



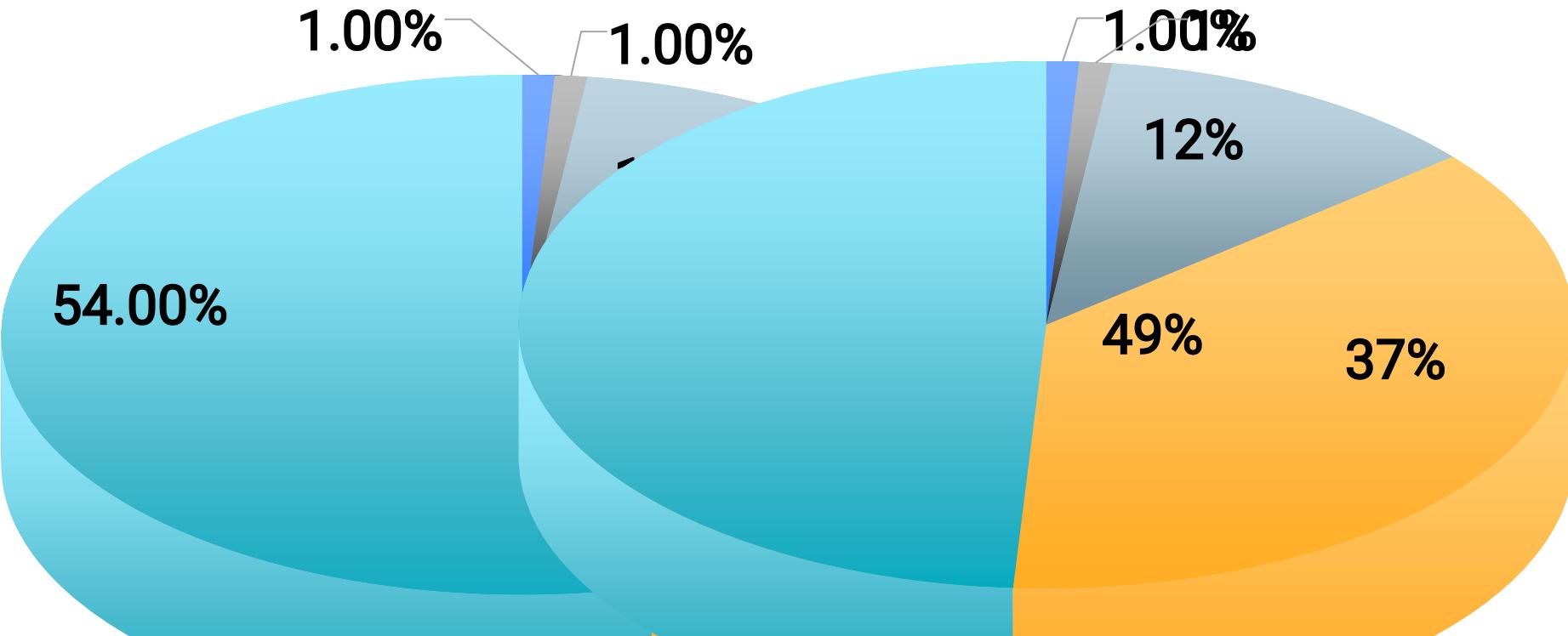
# SMART SAFETY HELMET

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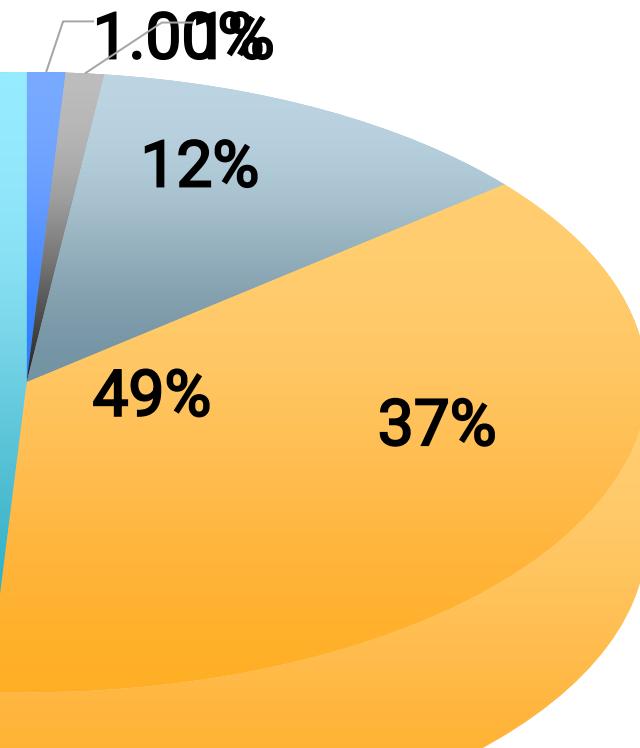


# STATISTICS OF COMMON WORK SITE HAZARDS

HSE(UK), 2020



OSHA (USA), 2020



- CO poisoning
- Struck by an object
- Other

- LPG poisoning
- Falls

# SURVEY REGARDING HAZARDS IN WORK SITES

Timestamp	Where did you work/train? أين سبق لك العمل / التدريب؟	What are the most common hazards in the work site? ما هي المخاطر التي تواجهكم في الموقع؟	How can these hazards be minimized? كيفية الحد من هذه المخاطر من وجهة نظرك؟
12/13/2022 22:37:46	Alexandria Shipyard	exposure to welding fumes	using local exhaust ventilation systems or air purifying welding masks
12/14/2022 16:39:27	Alkan Group, Ecotel, Sky Group	As we are working on Heights so it is the major risk, alongside with our main work risks such as electricity chocks AC/DC, unsafe work environment such as dangers platform and people, also Tower work risks and Microwave health issues	should not take the safety rules and instructions lightly. for each risk you may face the company is trying to cover them by safety equipment and rules. Safety Helmets, safety Gloves and Shoes, safety belts and climbing tools, auto monitoring system for car driving and in sites risks like Power DC/AC isolation and safe work space.. also each company working in that field should make risk and safety sessions with certificate for use.
12/14/2022 16:48:02	Top business	Death	Follow the safety instructions
12/14/2022 16:56:36	Trained at Abu Qeir Power	Bumping into pipes and constructions in the site Falling objects	Wear safety gear Ensure workers are aware of any changes in the worksite or maintenance taking place
12/14/2022 18:00:51	Vodafone NFM L1 project	العمل مع ارتفاعات ، العمل مع مخاطر الكهرباء ، العمل مع موجات راديو ذات تردد عالي	الالتزام بال PPE و ارتداء ال tools الازمة لإنفاذ المهمة بدون اي مخاطر
12/16/2022 18:42:01	المقاولون العرب في العالمين	سقوط اشياء من الاعلى الوقوع في حفر او في مساليف و اشلاء على الأرض	الالتزام بارتداء احذية واقية

# **SURVEY RESPONSES REGARDING HAZARDS IN WORKSITES**

**EXPOSURE TO FUMES**

**FALLING OBJECTS**

**FALLING FROM  
HEIGHTS**

# SMART SAFETY HELMET

OBJECT  
DETECTION

GAS  
MONITORING

TEMPERATURE  
& HUMIDITY  
MONITORING

GPS  
TRACKING

INDOORS  
TRACKING

FALL  
DETECTIO  
N

ULTRASONIC  
HC-SR04

MQ2

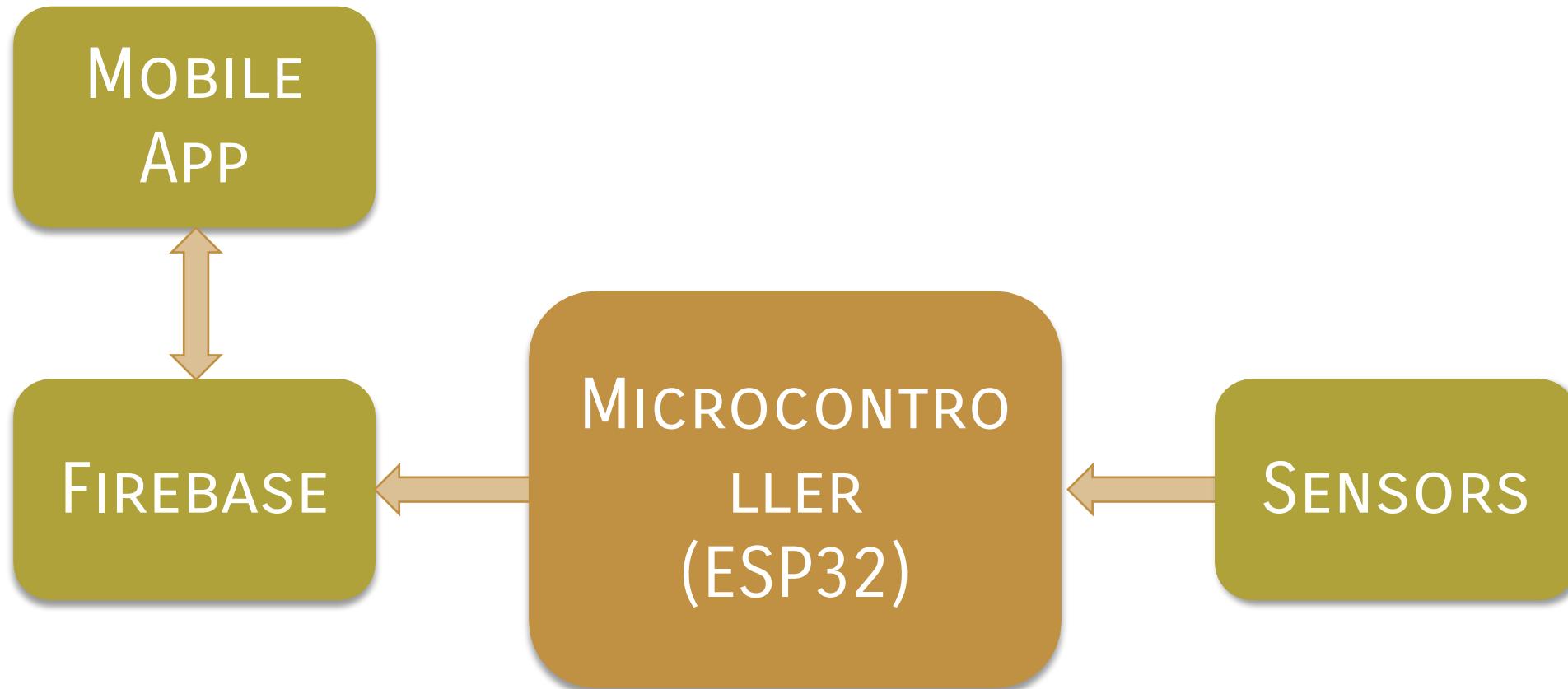
DHT22

GY-NE06MV2

IMU MPU-6050  
BMP180

IMU MPU-6050  
BMP180

# BLOCK DIAGRAM



# SMART SAFETY HELMET

OBJECT  
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INDOORS  
TRACKING

FALL  
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N

ULTRASONIC  
HC-SR04

MQ2

DHT22

GY-NE06MV2

IMU MPU-6050  
BMP180

IMU MPU-6050  
BMP180

# OBJECT DETECTION

**GOAL:** DETECT MOVING OBJECTS  
(EX: CRANES).



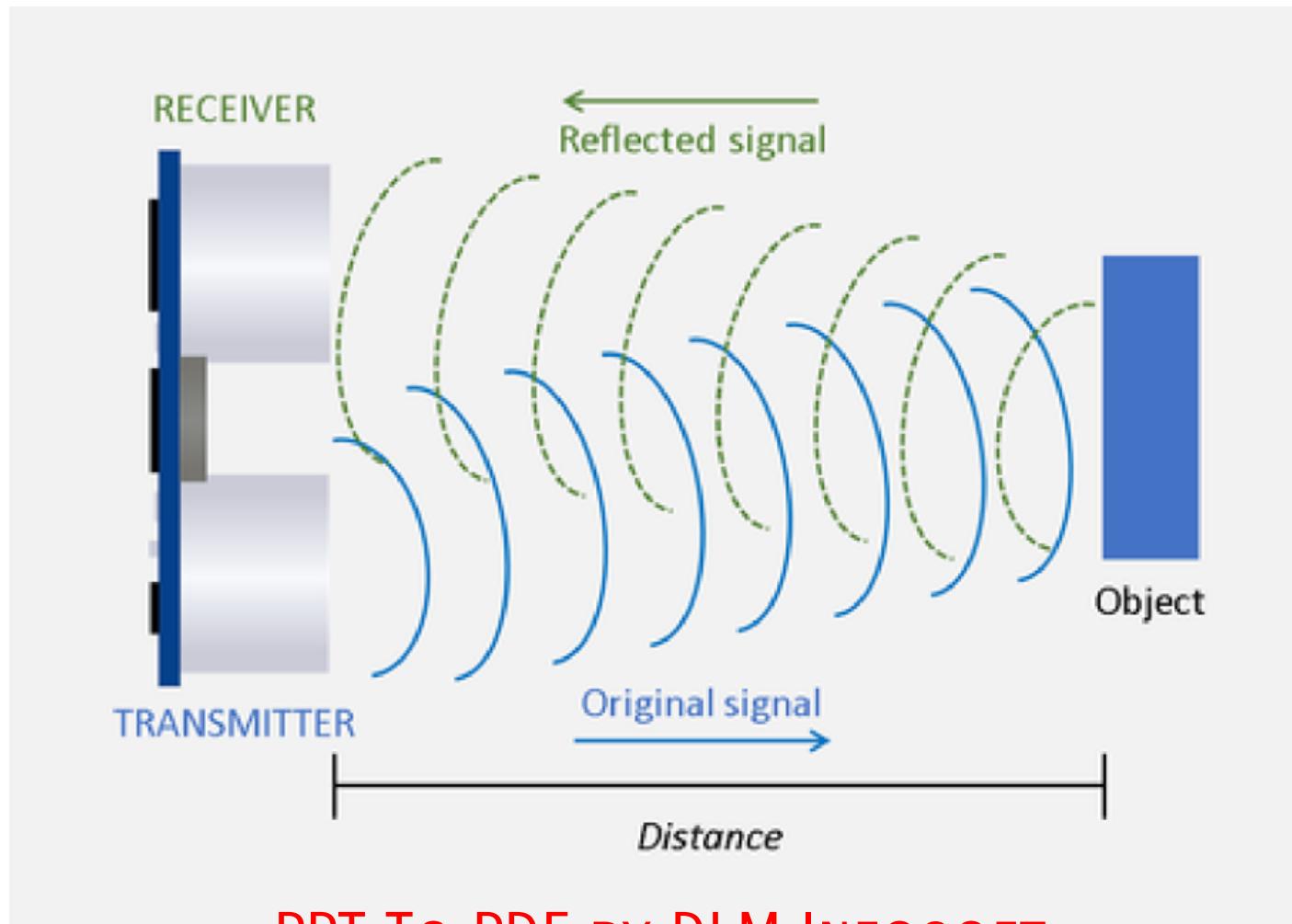
# SENSOR USED FOR OBJECT DETECTION

- ULTRASONIC SENSOR (HC-SR04)

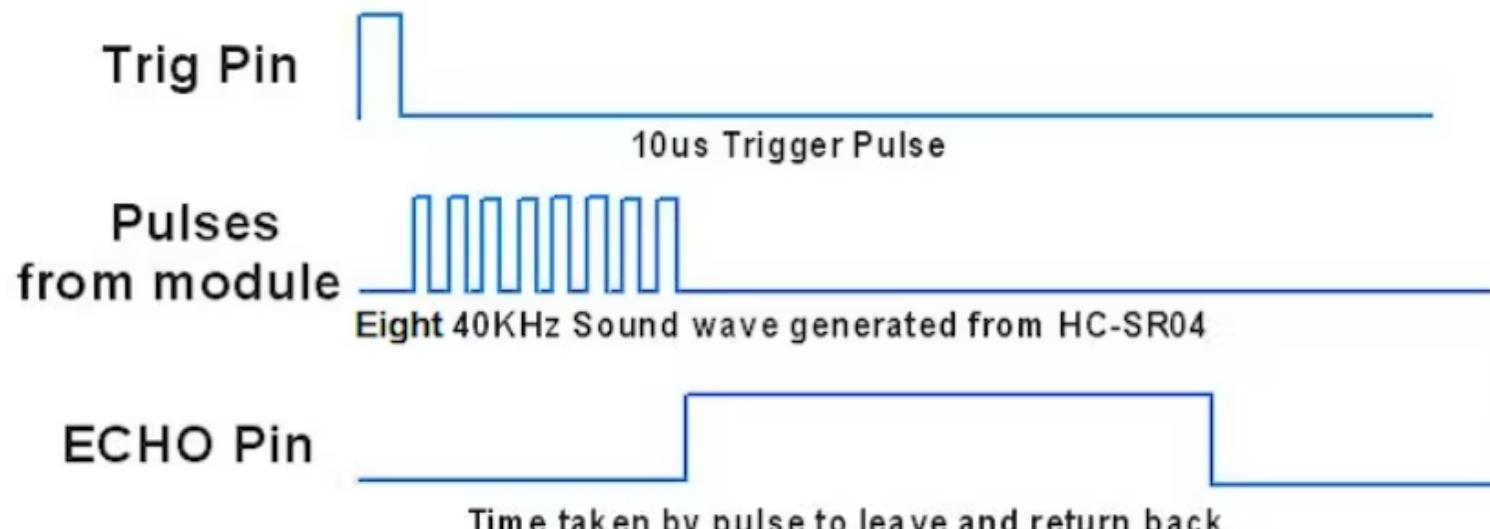
- DETECTION DISTANCE RANGES FROM 2 – 400 CM.
- DETECTION ANGLE 15 DEGREES.



