enables us to connect devices to AWS Services and other devices, secure data and interactions, process and act upon device data, enables applications to interact with devices even when they are offline. It’s one of the features, AWS IoT Device SDK helps us easily and quickly connect your hardware device or mobile application to AWS IoT Core. It enables the devices to connect, authenticate, and exchange messages with AWS IoT Core using the MQTT, HTTP, or WebSockets protocols.

3. SYSTEM ARCHITECTURE

3.1 WORKING

This is how people receive alerts.

- User presses the button
- Esp32 receives the coordinates from the gps module.
- Device sends a message to the MQTT topic
- AWS IoT receives the message and calls AWS Lambda Function
- AWS Lambda Function publishes a message to the AWS SNS (Simple Notification Service)
- AWS SNS notifies subscribers: in this case , just sends a message to a single email address
- User receives the email

3.2 BLOCK DIAGRAM

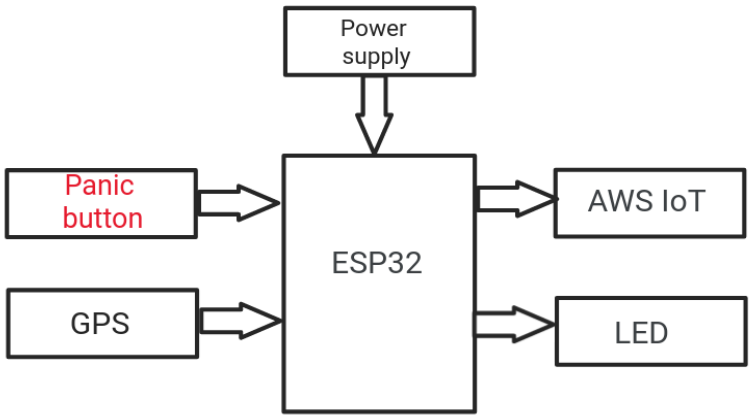

Fig.1. Block Diagram showing inputs and outputs

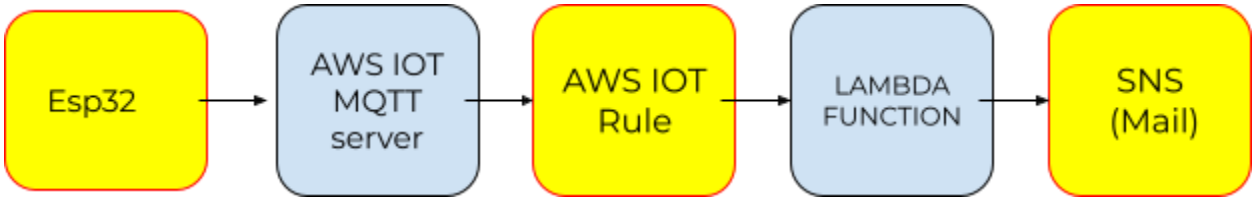

Fig.2 Data transfer from device to iot core

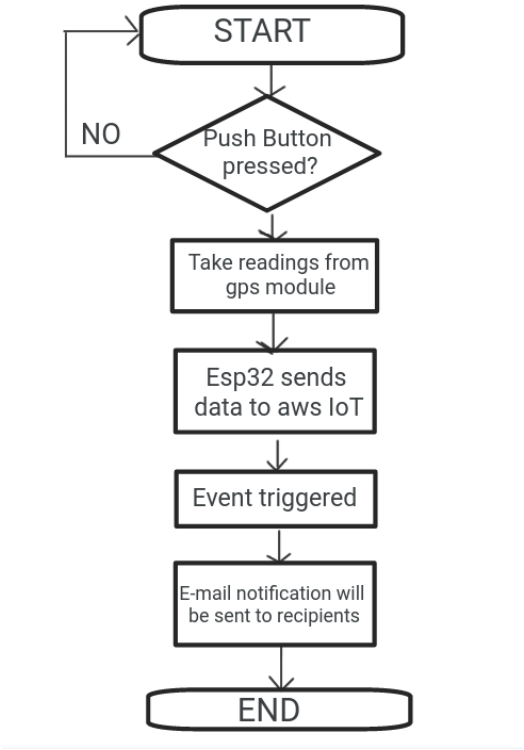

