CENTER FOR DEVELOPMENT OF ADVANCED COMPUTING

AUTOMATIC ACCIDENT DETECTION & RESCUE MANAGEMENT SYSTEM

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INTRODUCTION

The constant improvement of technology leading to civilization in search of better prospects as expected an implosion of transportation system is observed that increment in number of vehicles on road result in increased chance of vehicular accidents . The accidents must be reported immediately in order to provide quick and proper medical assistance because there is also rise in unreported accidents.

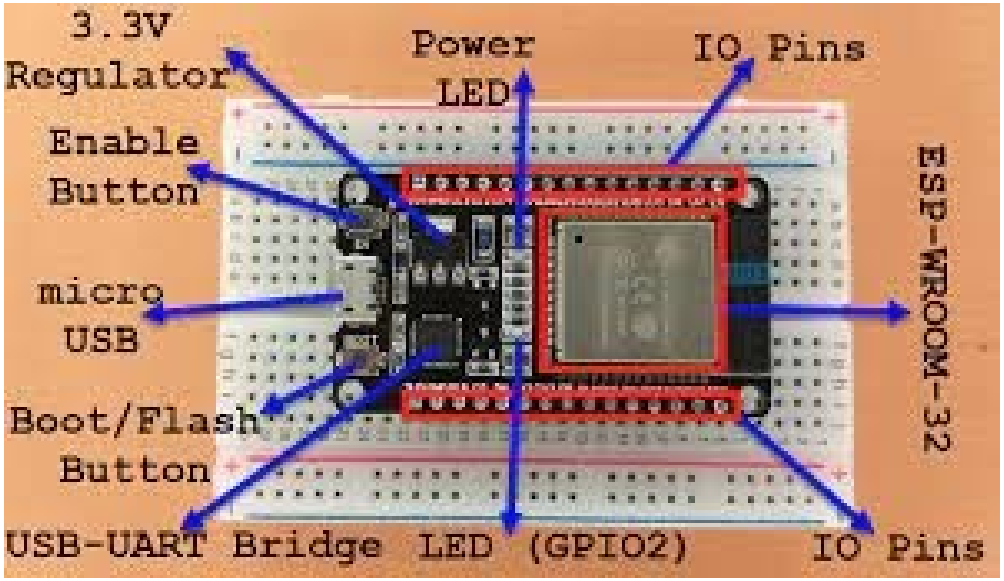
Sl. No.	Year	Number of Accidental Deaths					Percentage Share of 'Traffic Accidental Deaths' in Accidental Deaths due to 'Other Causes'
		Road Accidents	Railway Accidents	Railway Crossing Accidents	Total Traffic Accidents	Total Accidental Deaths due to 'Other Causes'	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	2017	1,50,093	23,959	1,534	1,75,586	3,89,441	45.1%
2	2018	1,52,780	24,545	1,507	1,78,832	4,04,933	44.2%
3	2019	1,54,732	24,619	1,762	1,81,113	4,12,959	43.9%
4	2020	1,33,201	11,968	1,185	1,46,354	3,66,992	39.9%
5	2021	1,55,622	16,431	1,807	1,73,860	3,90,404	44.5%

OBJECTIVES

- Detection of Accident as quickly as possible.
- Have minimum false detection.
- Immediately messaging current location an call for help.

HARDWARE & SOFTWARE USED

Why ESP32 ?