# How ULTRASONIC WORKS?



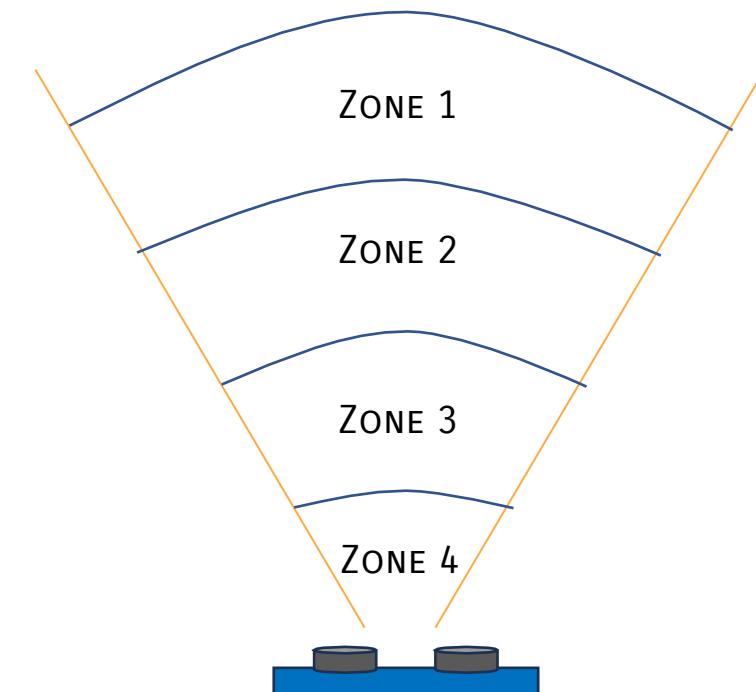
## Ultrasonic HC-SR04 module Timing Diagram



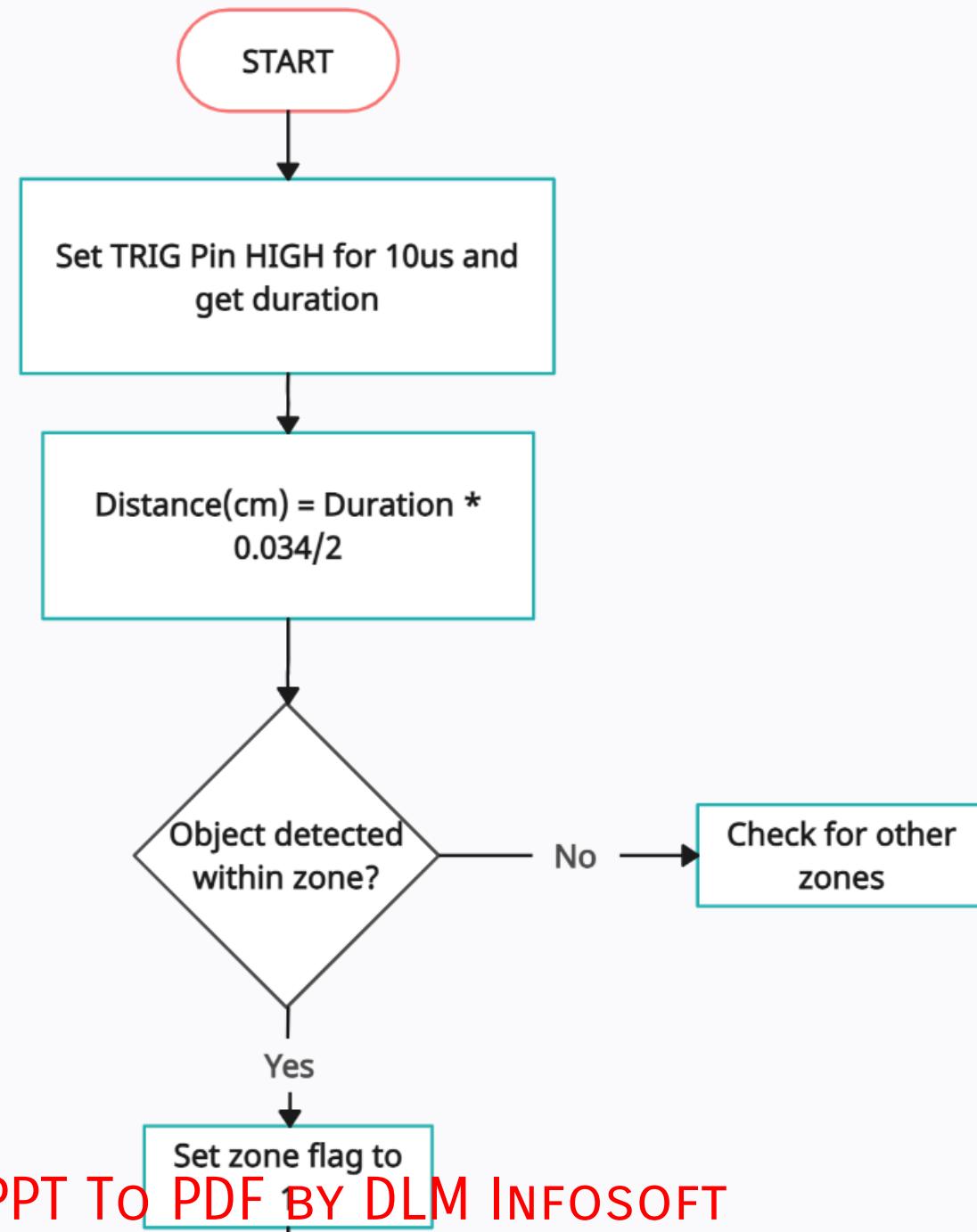
*Ultrasonic HC-SR04 timing diagram*

# OBJECT DETECTION ALGORITHM

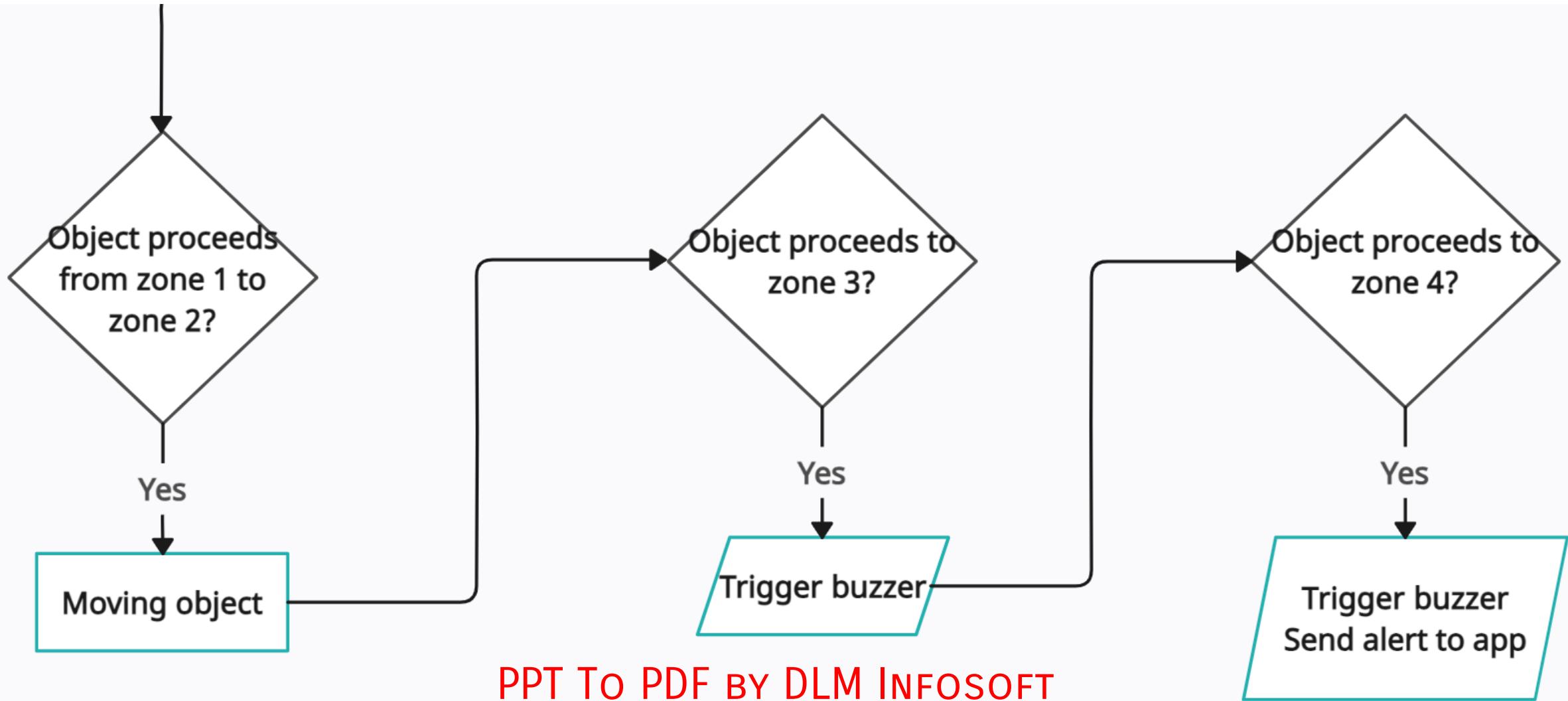
DIVIDE THE SENSOR'S RANGE  
INTO ZONES TO DETECT IF AN  
OBJECT IS IN MOTION OR AT  
REST.



# FLOWCHART



# FLOWCHART



# SMART SAFETY HELMET

OBJECT  
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MONITORING

TEMPERATURE  
& HUMIDITY  
MONITORING

GPS  
TRACKING

INDOORS  
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FALL  
DETECTIO  
N

ULTRASONIC  
HC-SR04

MQ2

DHT22

GY-NEO6MV2

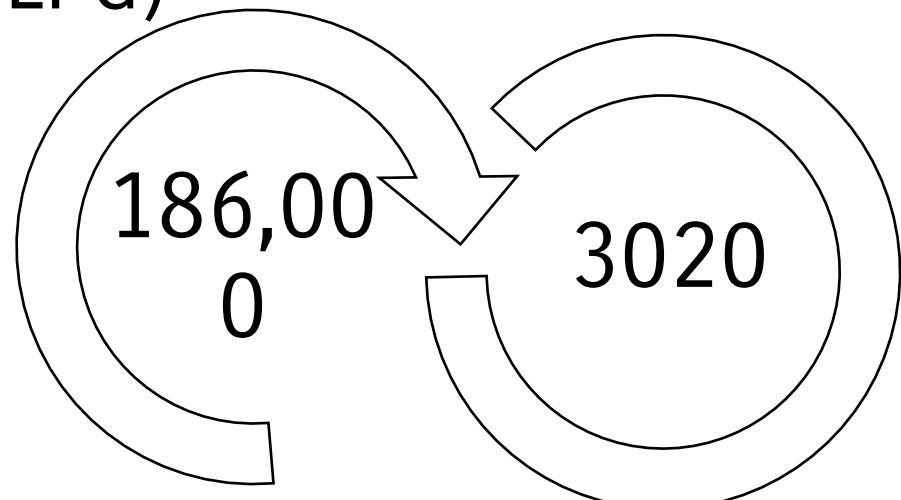
IMU MPU-6050  
BMP180

IMU MPU-6050  
BMP180

# **GAS MONITORING**

# GAS MONITORING

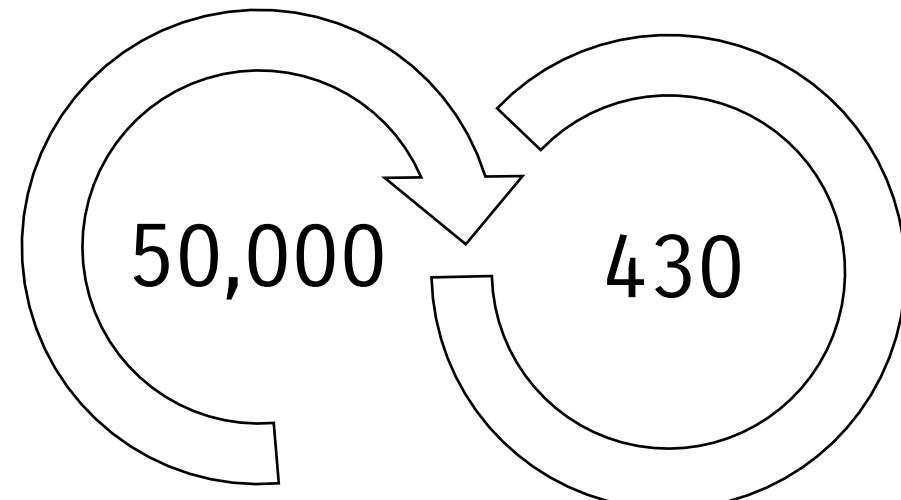
LIQUEFIED PETROLEUM GAS  
(LPG)



GAS  
LEAKS

FIRE &  
EXPLOSIONS

CARBON MONOXIDE (CO)



EMERGENC  
Y VISITS

FATALITIES

ACCORDING TO NFPA (US, 2019)

PPT TO PDF BY DLM INFOSOFT

ACCORDING TO OSHA  
(US)

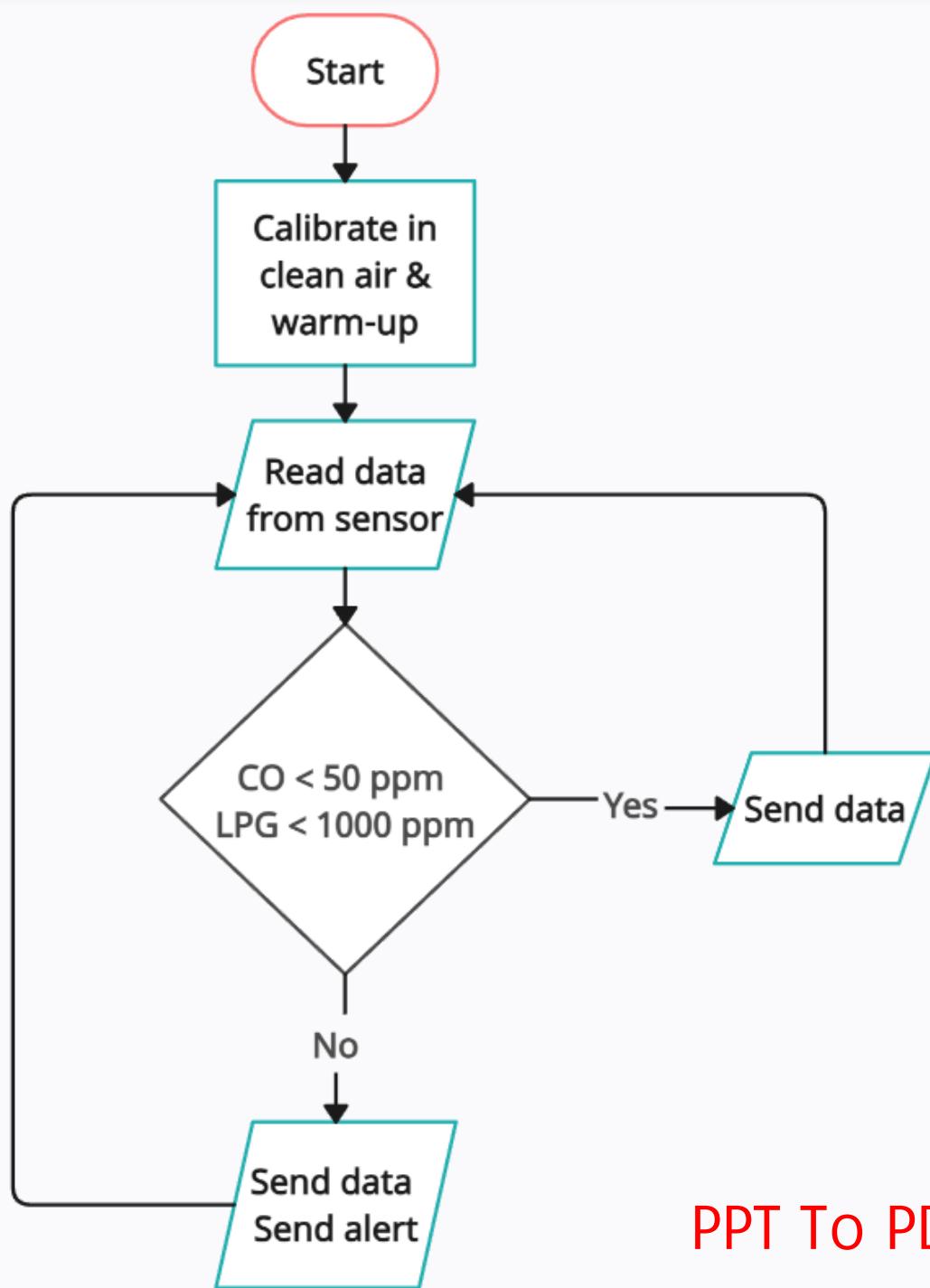
# GAS MONITORING



MQ2 SENSOR

CONCENTRATION  
RANGE:  
UP TO 10,000 PPM

GAS	OSHA	NIOSH
CO	50 PPM FOR 8 HRS SHIFT	50 PPM FOR 8 HRS SHIFT 35 PPM FOR 10 HRS SHIFT
LPG	1000 PPM FOR 8 HRS SHIFT	1000 PPM FOR 8 HRS SHIFT