Fig.3 Flow chart

5. EXPERIMENTAL SETUP

5.1 CIRCUIT DIAGRAM

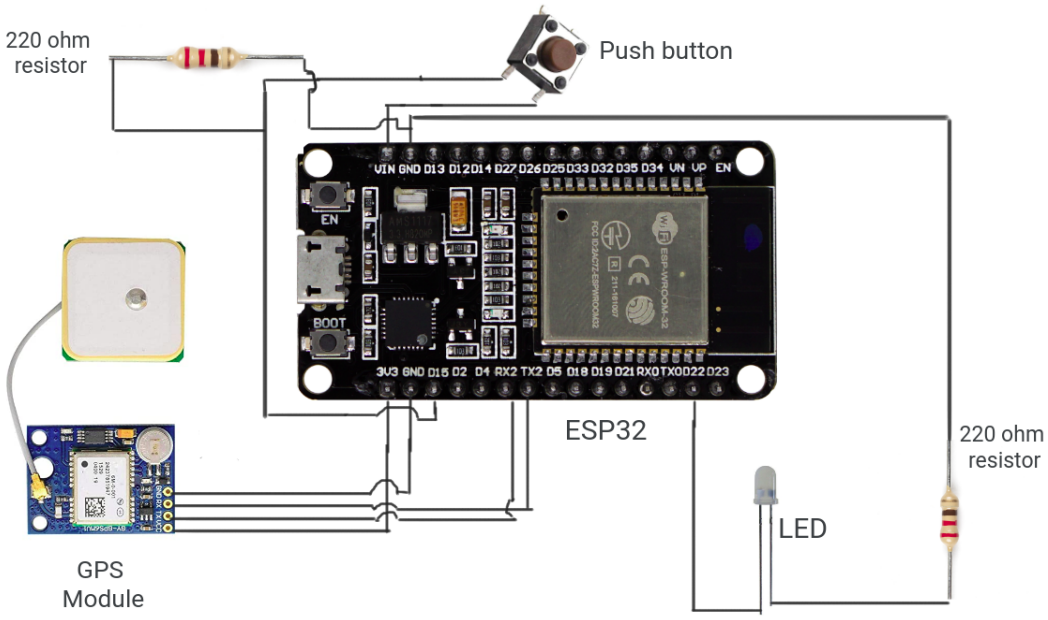

fig.4-Circuit diagram

5.2 CONNECTIONS

- **Push Button**

  In the circuit diagram above(Fig 4), **GPIO 22 is** connected with anode pin of LED and another pin of LED is connected with ground through a 220ohm resistor. Next push button one terminal is connected with 3.3 volts of ESP32 and other terminals of a push button are common with **GPIO 15** and resistor. Another end of the resistor is connected with a ground. When the push button is pressed, a logic high will be on GPIO15 and turn on the LED accordingly.

- **GPS Module**

  As the GPS module requires an operating voltage in the range of 2.7-3.6V hence we will connect the VCC terminal with 3.3V which will be in common with the ESP32 board. The TX (transmitter) terminal of the GPS module will be connected with the RX2 pin of

the ESP32 for communication. Likewise, the RX (receiver) terminal of the GPS module will be connected with the TX2 pin of the ESP32.

5.3 EXPERIMENTAL SETUP

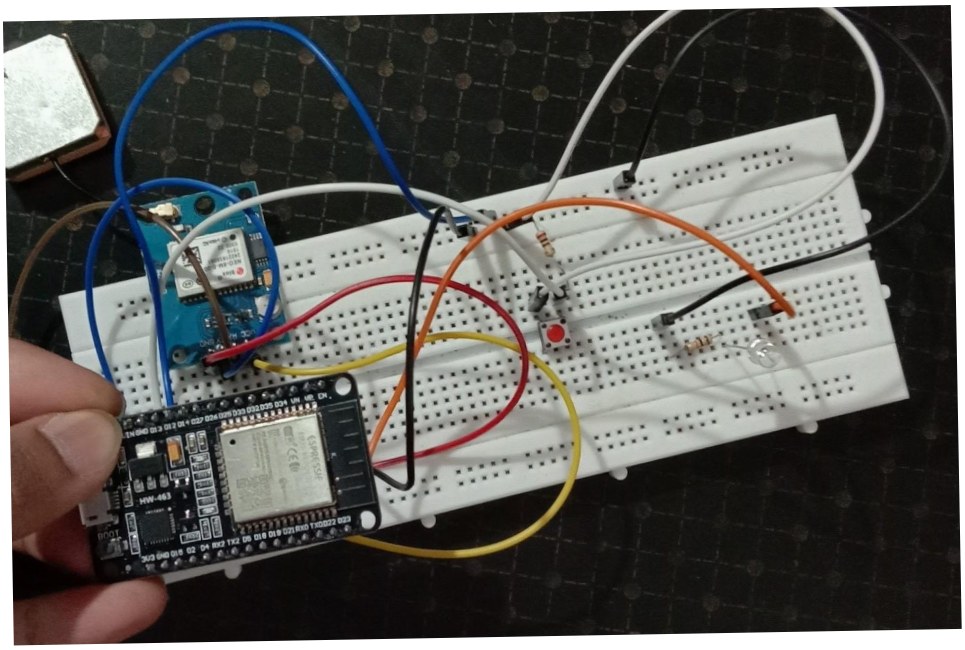

Fig .5 Actual experimental setup

All the connections were made using jumper wires and a breadboard .