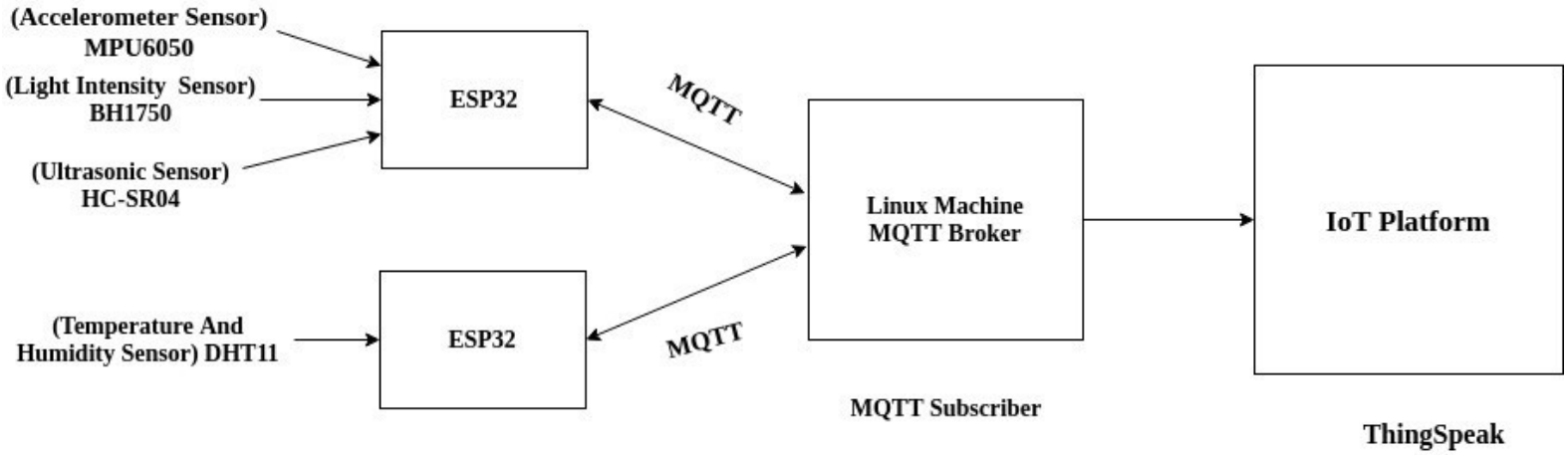
ESP32 WROOM

COMPONENTS

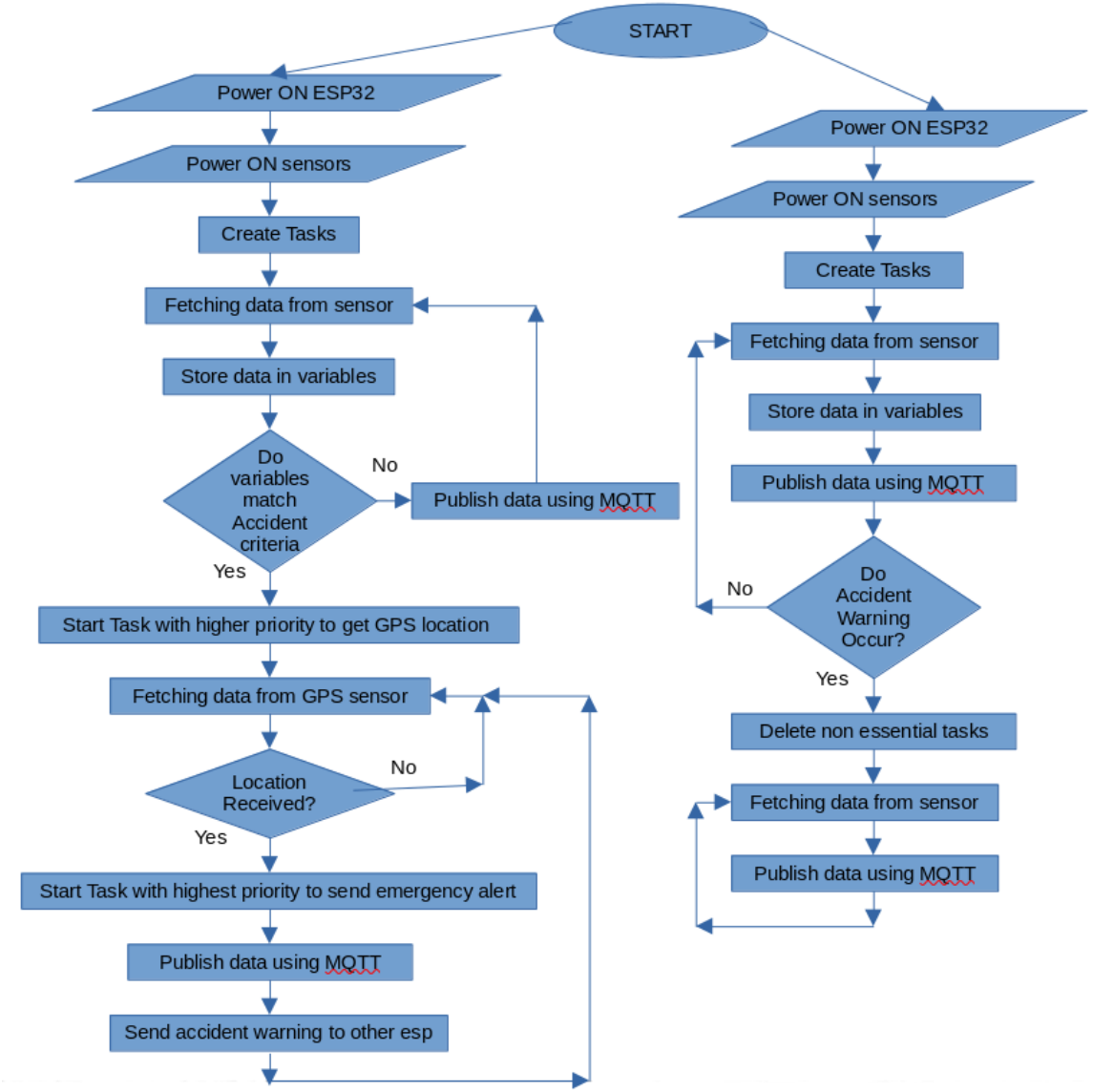
- 1x ESP32-WROOM-32
- 1x MPU-6050
- 1x SIM900A
- 1x HCSR-04
- 1x BH1750