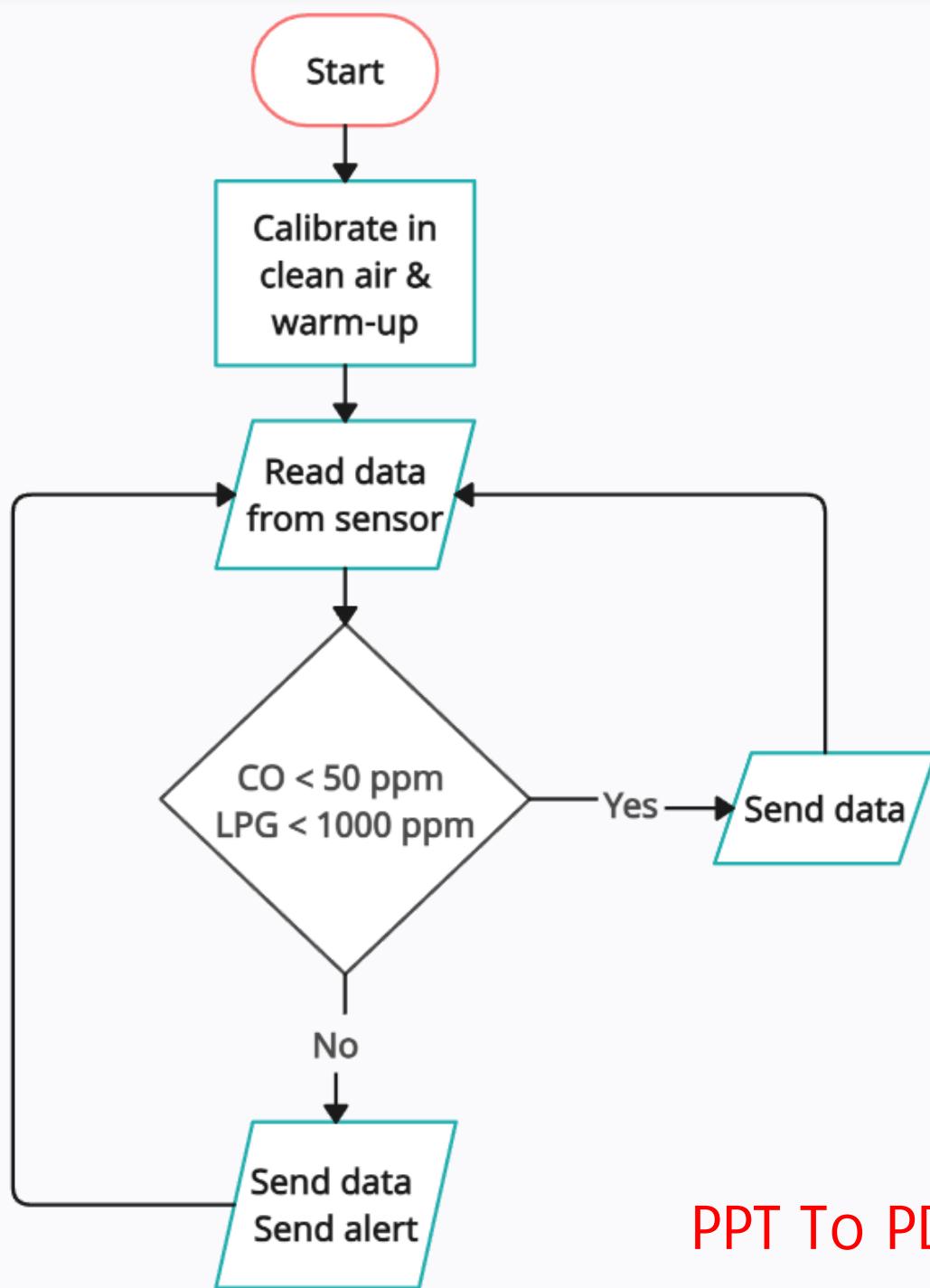


# TEST RESULTS

## INITIAL CONDITIONS IN DTD

```

Calibrating please wait.
R0 calc = 44.30
done!
Gas sensor warming up!
LPG PPM value: 3.50 - Normal LPG levels
CO PPM value: 29.41 - Normal CO levels
LPG PPM value: 3.50 - Normal LPG levels
CO PPM value: 29.41 - Normal CO levels
LPG PPM value: 3.50 - Normal LPG levels
CO PPM value: 29.41 - Normal CO levels
  
```



# TEST RESULTS

## UPON EXPOSURE TO STOVE

CO PPM value: 34.47	- Normal CO levels
LPG PPM value: 4.23	- Normal LPG levels
CO PPM value: 38.33	- Normal CO levels
LPG PPM value: 4.71	- Normal LPG levels
CO PPM value: 44.56	- Normal CO levels
LPG PPM value: 5.13	- Normal LPG levels
CO PPM value: 50.21	- High CO levels
LPG PPM value: 5.47	- Normal LPG levels
CO PPM value: 54.93	- High CO levels
LPG PPM value: 5.86	- Normal LPG levels
CO PPM value: 60.55	- High CO levels
LPG PPM value: 6.09	- Normal LPG levels
CO PPM value: 63.81	- High CO levels
LPG PPM value: 5.97	- Normal LPG levels
CO PPM value: 62.16	- High CO levels

# SMART SAFETY HELMET

OBJECT  
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MONITORING

TEMPERATURE  
& HUMIDITY  
MONITORING

GPS  
TRACKING

INDOORS  
TRACKING

FALL  
DETECTIO  
N

ULTRASONIC  
HC-SR04

MQ2

DHT22

GY-NEO6MV2

IMU MPU-6050  
BMP180

IMU MPU-6050  
BMP180

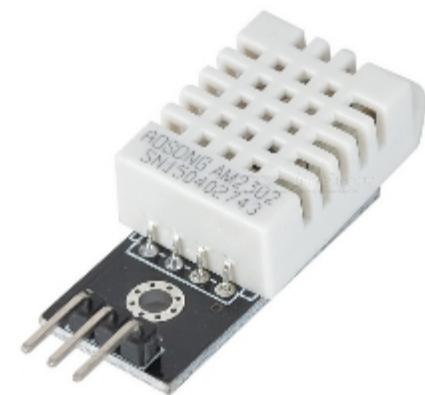
# **TEMPERATURE & HUMIDITY**

# **TEMPERATURE & HUMIDITY**

## **HUMIDITY CONTROL**

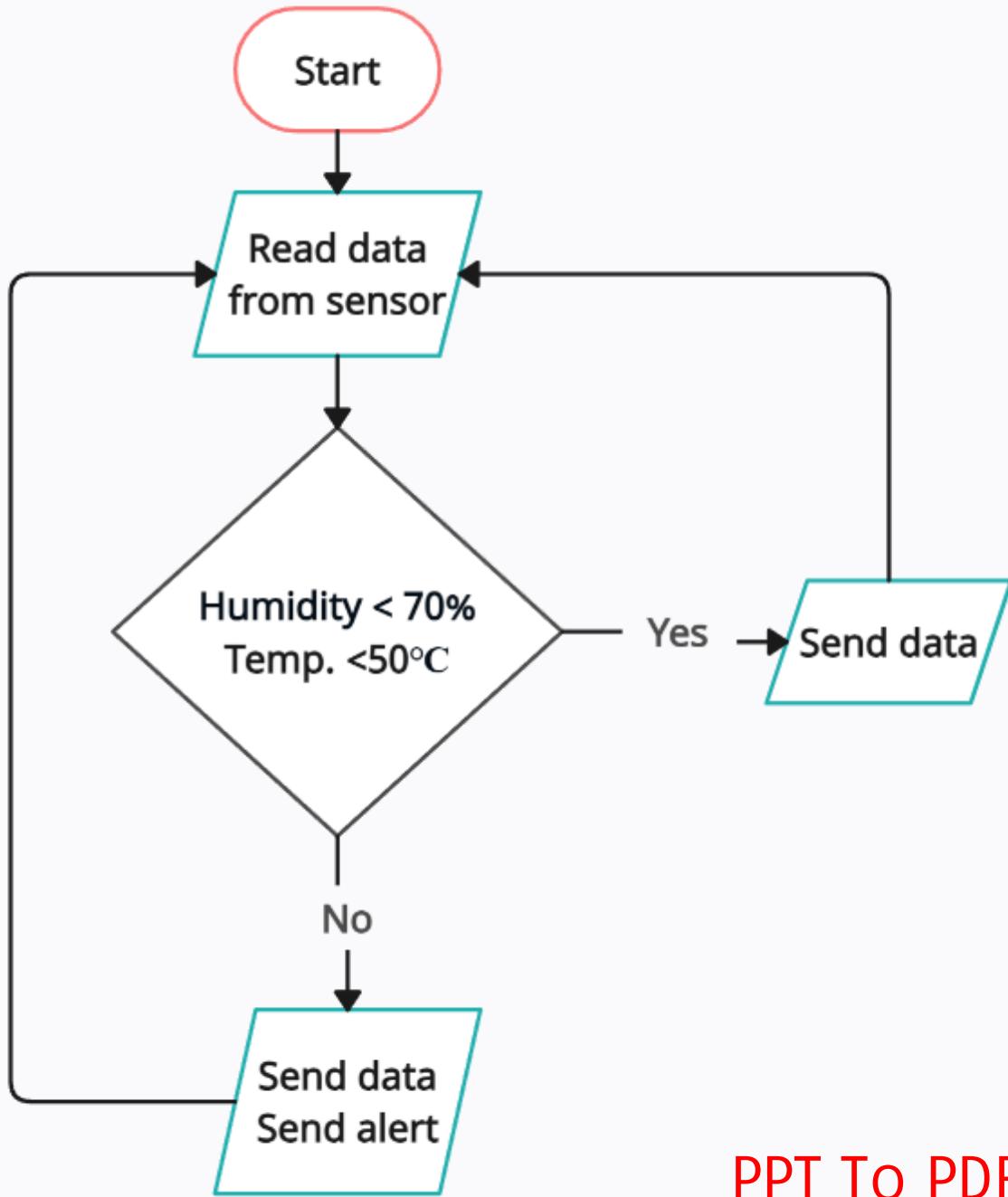
**AS PER TO OSHA STANDARDS, HUMIDITY OF THE WORKPLACE IS TO BE CONTROLLED BETWEEN 20 TO 60%**

# TEMPERATURE & HUMIDITY



DHT22  
SENSOR

TECHNICAL SPECIFICATIONS	
OPERATING CURRENT	2.5 mA
OPERATING RANGE	TEMP. : -40 TO 80 °C HUMIDITY: 0 TO 100%
ACCURACY	TEMP. : $\pm 0.5$ °C HUMIDITY: 2 TO 5%



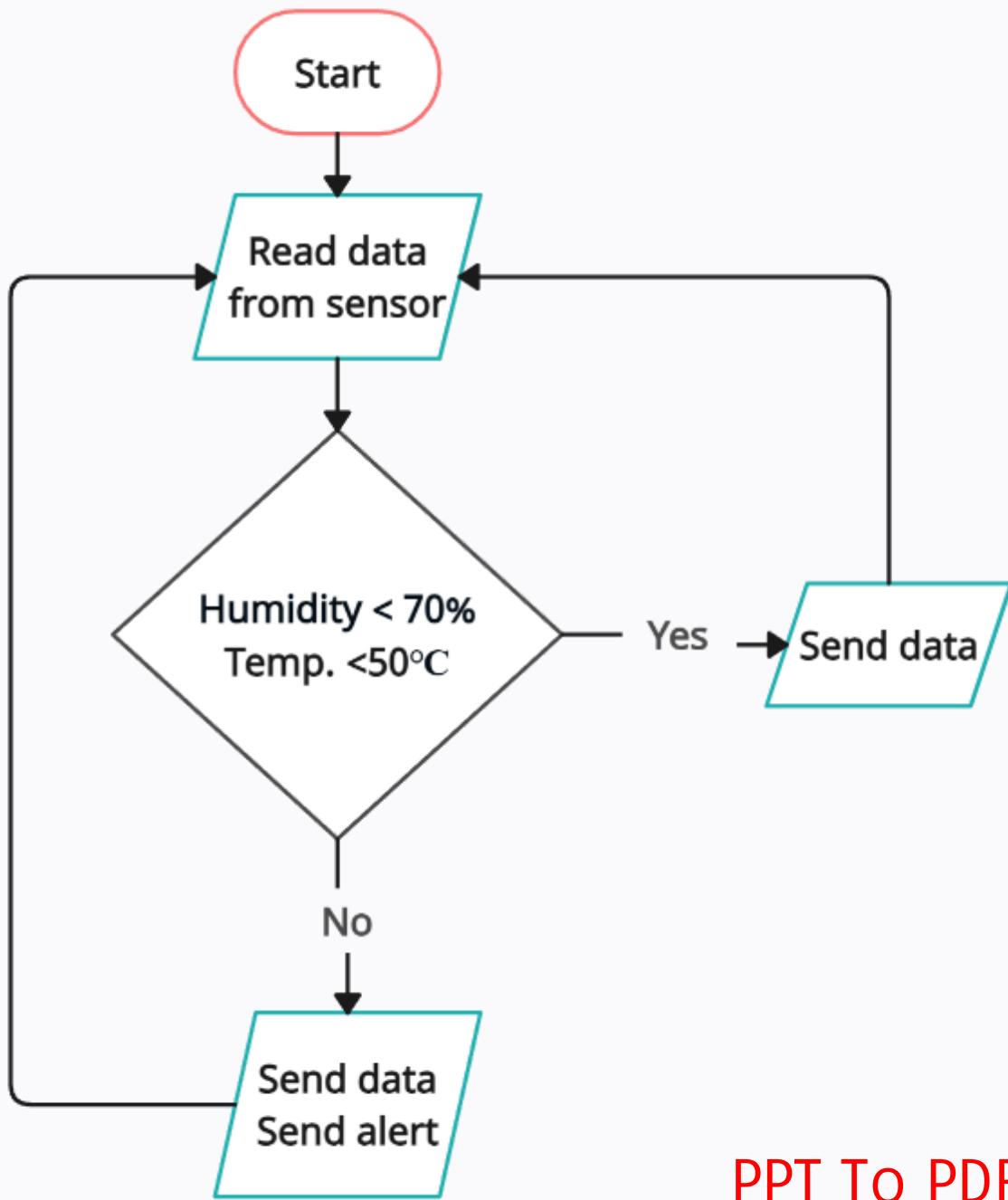
# TEST RESULTS

## INITIAL CONDITIONS IN

R

```

Temp: 19.80 Celsius
Humidity: 57.00%
Temp: 19.90 Celsius
Humidity: 53.00%
Temp: 20.00 Celsius
Humidity: 57.00%
Temp: 20.10 Celsius
Humidity: 57.00%
Temp: 20.10 Celsius
Humidity: 56.00%
  
```



# TEST RESULTS

## UPON EXPOSURE TO STOVE FIRE

Temp: 51.40 Celsius

HIGH TEMPERATURE

Humidity: 19.00%

Temp: 51.50 Celsius

HIGH TEMPERATURE

Humidity: 19.00%

Temp: 51.80 Celsius

HIGH TEMPERATURE

Humidity: 19.00%

Temp: 52.10 Celsius

HIGH TEMPERATURE

Humidity: 20.00%

Temp: 52.30 Celsius

HIGH TEMPERATURE

Humidity: 20.00%

Temp: 52.50 Celsius

HIGH TEMPERATURE

# SMART SAFETY HELMET

OBJECT  
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& HUMIDITY  
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INDOORS  
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ULTRASONIC  
HC-SR04

MQ2

DHT22

GY-NEO6MV2

IMU MPU-6050  
BMP180

IMU MPU-6050  
BMP180

# **GPS TRACKING**

# GPS TRACKING

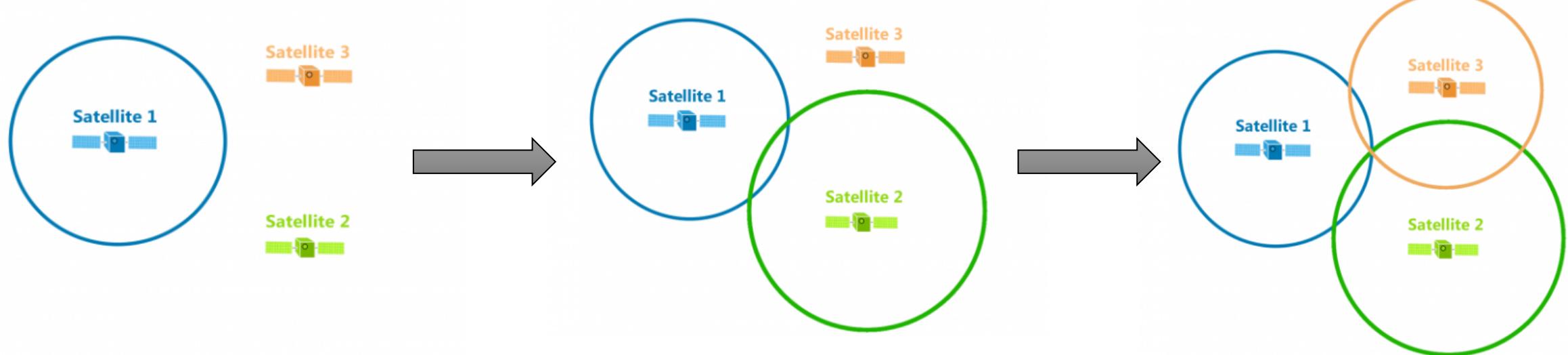


GY-NEO6MV2  
SENSOR

## TECHNICAL SPECIFICATIONS

OPERATING CURRENT	45mA
OPERATING TEMPERATURE	-40 TO 85 °C
HORIZONTAL POSITION ACCURACY	2.5M
CAN TRACK UP TO 22 SATELLITES	

# GPS TRACKING (TRILATERATION)

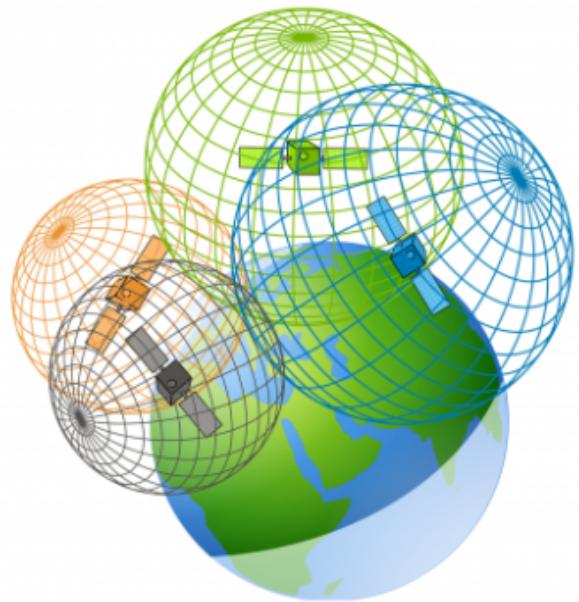


SPECIFIES A  
REGION

MINIMIZES THE  
SPECIFIED  
REGION

SPECIFIES A  
POINT

# GPS TRACKING



IN ADDITION, A FOURTH SATELLITE IS  
NORMALLY REQUIRED TO ADJUST THE  
ERROR IN THE RECEIVER'S CLOCK.