5. RESULTS AND CONCLUSIONS

5.1 EXPERIMENTAL RESULTS

The system was successfully implemented as the ESP-32 development board is powered On, it starts connecting to the configured network with particular SSID and Password and then starts connecting to the AWS IoT. Once it is connected to the WiFi enabled microcontroller, and the setting is made for individual interfaced sensors and the devices then it fetches the information of the connected sensors.When the button was pressed, the message received on the recipients' devices contained the details of when the button was pressed, the name of the event, an emergency message, as well as the URL of the user's location, as depicted in Fig. 9. The same message was sent to all the family members of the user. On clicking the provided URL, it was possible to get the exact coordinates of the user's location, which would be redirected on Google maps. This allowed the family members of the user to track the exact location and easily reach their loved ones during emergencies. It was also observed that every time the button was pressed, the messages were sent successfully. This indicated that our code was functioning properly as per our given commands. It was also observed that the messages (email) were received as soon as the button was pressed. The delay observed was that of a mere 2 s. Moreover, the URL provided in the message redirected the recipient to the realtime location-tracking website that showed the real-time location of the user. On clicking on the coordinates, it was possible to get redirected onto the Google maps website thus providing the family members with the exact location, as well as the directions towards the coordinates of the user

Fig 6- Connecting to aws iot and publishing the status of led

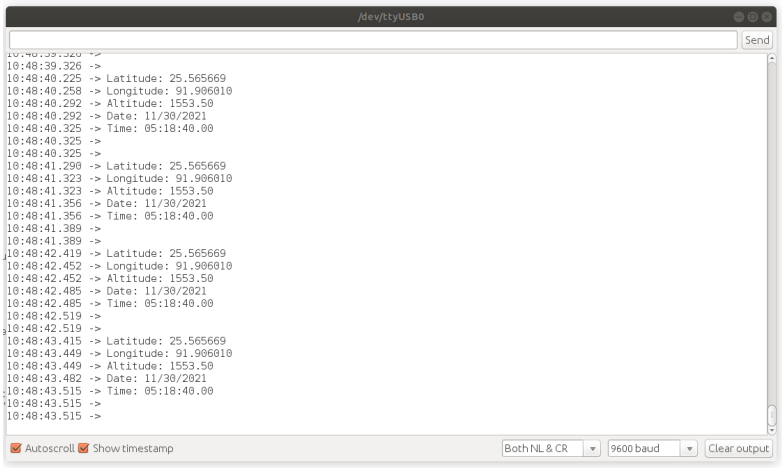