- 1x Buzzer
- 1x Display
- 1x Piezoelectric sensor

BLOCK DIGRAM

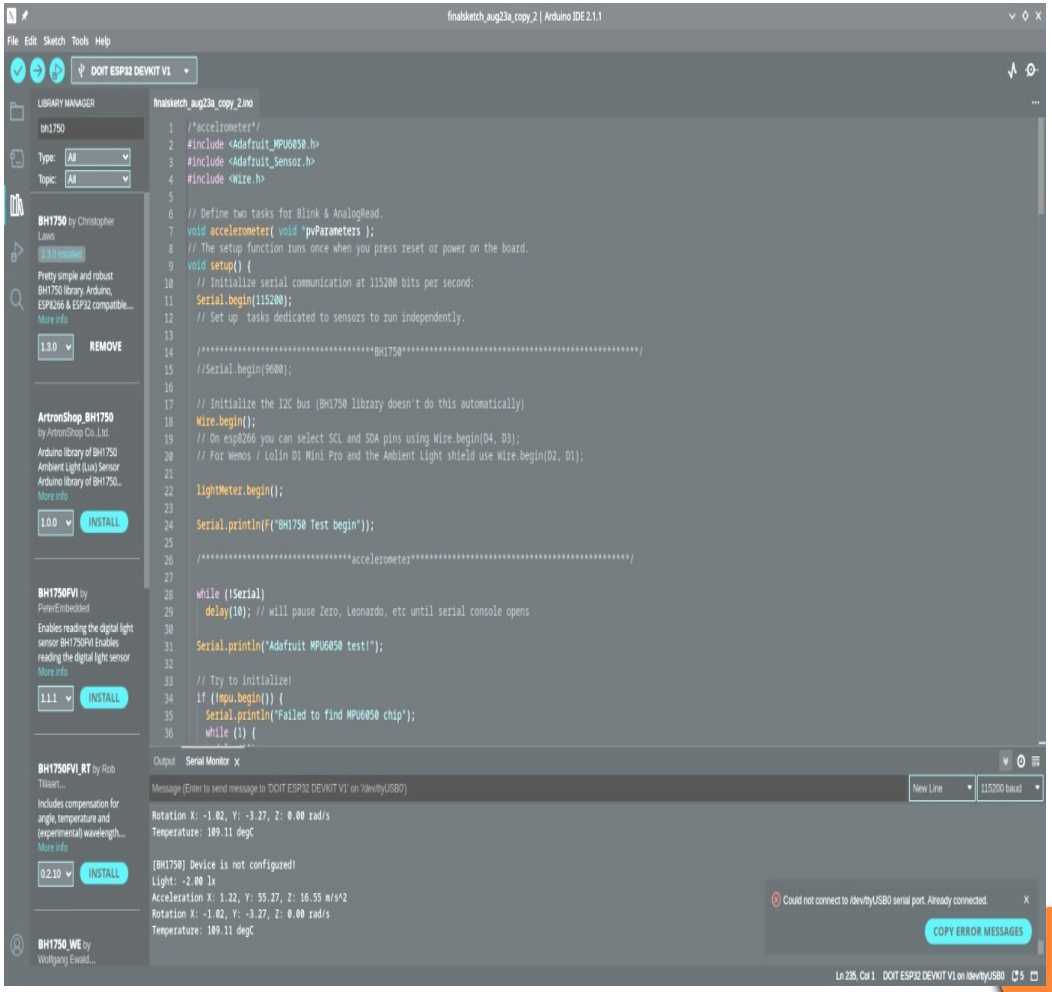


FLOW CHART

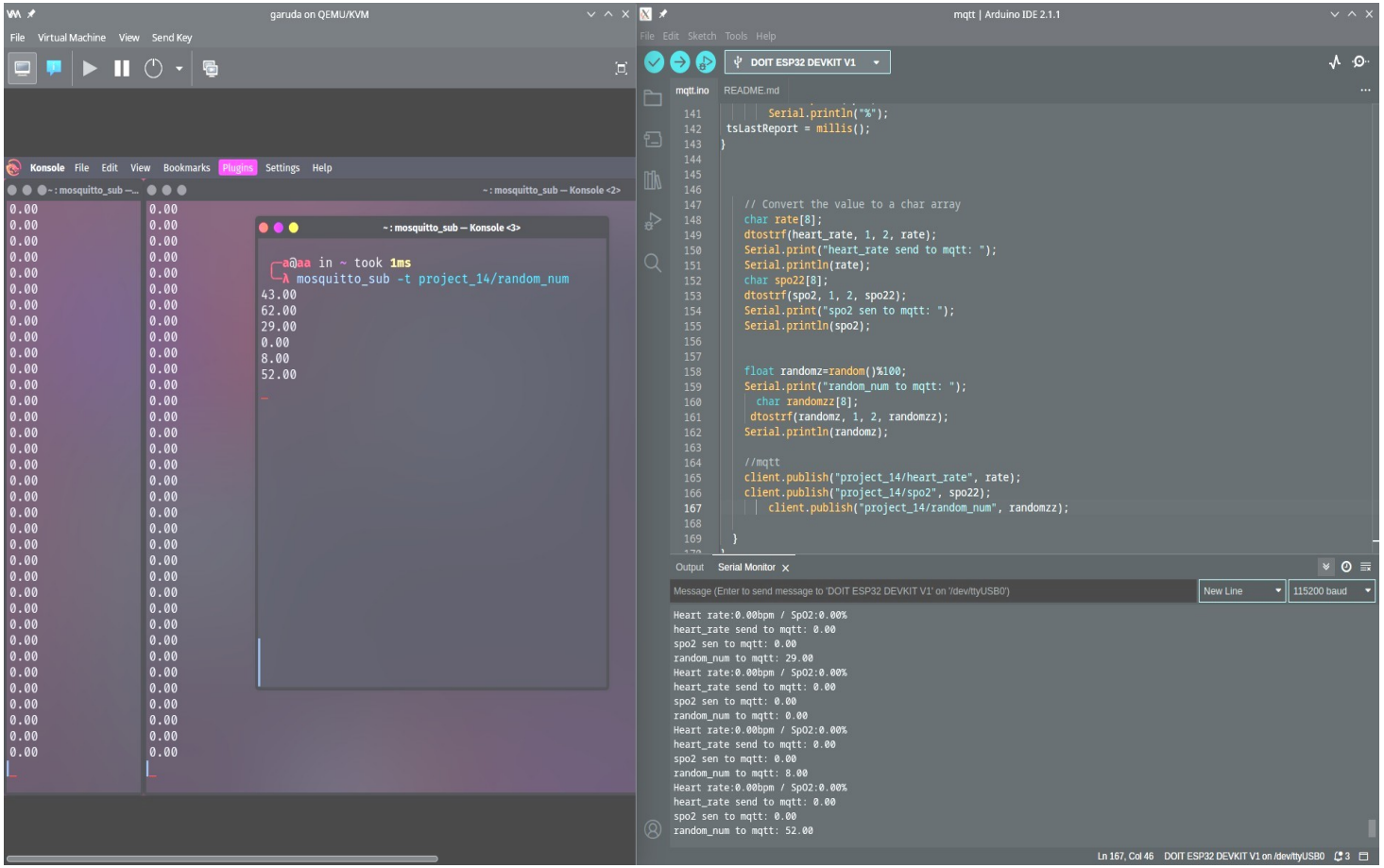

START
Power ON ESP32
Power ON sensors
Create Tasks
Fetching data from sensor
Store data in variables
Do variables match Accident criteria
No