## TEST RESULT:

Date:

3/12/2023

Time:

07:58:03.00

Location:

Latitude: 31.214757

Longitude: 29.943059

Date:

3/12/2023

Time:

07:59:37.00

Location:

Latitude: 31.215034

Longitude: 29.944032

# SMART SAFETY HELMET

OBJECT  
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HC-SR04

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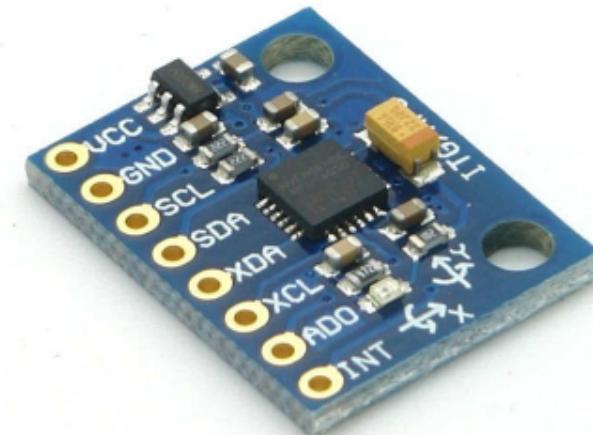
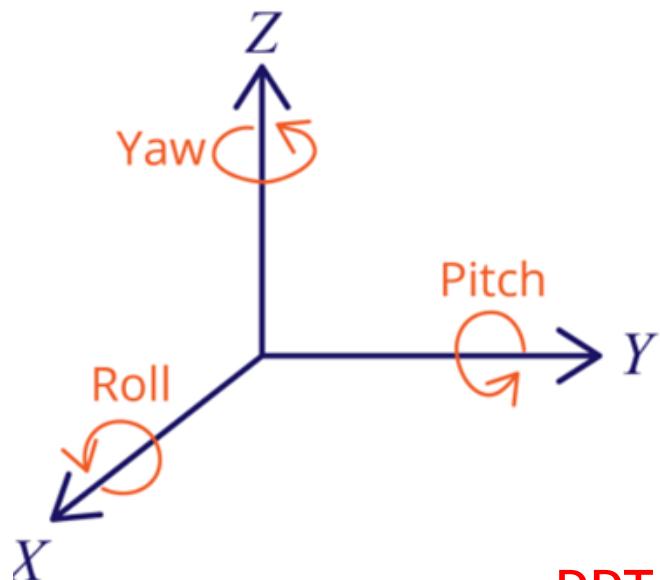
IMU MPU-6050  
BMP180

IMU MPU-6050  
BMP180

# **INDOORS TRACKING**

# SENSORS USED FOR INDOORS TRACKING:

- MPU 6050:
  - 3-AXIS GYROSCOPE
  - 3-AXIS ACCELEROMETER



# **BENEFITS OF ADDING TRACKING FEATURES TO A SAFETY HELMET**

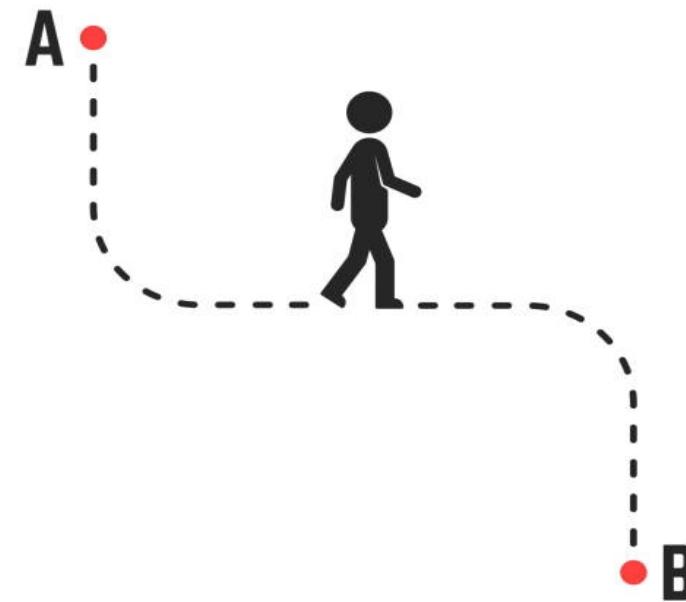
- **LOCATION TRACKING:** WE CAN MONITOR THE LOCATION OF WORKERS IN REAL-TIME.
- **EMERGENCY RESPONSE:** IN THE EVENT OF AN ACCIDENT OR EMERGENCY, TRACKING FEATURES CAN HELP EMERGENCY RESPONDERS LOCATE WORKERS QUICKLY AND EFFICIENTLY.
- **COMPLIANCE MONITORING:** YOU CAN MONITOR WHETHER WORKERS ARE WEARING THEIR HELMETS AT ALL TIME.

# TRACKING

THE GOAL IS TO DRAW THE PATH THAT THE WORKER WALKED.

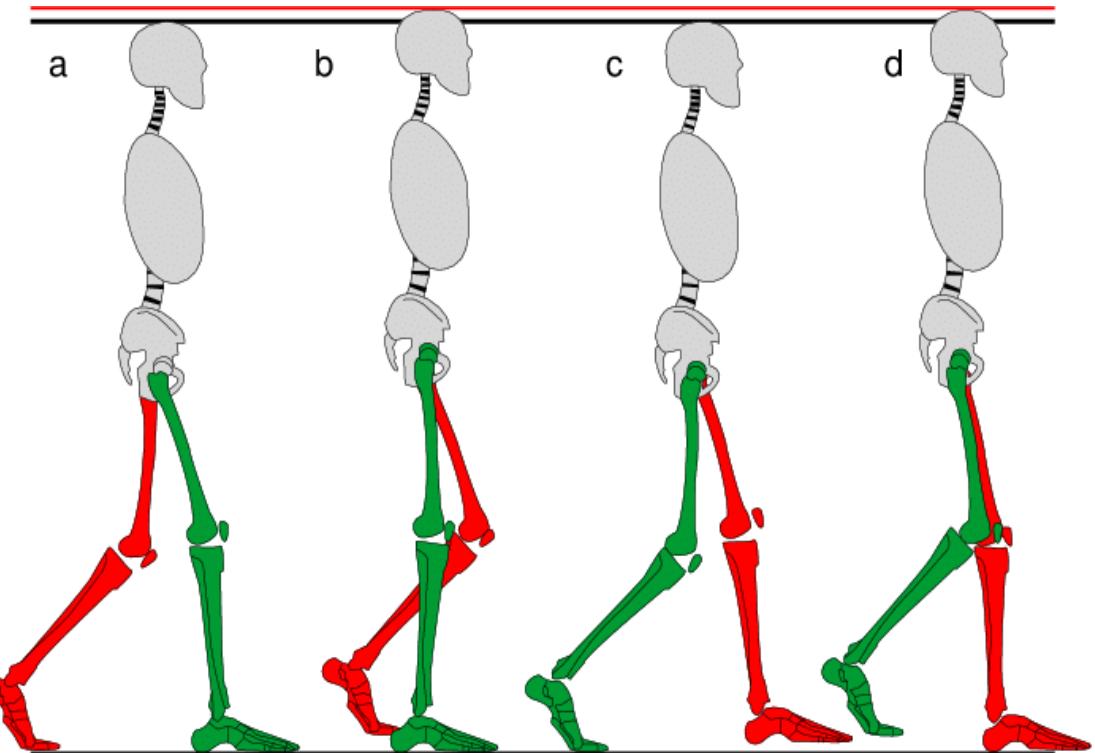
SO WE NEED TWO THINGS:

- DISTANCE
- ANGLE

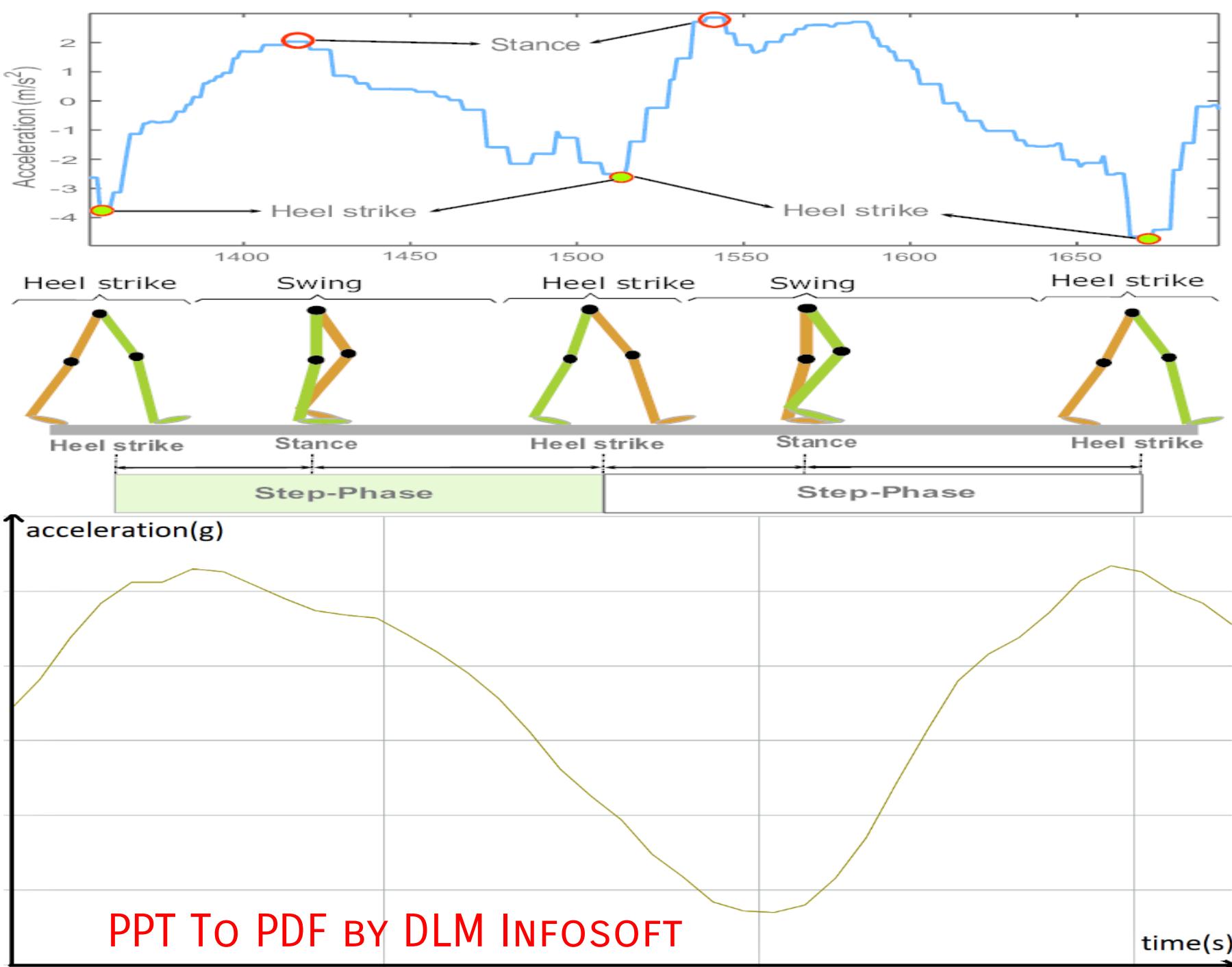


# ANALYSIS OF GAIT CHARACTERISTICS

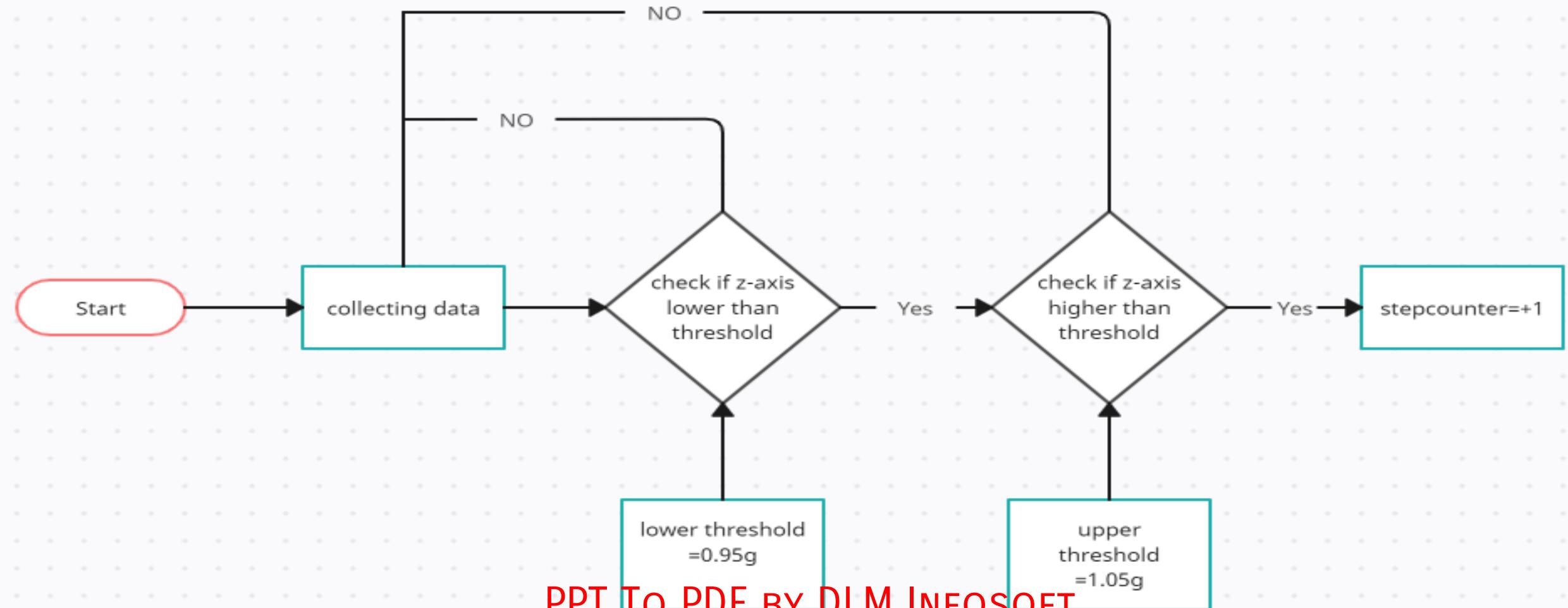
DURING EACH STEP A CHANGE  
IN HEIGHT HAPPENS WHICH  
CAUSES A SMALL CHANGE IN  
ACCELERATION ALONG THE Z  
AXIS.



BY ANALYZING  
THE GRAPH  
DURING WALKING  
WE CAN APPLY  
THRESHOLDS  
THAT WILL HELP  
US COUNTING  
NUMBER OF  
STEPS



# STEP COUNTER ALGORITHM



# HOW TO CALCULATE DISTANCE

DISTANCE = NUMBER OF STEPS X STEP LENGTH

Step Length

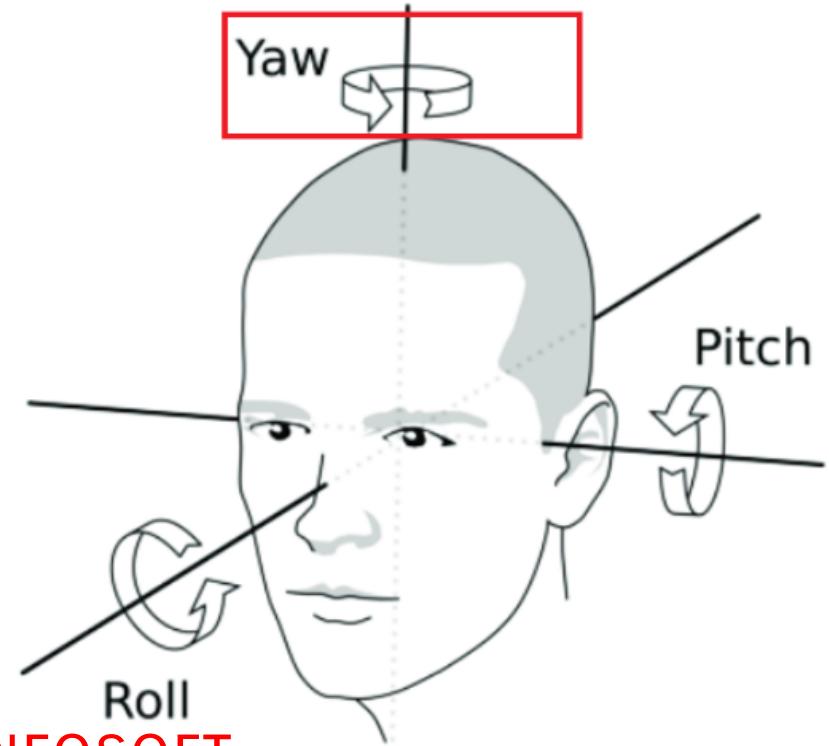


STEP LENGTH = 0.71M  
(AVERAGE STEP LENGTH FOR MALE)