Fig 7.Output of GPS Module on Serial monitor

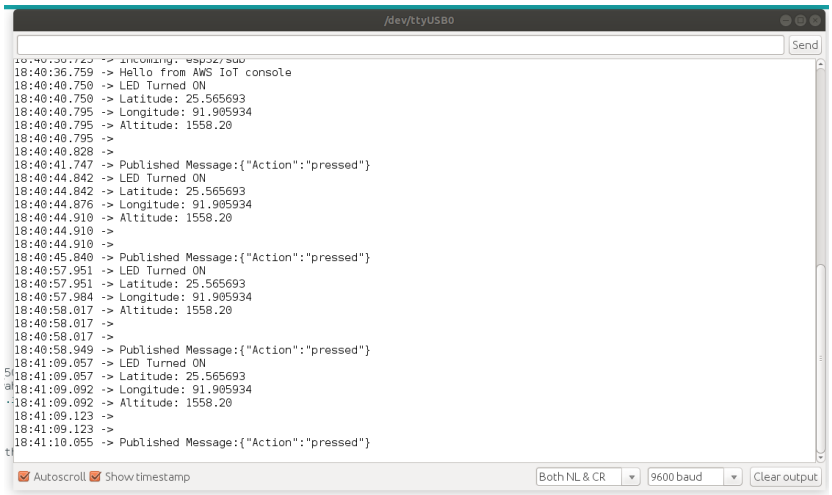

Fig 7 Output on serial monitor When the button is pressed

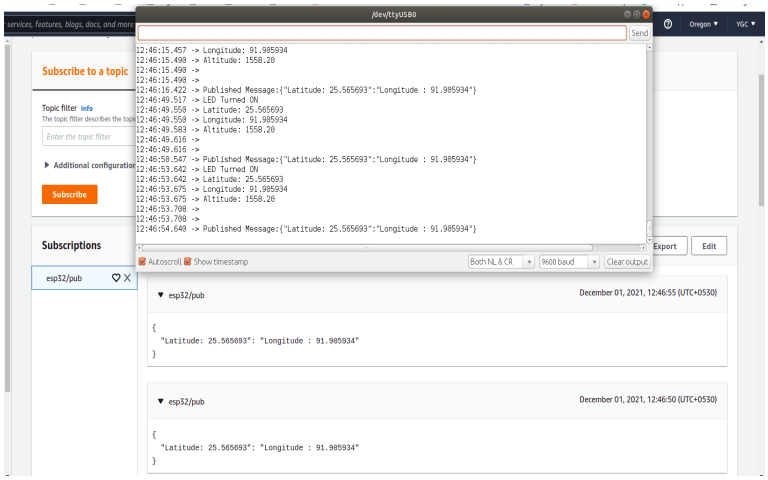

Fig 9 Date is pushed to aws iot

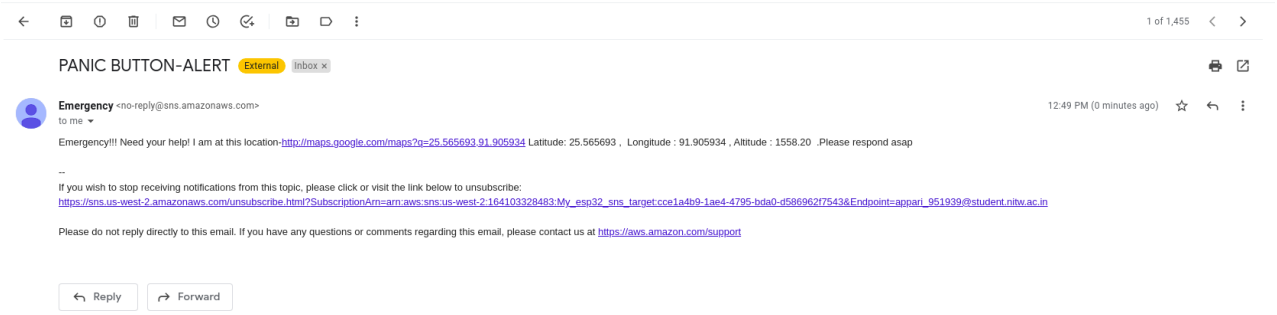

Fig 10 - Event is triggered and mai is sent

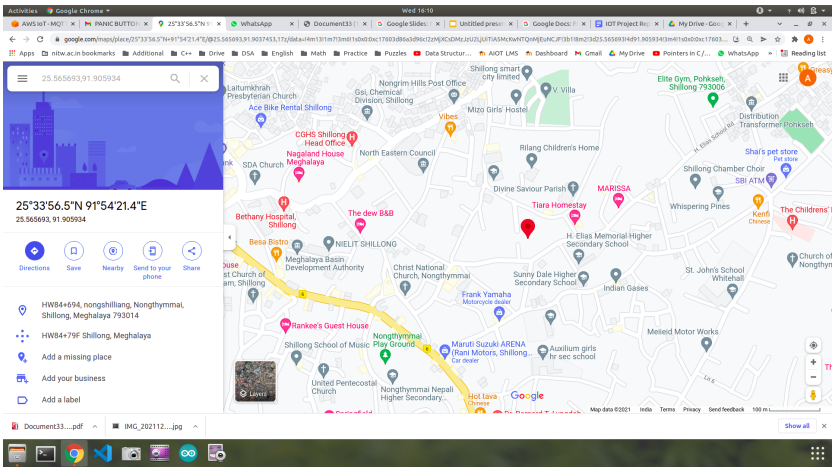

Fig 10 Google maps website showing exact location of the user

5.2 CONCLUSION

Through this work, it was possible to successfully create an emergency push-button system that would notify the family members of the user as soon as the user presses it. This would allow an email to be sent to the recipients along with the location details of the user facing an emergency. The proposed system is extremely sturdy, reliable and cost-effective. The system is simple to build and implement, easy to carry, and very accurate. These factors make it well suited for nearly every household. Moreover, the low budget within which it can be built makes it economical and commercially viable. In past few years, the internet of things has been used in approximately all types of systems including security systems, home automation systems and many more. we present an emergency alert system combined with IoT to overcome some drawbacks In addition, considering the increasing rates of crime in today's world, a system like this would prove to be a huge boon to every individual as it would allow family members to keep track of their loved ones and act efficiently during untoward happenings. The emergency alert system can be used by persons with disability, elderly people or by any individual. The same can be used anywhere where a need for an Emergency Response exists with minor changes in the setup as required in an IoT application. It can be made as a wearable device.

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