Publish data using MQTT
Yes
Start Task with higher priority to get GPS location
Fetching data from GPS sensor
Location Received?
No
Yes
Start Task with highest priority to send emergency alert
Publish data using MQTT
Send accident warning to other esp
Power ON ESP32
Power ON sensors
Create Tasks
Fetching data from sensor
Store data in variables
Publish data using MQTT
Do Accident Warning Occur?
No
Yes
Delete non essential tasks
Fetching data from sensor
Publish data using MQTT

SOFTWARES

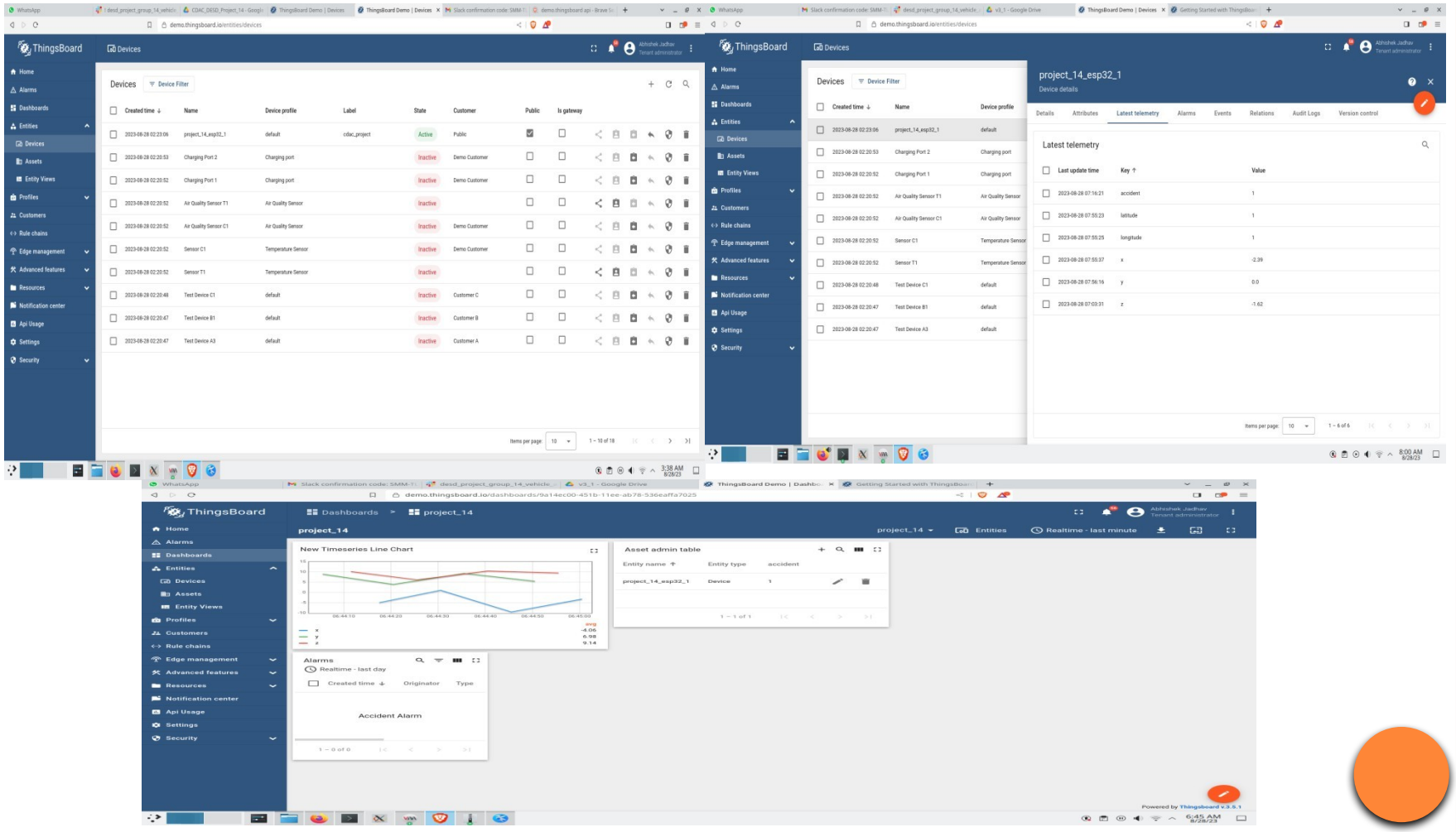
- IDE
  - Aruino IDE
  -Espressif IDE
- Protocols
  - MQTT
  - UART
- Operating system
  - FreeRTOS