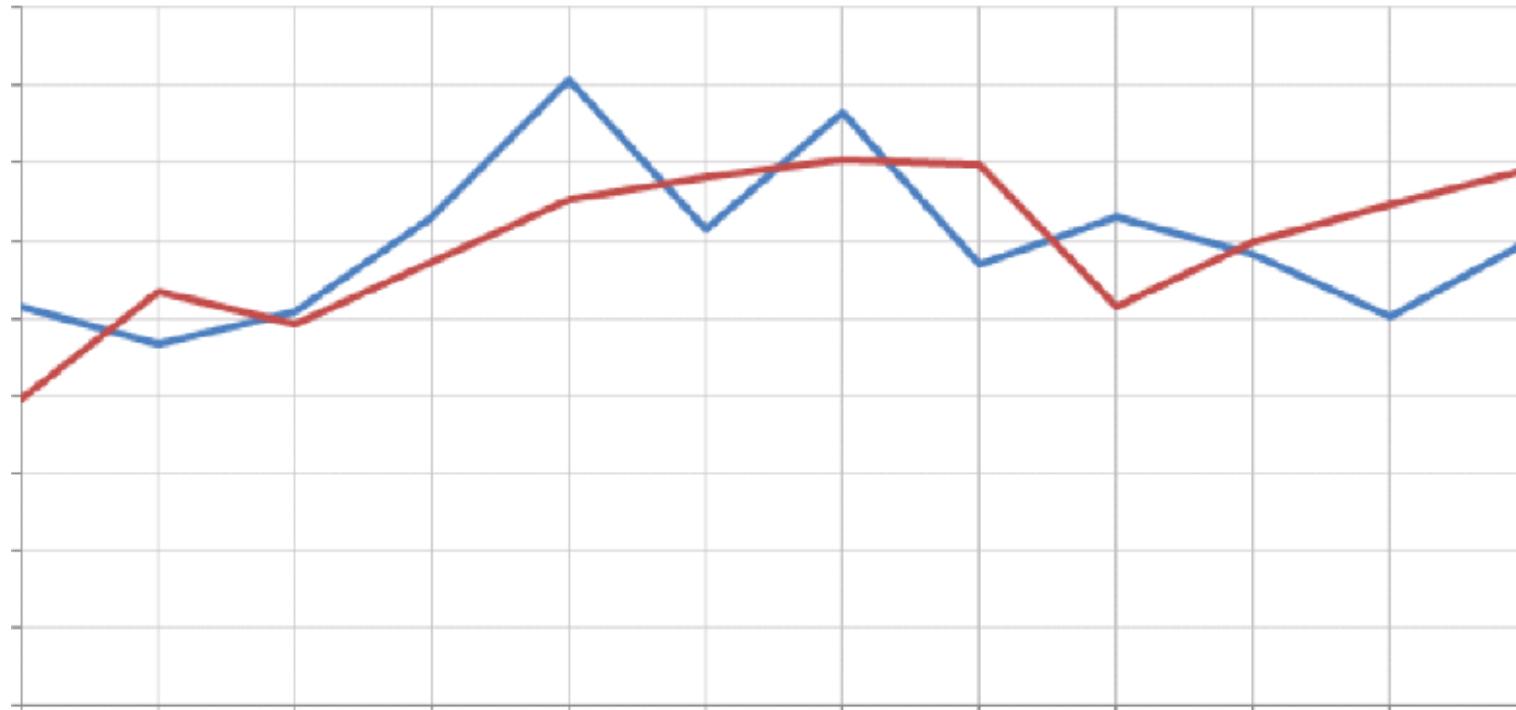
# HEAD ANGLES

SINCE THE GYROSCOPE OF THE MPU-6050 MEASURES THE ROTATIONAL VELOCITY WE CAN DETERMINE THE ANGLES IN X,Y,Z DIRECTION BY SIMPLE INTEGRATION.

**YAW ANGLE** IS THE MOST  
IMPORTANT FOR PLOTTING  
THE PATH.



# ANGLE INSTABILITY



TRUE PATH:



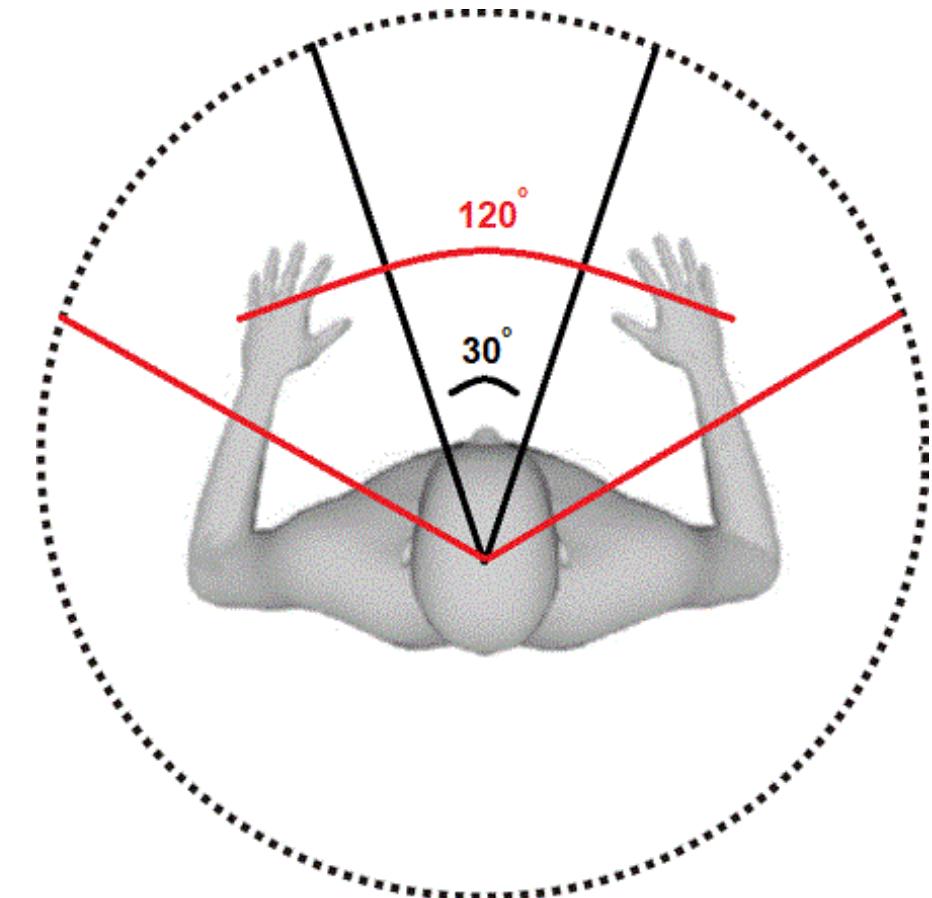
RESULTED PATH:



# ANGLE STABILIZATION

IN ORDER TO STABILIZE THE ANGLE DURING MOTION WE DIVIDED THE RANGE OF MOTION INTO 3 PARTS:

1. INSIDE **BLACK RANGE**: ANGLE DOESN'T CHANGE
2. INSIDE **RED RANGE**: ANGLE CHANGE IF IT STAYS BETWEEN BLACK AND RED RANGE FOR 1.5 SECONDS
3. OUTSIDE **RED RANGE**: ANGLE CHANGE IMMEDIATELY



# **TWO PHASE UPDATING**

## **1. FIRST PHASE:**

UPDATING PRIMARILY THE DISTANCE IN ALMOST A STRAIGHT LINE.

## **2. SECOND PHASE:**

UPDATING PRIMARILY THE ANGLE IN A CURVE.

SINCE NOW WE HAVE DISTANCE AND ANGLE, POLAR COORDINATES ARE OBTAINED.

# TESTING:

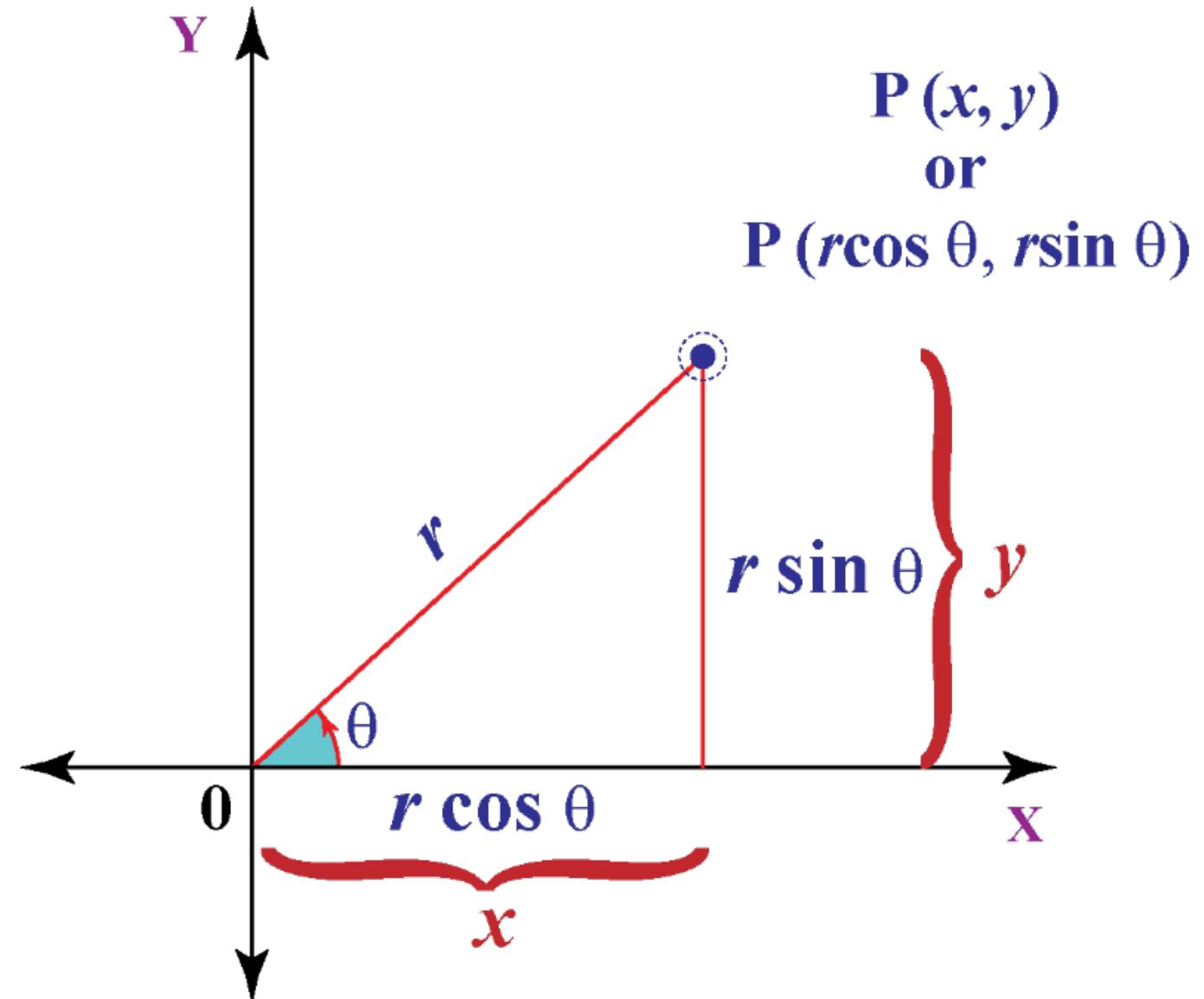
```
MPU6050 status: 0
Calculating offsets, do not move MPU6050
Done!

Total steps: 5.00  Total Distance: 3.55  Approximate Recent Distance: 3.55m  in angle:0
Total steps: 5.00  Total Distance: 3.55  Approximate Recent Distance: 0.00m  in angle:295
Total steps: 5.00  Total Distance: 3.55  Approximate Recent Distance: 0.00m  in angle:235
Total steps: 10.50  Total Distance: 7.46  Approximate Recent Distance: 3.91m  in angle:191
Total steps: 10.50  Total Distance: 7.46  Approximate Recent Distance: 0.00m  in angle:256
Total steps: 10.50  Total Distance: 7.46  Approximate Recent Distance: 0.00m  in angle:317
Total steps: 16.50  Total Distance: 11.71  Approximate Recent Distance: 4.26m  in angle:351
Total steps: 16.50  Total Distance: 11.71  Approximate Recent Distance: 0.00m  in angle:290
Total steps: 17.50  Total Distance: 12.42  Approximate Recent Distance: 0.71m  in angle:229
Total steps: 22.00  Total Distance: 15.62  Approximate Recent Distance: 3.20m  in angle:189
Total steps: 22.00  Total Distance: 15.62  Approximate Recent Distance: 0.00m  in angle:127
Total steps: 22.00  Total Distance: 15.62  Approximate Recent Distance: 0.00m  in angle:66
Total steps: 27.50  Total Distance: 19.52  Approximate Recent Distance: 3.91m  in angle:6
Total steps: 27.50  Total Distance: 19.52  Approximate Recent Distance: 0.00m  in angle:342
Total steps: 37.00  Total Distance: 26.27  Approximate Recent Distance: 0.00m  in angle:3
Total steps: 37.00  Total Distance: 26.27  Approximate Recent Distance: 0.00m  in angle:67
Total steps: 37.00  Total Distance: 26.27  Approximate Recent Distance: 0.00m  in angle:129
Total steps: 37.00  Total Distance: 26.27  Approximate Recent Distance: 0.00m  in angle:192
Total steps: 37.00  Total Distance: 26.27  Approximate Recent Distance: 0.00m  in angle:253
Total steps: 38.00  Total Distance: 26.98  Approximate Recent Distance: 0.71m  in angle:317
Total steps: 39.50  Total Distance: 28.04  Approximate Recent Distance: 1.06m  in angle:17
Total steps: 44.50  Total Distance: 31.59  Approximate Recent Distance: 3.55m  in angle:1
```

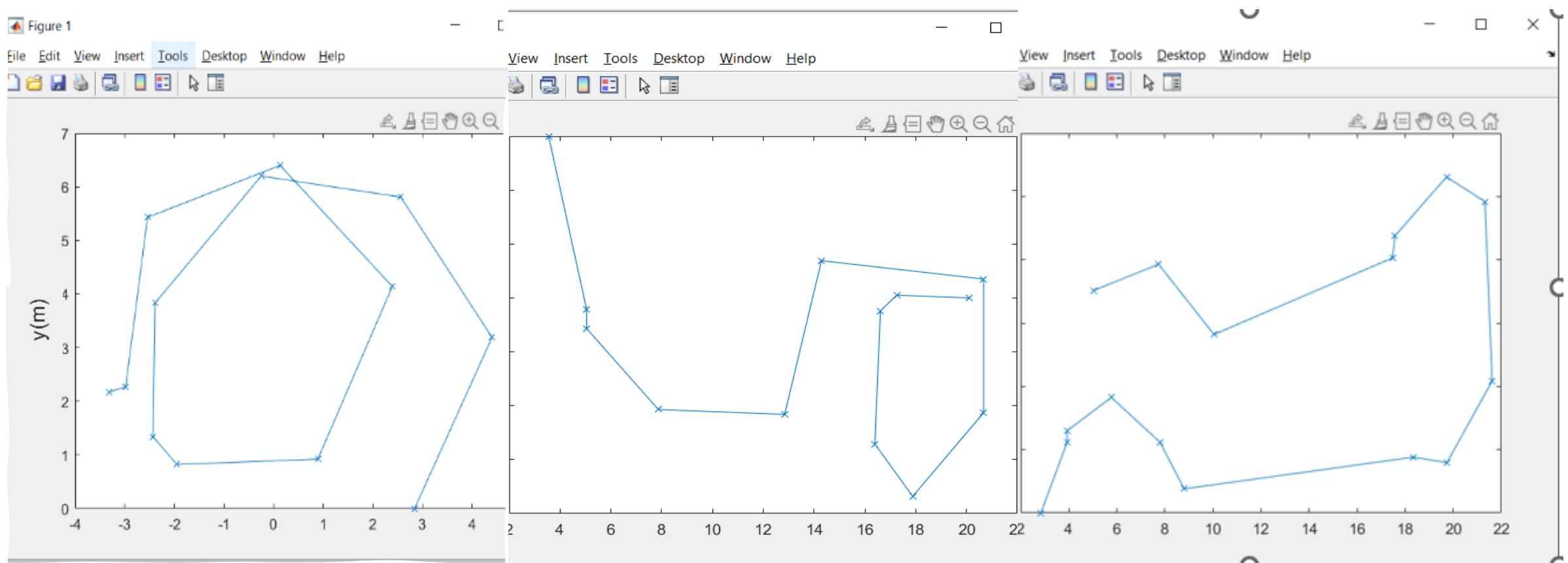
# POLAR COORDINATES



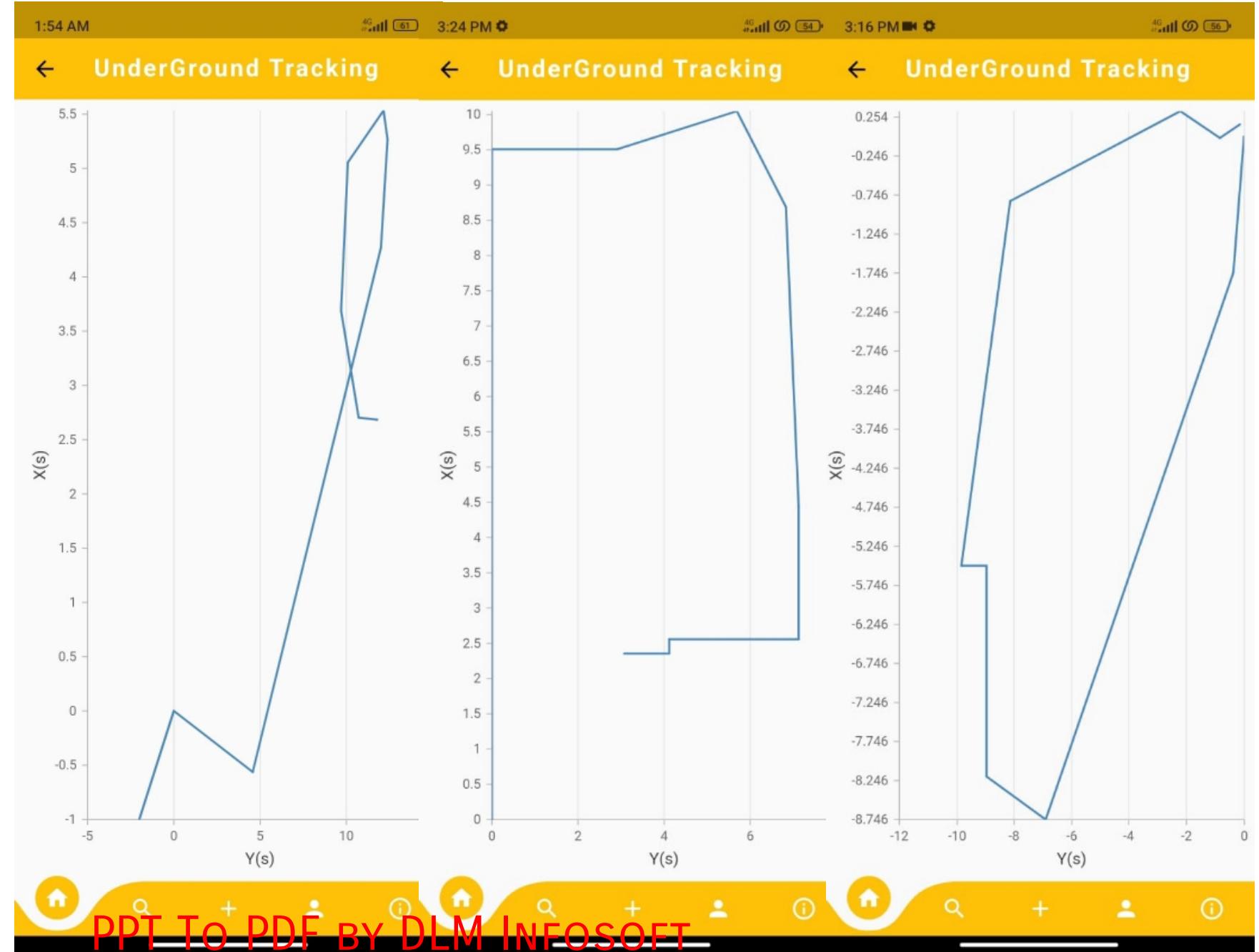
# CARTESIAN COORDINATES



# TESTING USING MATLAB



# TESTING USING OUR APP:



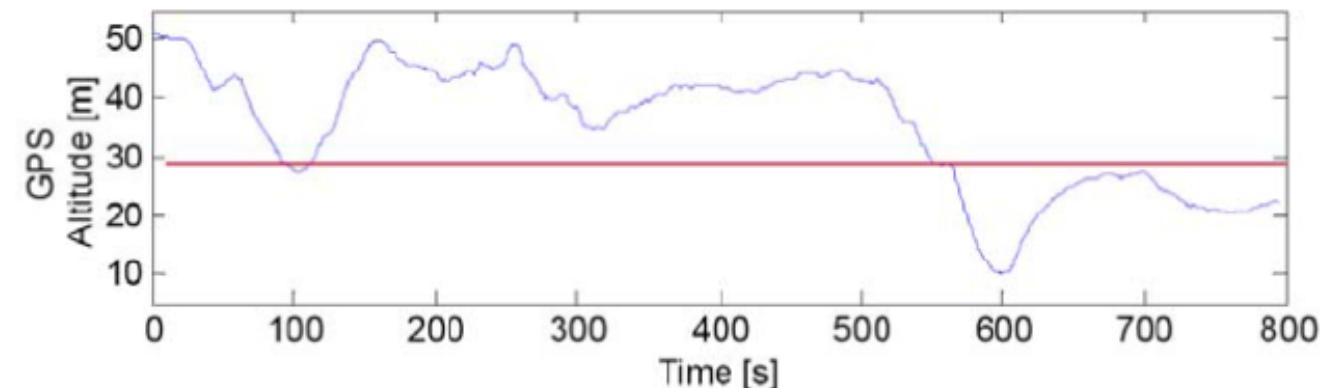
# FROM 2D TO 3D

GPS SHORTCOMINGS.

MODERN GPS SHOW PRETTY ACCURATE PERFORMANCE IN TERMS OF LATITUDE AND LONGITUDE.

WHEREAS THE ALTITUDE INFORMATION IS LESS RELIABLE DUE TO:

- ATTENUATION
- OBSTRUCTIONS
- MULTIPATH EFFECTS

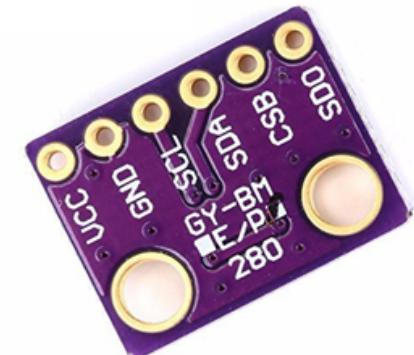


# THE SOLUTION: BAROMETRIC PRESSURE!

BY USING BMP-180 WHICH IS A BAROMETRIC SENSOR AS AN ALTIMETER ,WE MASSIVELY INCREASE THE ACCURACY OF OUR ALTITUDE READINGS.

WHICH OPERATES IN THE FOLLOWING RANGES:

-  Temperature: -40°C to 85°C ( $\pm 1.0^\circ\text{C}$  accuracy)
-  Pressure: 300hPa to 1100hPa ( $\pm 1\text{hPa}$  accuracy)
-  Altitude: 0 to 30,000ft ( $\pm 1$  meter accuracy)



To get altitude from barometric pressure we use the following equation:

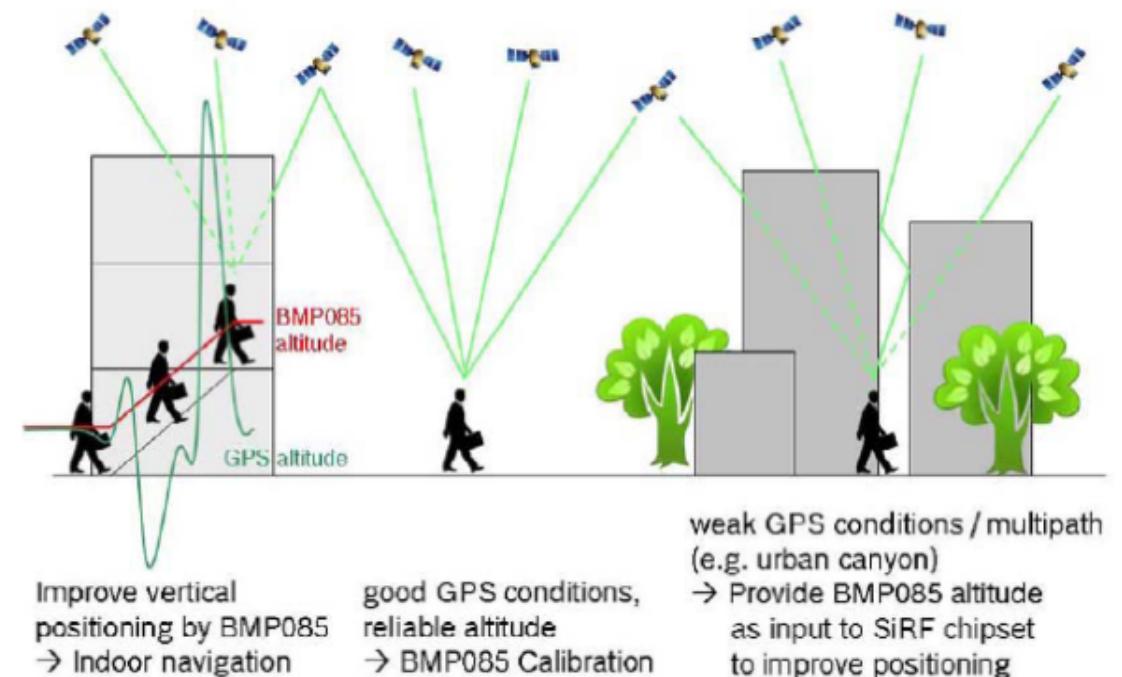
$$\text{Altitude} = 44330 \times \left( 1 - \left( \frac{p}{P_0} \right)^{\frac{1}{5.255}} \right)$$

$P_0$ : Atmospheric pressure at sea level(in hPa)

P : Atmospheric pressure at your current location

However, there are 2 problems:

- Weather effect
- Accuracy



# WEATHER EFFECT

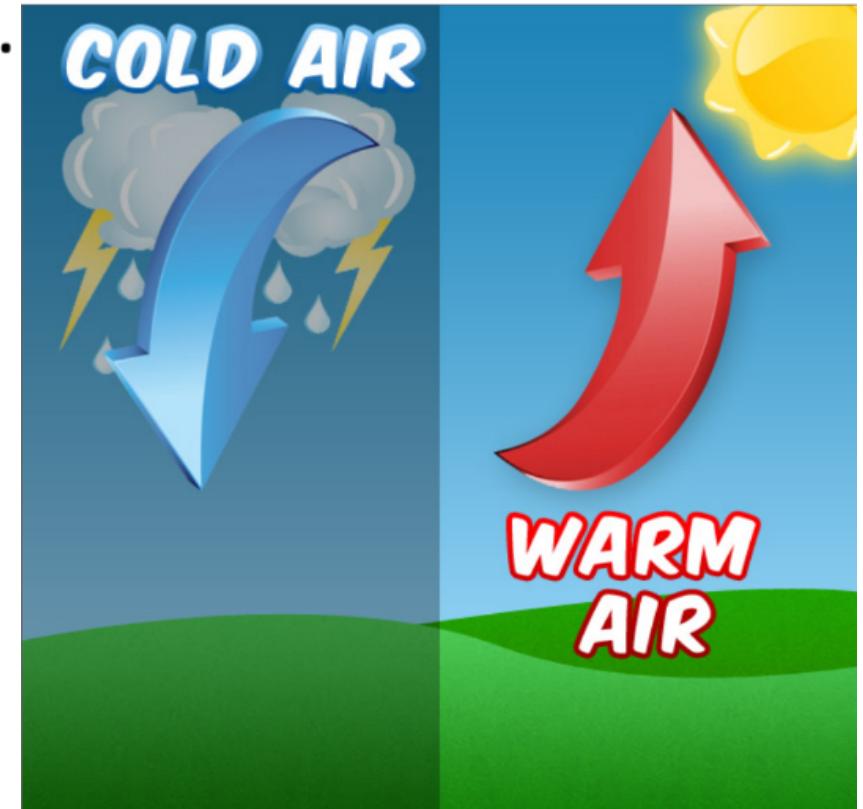
- Low pressure brings stormy weather.
- high pressure brings Sunny weather.

**Solution:** Calibrating the sensor in a location with known altitude:

$$p_0 = \frac{p}{\left(1 - \frac{\text{altitude}}{44330}\right)^{5.255}}$$

$P_0$ : Atmospheric pressure at sea level( in hPa)

$P$  : Atmospheric pressure at your current location



# ACCURACY TEST:

The accuracy of the pressure is  
**-1hPa~1hPa**

$$\text{Altitude} = 44330 \times \left( 1 - \left( \frac{p}{P_0} \right)^{\frac{1}{5.255}} \right)$$

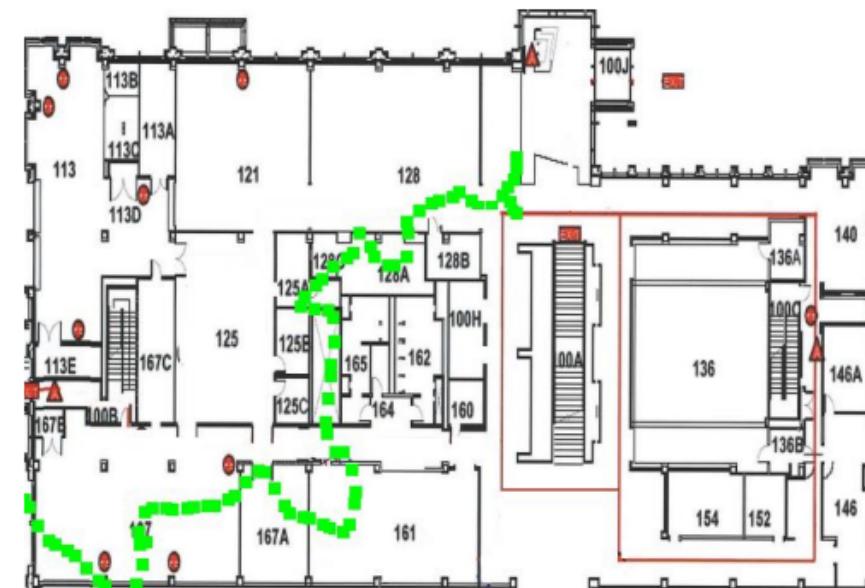
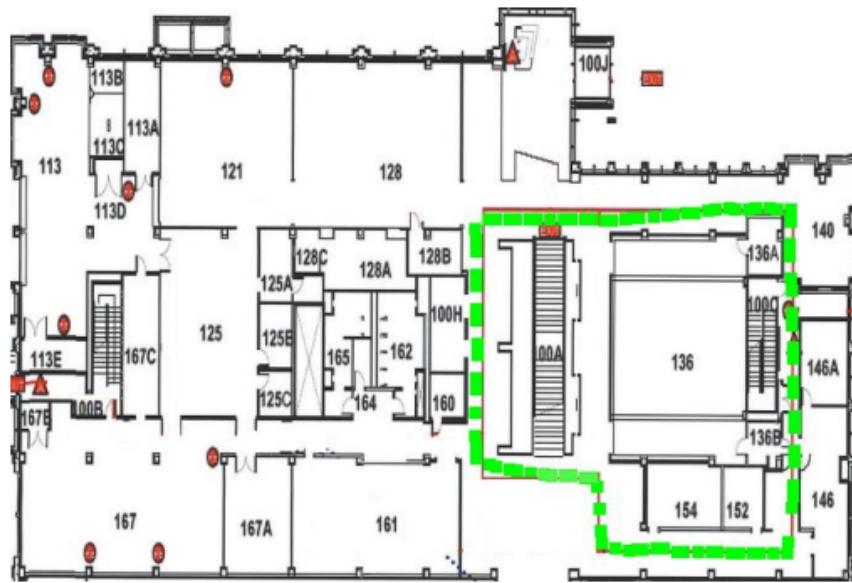
$P_0$ : Atmospheric pressure at sea level( in hPa)

P : Atmospheric pressure at your current location

**Solution:** By taking a number of samples and averaging them we reduced the error to **-0.2m ~ 0.2m** only!

```
Output Serial Monitor ×  
Message (Enter to send message to 'Arduino Nano' on 'COM4')  
  
old average: 19.19 new average: 19.12 diff: 0.07  
old average: 19.09 new average: 19.11 diff: 0.03  
old average: 19.08 new average: 19.13 diff: 0.05  
old average: 19.07 new average: 19.09 diff: 0.03  
old average: 19.17 new average: 19.01 diff: 0.16  
old average: 19.13 new average: 19.15 diff: 0.02  
old average: 19.07 new average: 19.09 diff: 0.02  
old average: 19.11 new average: 19.04 diff: 0.07  
old average: 19.08 new average: 18.96 diff: 0.12  
old average: 19.14 new average: 18.94 diff: 0.20  
old average: 19.18 new average: 18.94 diff: 0.24  
old average: 19.12 new average: 18.97 diff: 0.14  
old average: 19.11 new average: 19.02 diff: 0.10  
old average: 19.13 new average: 19.15 diff: 0.02  
old average: 19.09 new average: 19.19 diff: 0.10  
old average: 19.01 new average: 19.16 diff: 0.15  
old average: 19.15 new average: 19.15 diff: 0.00  
old average: 19.09 new average: 19.17 diff: 0.08
```

NOW THAT WE HAVE ACCURATE HORIZONTAL AND VERTICAL READINGS, BY APPLYING A MAP OVER OUR PLOT WE CAN DETERMINE THE WORKER'S LOCATION AT ALL TIMES.