OUTPUT


garuda on QEMU/KVM
File Virtual Machine View Send Key
Konsole File Edit View Bookmarks Plugins Settings Help
~ : mosquitto_sub — Konsole <3>
a@aa in ~ took 1ms
mosquitto_sub -t project_14/random_num
43.00
62.00
29.00
0.00
8.00
52.00
mqtt | Arduino IDE 2.1.1
File Edit Sketch Tools Help
DOIT ESP32 DEVKIT V1
mqtt.ino README.md
Serial.println("%");
tsLastReport = millis();
// Convert the value to a char array
char rate[8];
dtostrf(heart_rate, 1, 2, rate);
Serial.print("heart_rate send to mqtt: ");
Serial.println(rate);
char spo22[8];
dtostrf(spo2, 1, 2, spo22);
Serial.print("spo2 sen to mqtt: ");
Serial.println(spo2);
float randomz=random()%100;
Serial.print("random_num to mqtt: ");
char randomzz[8];
dtostrf(randomz, 1, 2, randomzz);
Serial.println(randomz);
//mqtt
client.publish("project_14/heart_rate", rate);
client.publish("project_14/spo2", spo22);
client.publish("project_14/random_num", randomzz);
Output Serial Monitor
Message (Enter to send message to 'DOIT ESP32 DEVKIT V1' on '/dev/ttyUSB0')
New Line
115200 baud
Heart rate:0.00bpm / SpO2:0.00%
heart_rate send to mqtt: 0.00
spo2 sen to mqtt: 0.00
random_num to mqtt: 29.00
Heart rate:0.00bpm / SpO2:0.00%
heart_rate send to mqtt: 0.00
spo2 sen to mqtt: 0.00
random_num to mqtt: 0.00
Heart rate:0.00bpm / SpO2:0.00%
heart_rate send to mqtt: 0.00
spo2 sen to mqtt: 0.00
random_num to mqtt: 8.00
Heart rate:0.00bpm / SpO2:0.00%
heart_rate send to mqtt: 0.00
spo2 sen to mqtt: 0.00
random_num to mqtt: 52.00
Ln 167, Col 46 DOIT ESP32 DEVKIT V1 on /dev/ttyUSB0

OUTPUT


ThingsBoard
Devices
Device Filter
Created time
Name
Device profile
Label
State
Customer
Public
Is gateway
project_14_esp32_1
Device details
Details
Attributes
Latest telemetry
Alarms
Events
Relations
Audit Logs
Version control
Last update time
Key
Value
accident
latitude
longitude
Dashboards
project_14
New Timeseries Line Chart
Asset admin table
Entity name
Entity type
Alarms
Realtime - last day
Originator
Type
Accident Alarm
Entities
Realtime - last minute

CONCLUSION

- Significant innovation in road safety and emergency response
- The AADRMS's capabilities significantly reduce response times, potentially saving lives and minimizing injuries.
- The AADRMS is a testament to our commitment to a safer future on the roads, where technology plays a pivotal role in safeguarding lives.

FUTURE SCOPE

- Incorporate machine learning algorithms to enhance the accuracy of accident detection by analyzing complex patterns from sensor data. This can improve the system's ability to differentiate between accidents and false positives.
- Develop algorithms that use historical accident data and real-time conditions to predict accident-prone areas. This proactive approach can enable authorities to take preemptive measures.
- Combine data from multiple sensors for more comprehensive accident detection. For instance, fusing accelerometer, GPS, and camera data can provide a holistic view of accidents.

THANK YOU !