# SMART SAFETY HELMET

OBJECT  
DETECTION

GAS  
MONITORING

TEMPERATURE  
& HUMIDITY  
MONITORING

GPS  
TRACKING

INDOORS  
TRACKING

FALL  
DETECTIO  
N

ULTRASONIC  
HC-SR04

MQ2

DHT22

GY-NEO6MV2

IMU MPU-6050  
BMP180

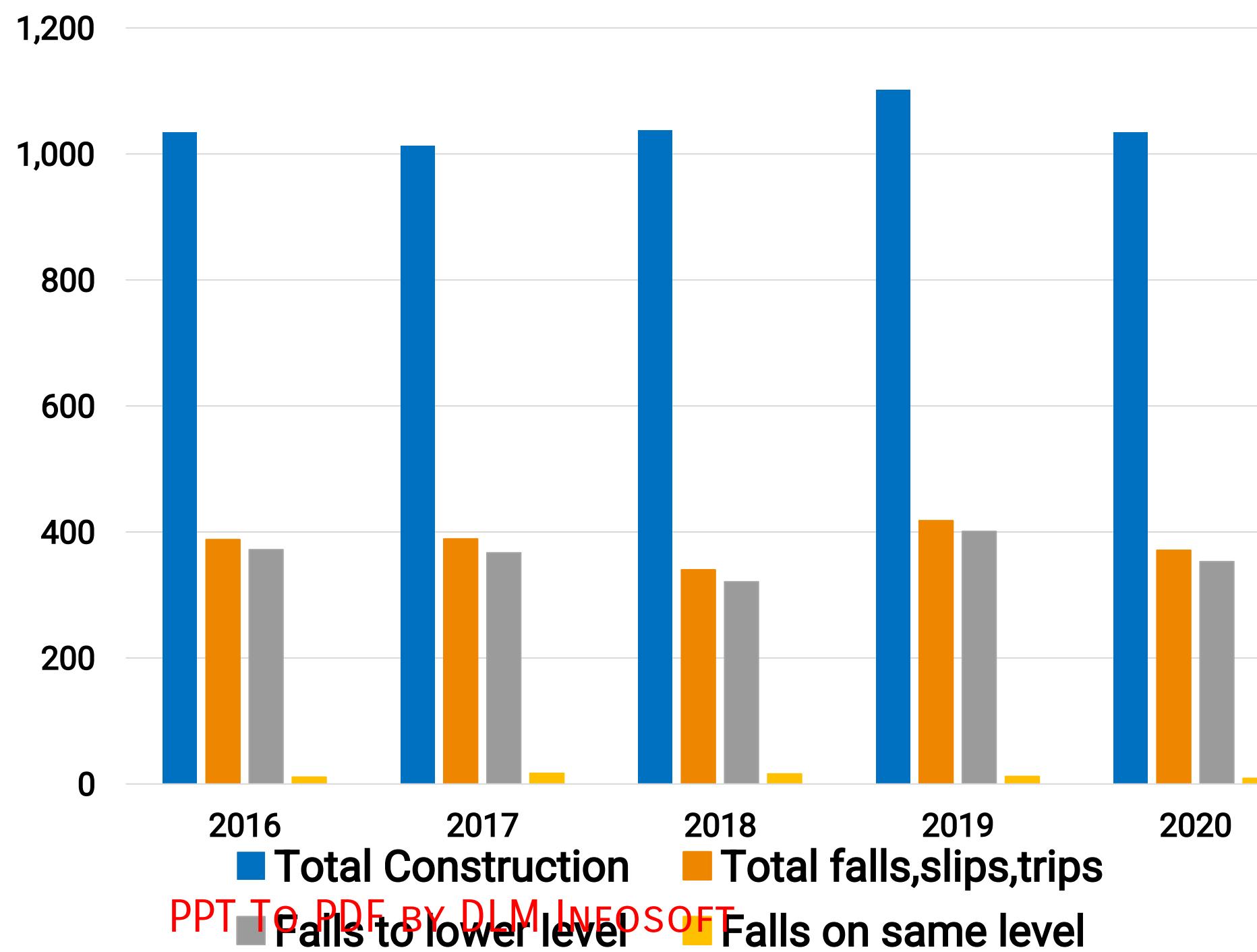
IMU MPU-6050  
BMP180

# FALL DETECTION

# WHY FALL DETECTION?

- According to OSHA(USA), falls are responsible for about one-third of all construction-related deaths
- THE HSE(UK) REPORTS THAT AROUND A QUARTER OF INJURIES REPORTED ARE DUE TO SLIPS, TRIPS AND FALLS

# FATALITIES DUE TO FALLS IN CONSTRUCTION SITES (BLS, US A)



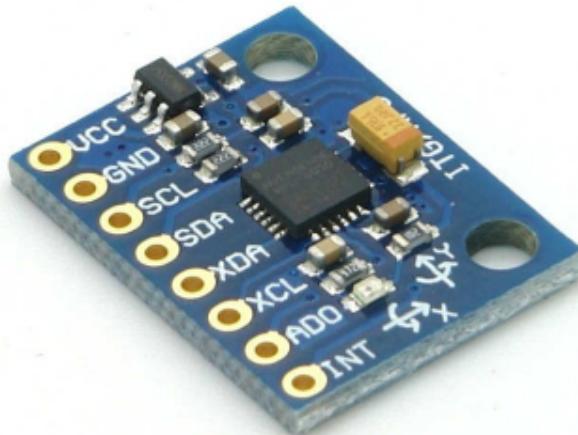
# FURTHER STATISTICS REGARDING FATALITIES IN CONSTRUCTION SITES DUE TO FALLS IN 2018:

	THE BUREAU OF LABOR STATISTICS (BLS, USA)	THE CENTERS FOR DISEASE CONTROL & PREVENTION (SOUTH KOREA)
NO. OF INJURED WORKERS DUE TO FALLS	5,147	8,607
PERCENTAGE OF FATAL FALLS FROM WORK INJURIES GENERALLY	39.2%	37.56%

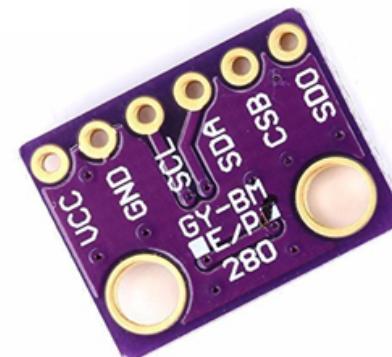
OUR AIM IN DETECTING FALLS ONCE THEY OCCUR IS TO HELP  
IN FASTER TRANSPORTATION TO MEDICAL FACILITIES AS  
RECOMMENDED BY ASSP(AMERICAN SOCIETY OF SAFETY  
PROFESSIONALS) PPT TO PDF BY DLM INFOSOFT

# THE SENSORS USED:

- THE SENSOR USED TO DETECT FALLS IS IMU(MPU-6050).

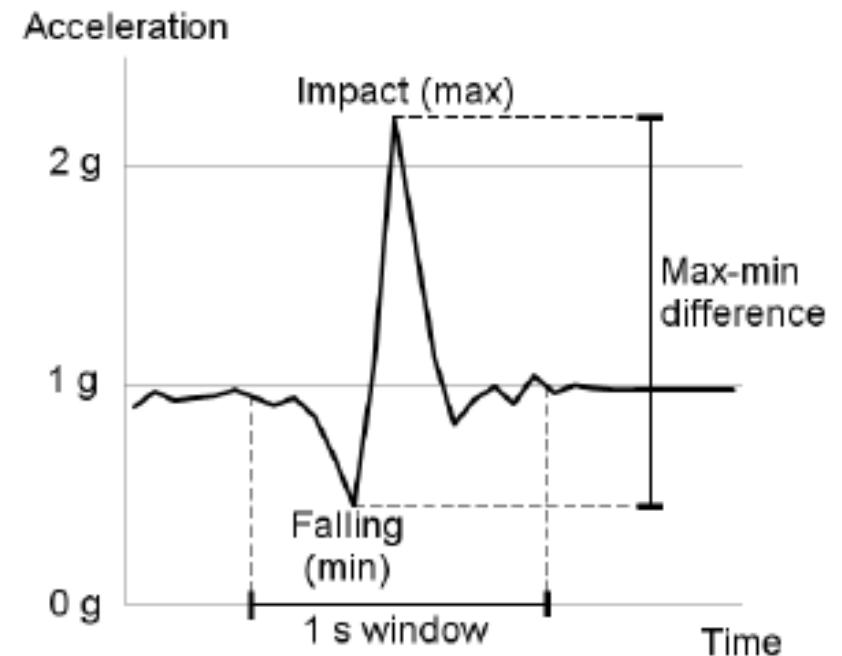


- THE SENSOR USED TO CHECK FOR RECOVERY IS BMP180



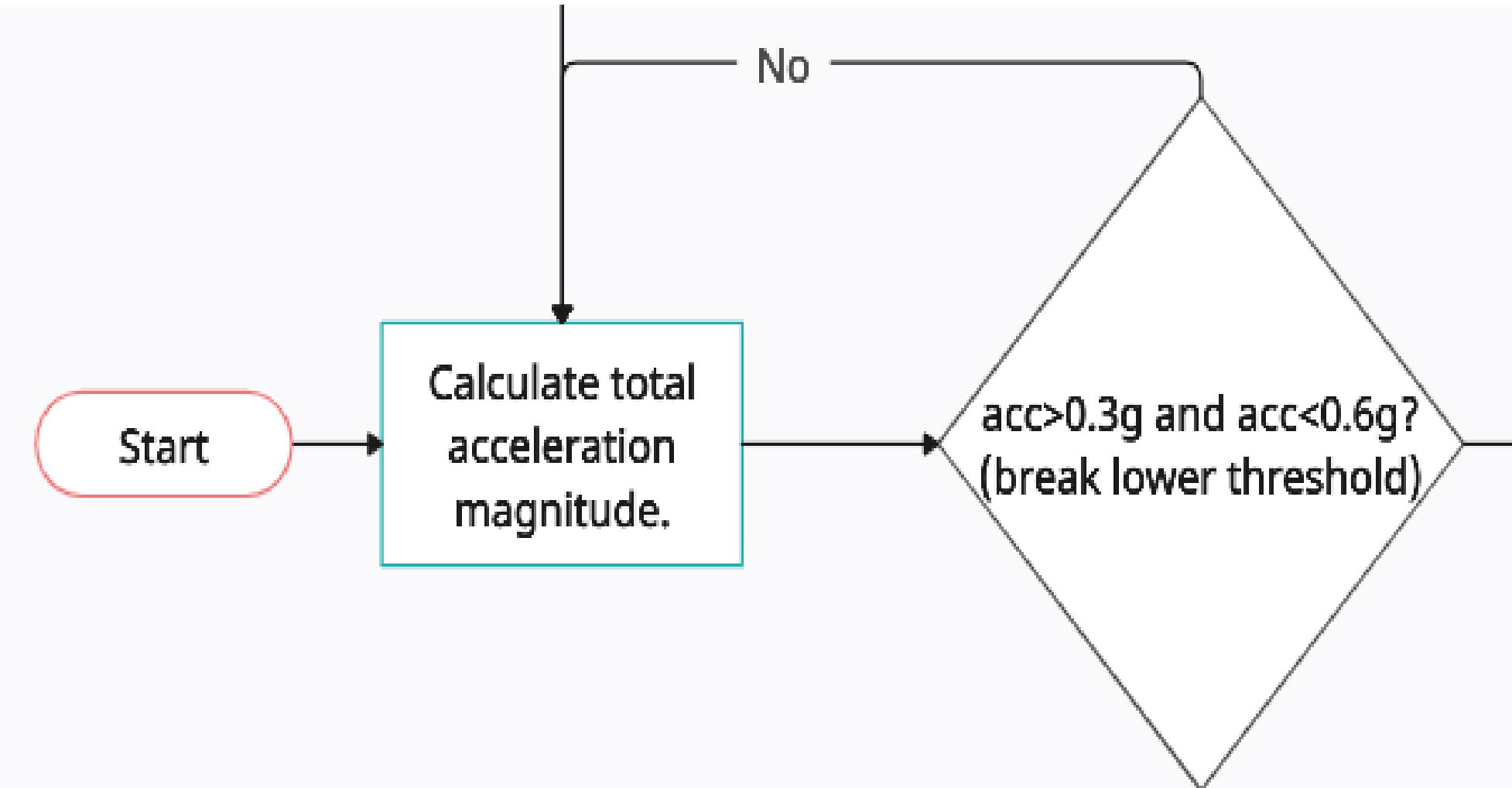
# WHAT HAPPENS DURING A FALL?

- AT REST, THE IMU READS 1G.
- DURING A FALL, THE ACCELERATION DECREASES.
- UPON IMPACT, THE ACCELERATION INCREASES SHARPLY.
- THIS IS WHAT OUR ALGORITHM IS BASED UPON.

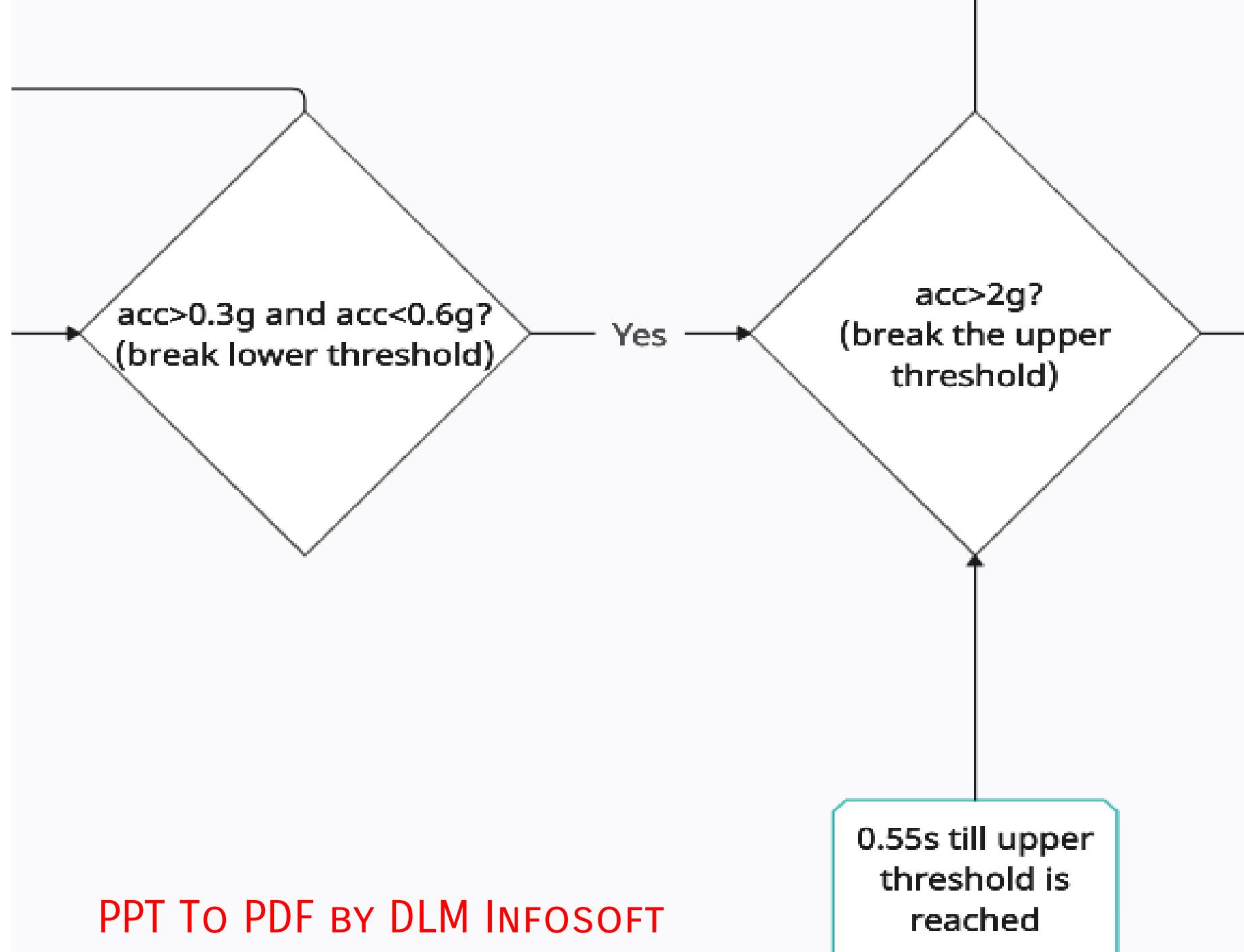


# THE ALGORITHM:

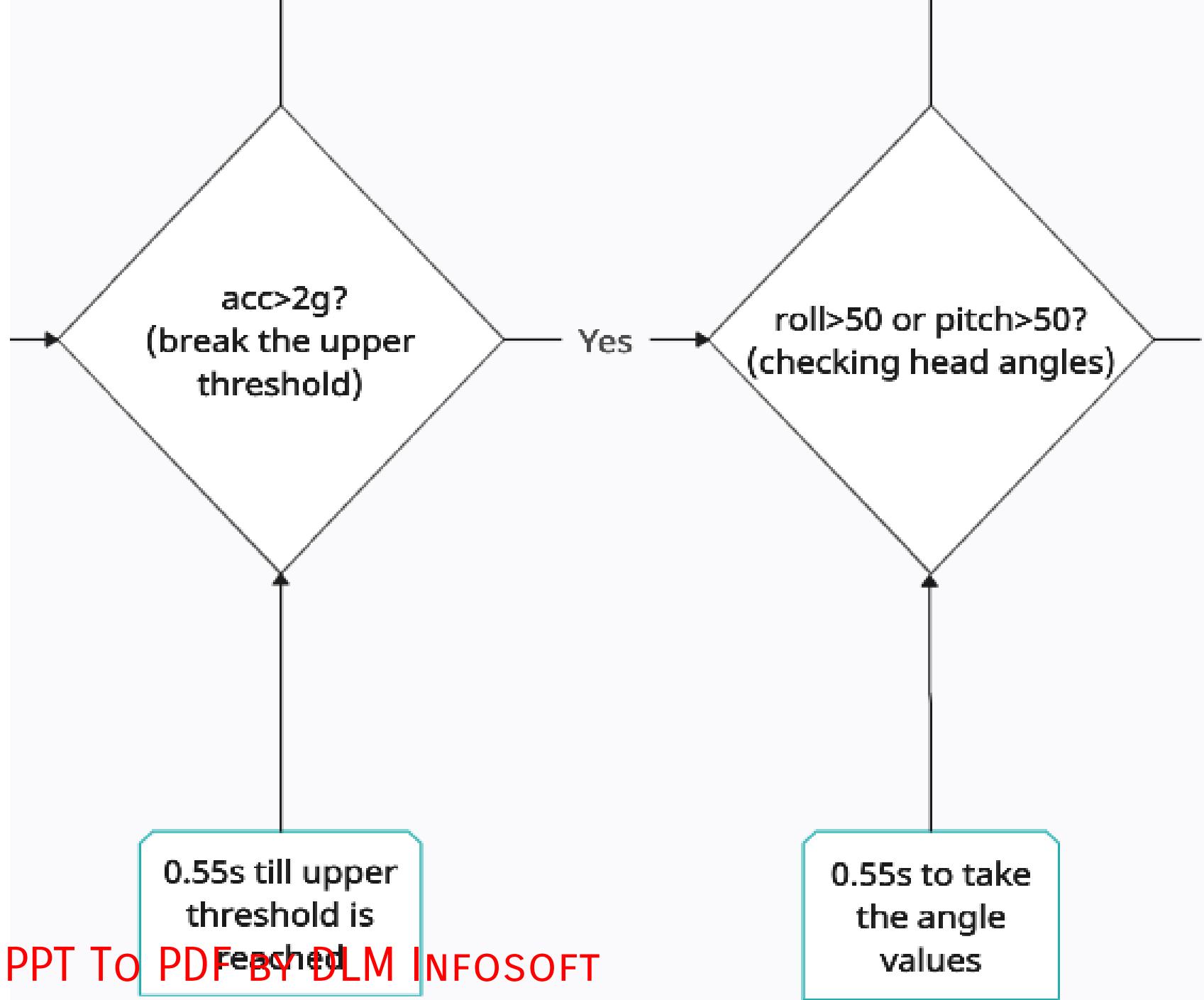
- CHECKING LOWER THRESHOLD:



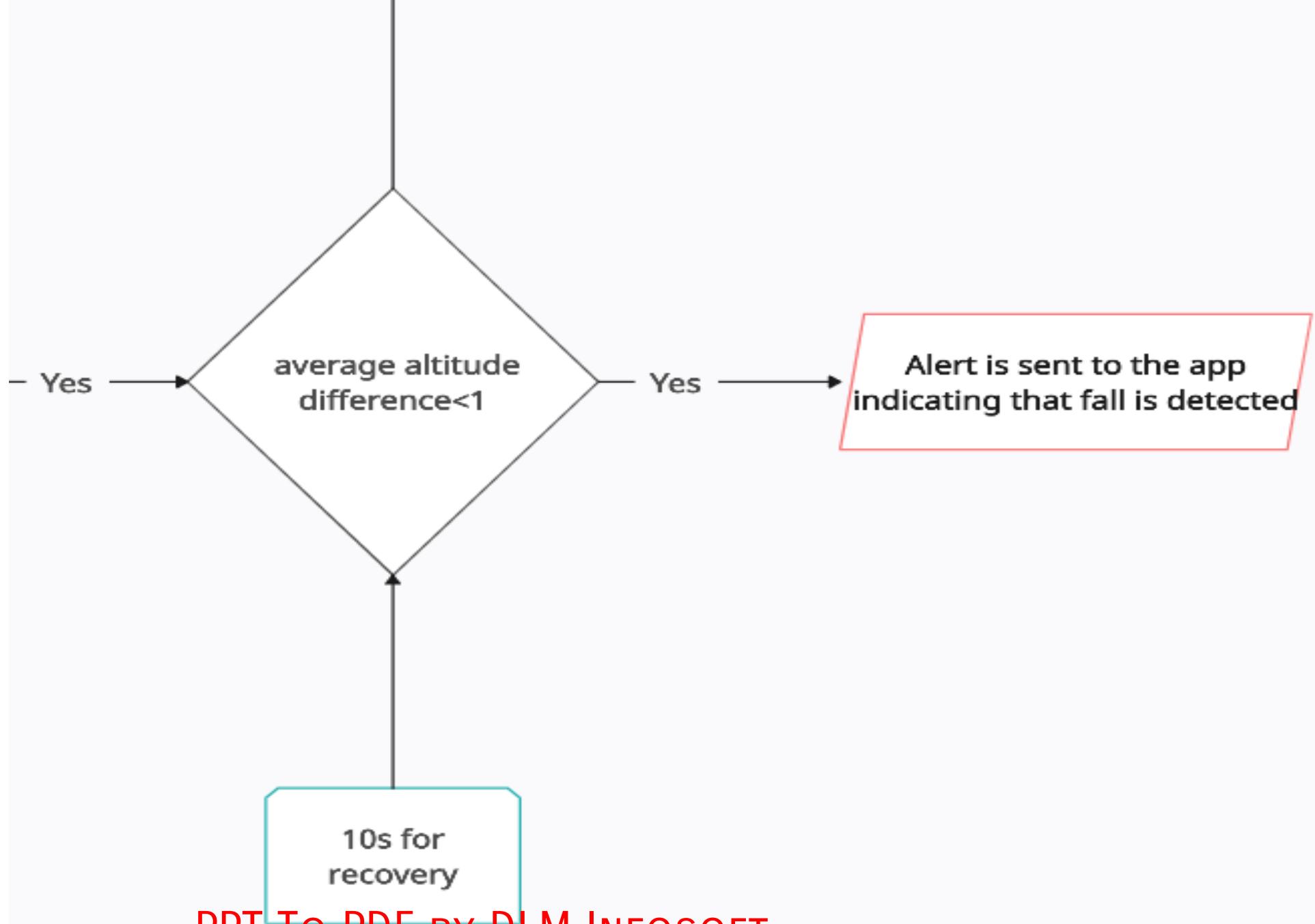
- CHECKING  
UPPER  
THRESHOLD
- ⋮



## ● CHECKING HEAD ANGLES:



## ● CHECKING FOR RECOVERY:



# TEST RESULTS

● BENDING,  
SPEED  
WALKING,  
SITTING

FLAG 1 ACTIVATED  
FLAG 1 ACTIVATED

• SITTING &  
STANDING,  
TRIPPING

FLAG 1 ACTIVATED  
FLAG 1 ACTIVATED  
FLAG 1 ACTIVATED  
FLAG 2 ACTIVATED  
FLAG 1 ACTIVATED  
FLAG 1 ACTIVATED  
FLAG 1 ACTIVATED  
FLAG 1 ACTIVATED

• FALLS

FLAG 1 ACTIVATED  
FLAG 2 ACTIVATED  
FLAG 3 ACTIVATED  
FALL DETECTED

# TESTS CLASSIFICATION

- TP: FALL EVENTS THAT WERE CORRECTLY CLASSIFIED AS FALLS.
- TN: THE NON-FALL EVENTS THAT WERE CORRECTLY CLASSIFIED AS NON-FALLS.
- FP: THE NON-FALL EVENTS THAT WERE INCORRECTLY CLASSIFIED AS FALLS.
- FN: THE FALL EVENTS THAT WERE INCORRECTLY CLASSIFIED AS NON-FALLS.

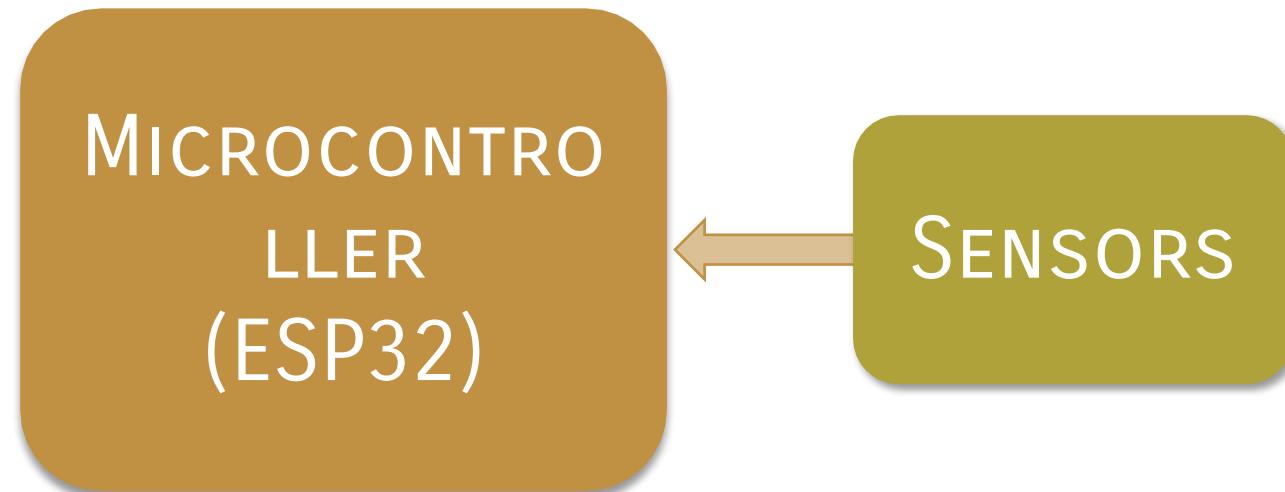
# MEASURE OF PERFORMANCE

PARAMETER	CALCULATION
<b>TRUE POSITIVE RATE (TPR) SENSITIVITY</b>	

# STATISTICS

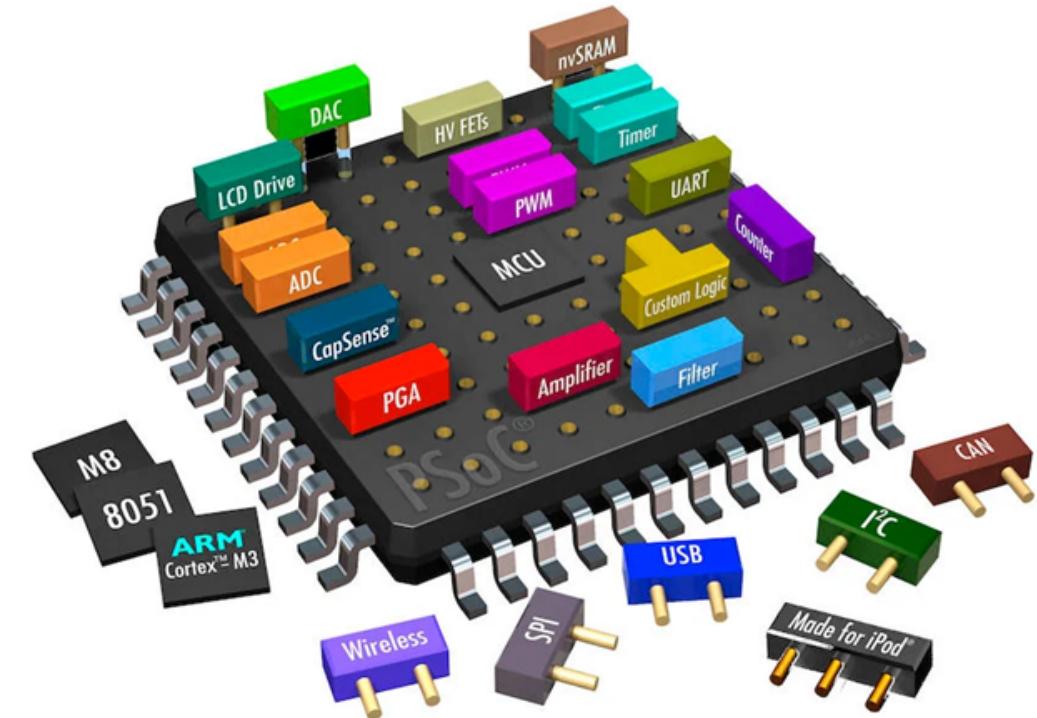
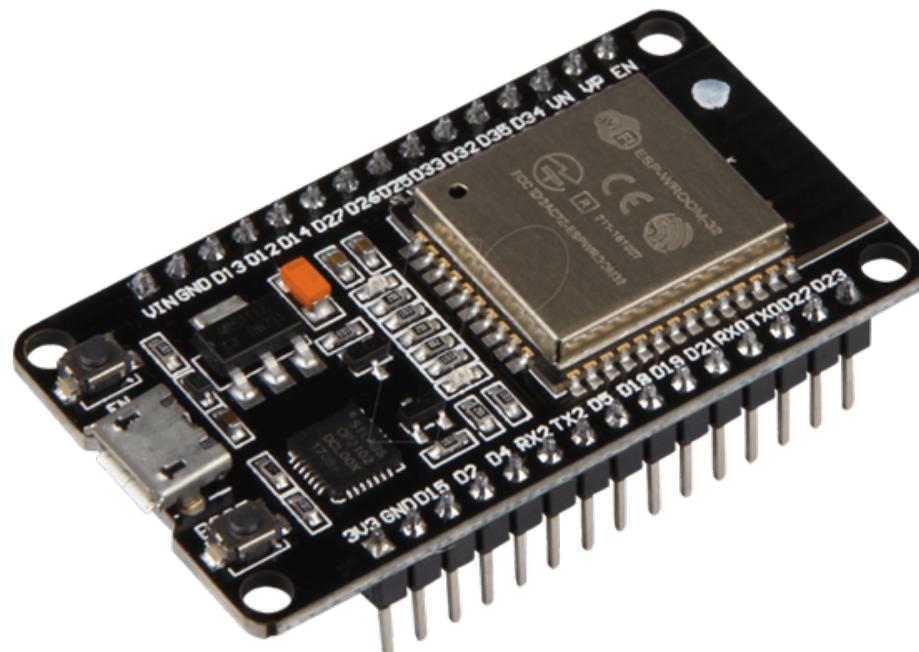
CASES	TP	TN	FP	FN	RECOVERED	RECOVERY NOT DETECTED
FALLS	65			16	11	5
SITTING		4				
BENDING		3				
SPEED WALKING		4				
STAIRS		6				
TRIPPING		2				
SUM	65	19		16		
TOTAL TESTS	100					
TRUE POSITIVE RATE (SENSITIVITY)	80.25 %					
TRUE NEGATIVE RATE (SPECIFICITY)	100.00 %					
ACCURACY	PPT TO PDF BY DLM INFOSOFT					

# BLOCK DIAGRAM



# **MICROCONTROLLER**

# Why ESP32 ?

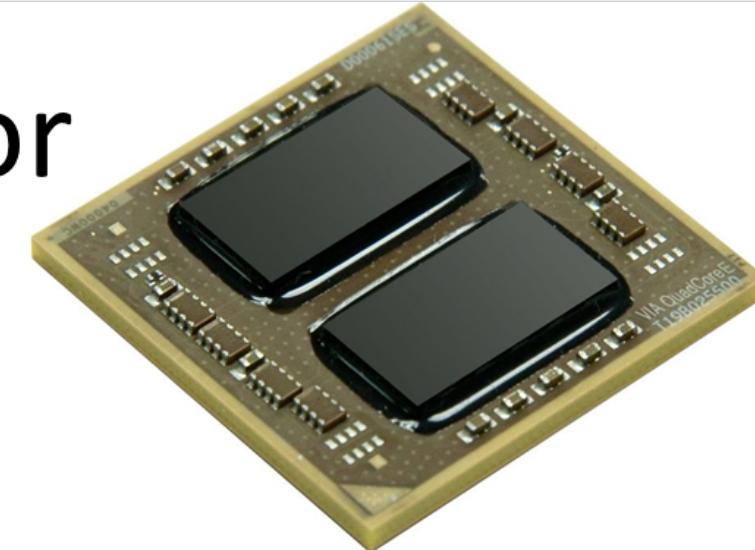


# Wi-Fi and Bluetooth built in.

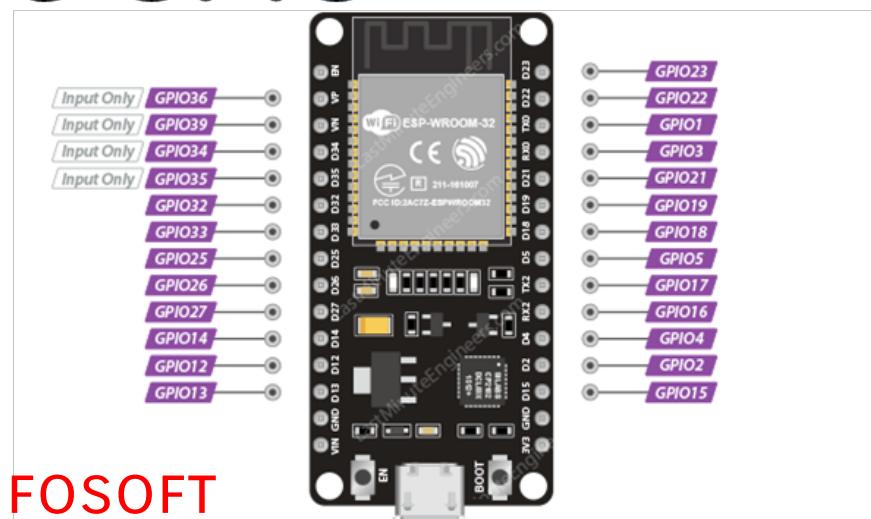
- can easily connect to a Wi-Fi network
- access point so other devices can connect to it
- Bluetooth classic
- Bluetooth low energy (BLE)



- Dual-core processor



- 34 × programmable GPIO pins



# Low-power consumption



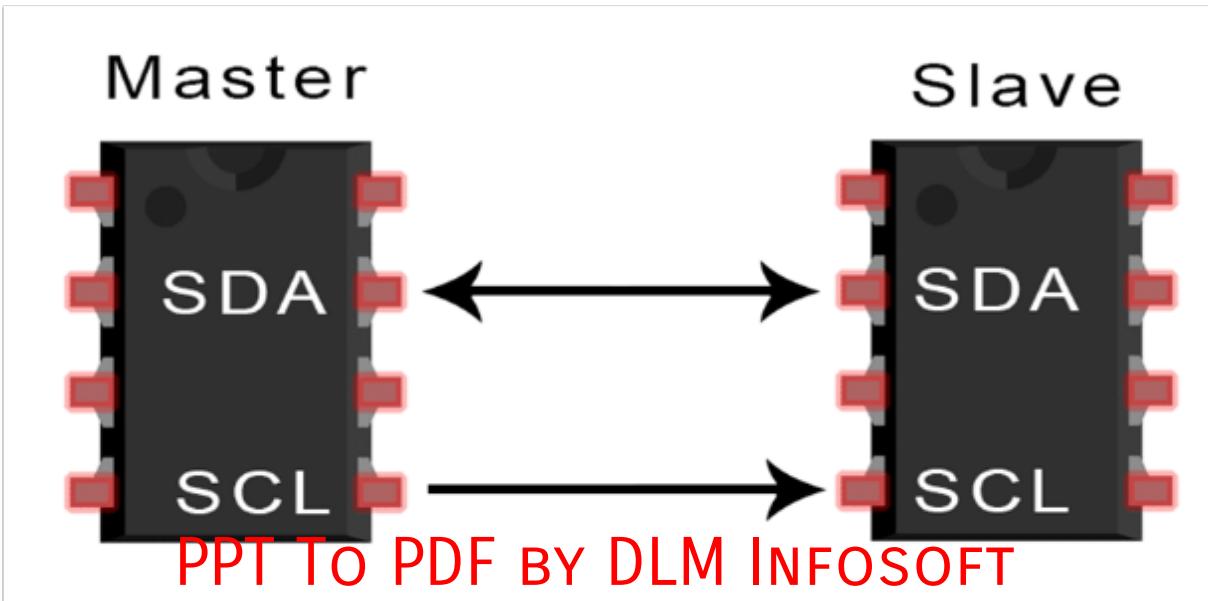
- Active mode
- Modem mode
- Light sleep
- Deep sleep
- Hibernation mode

# External Antenna

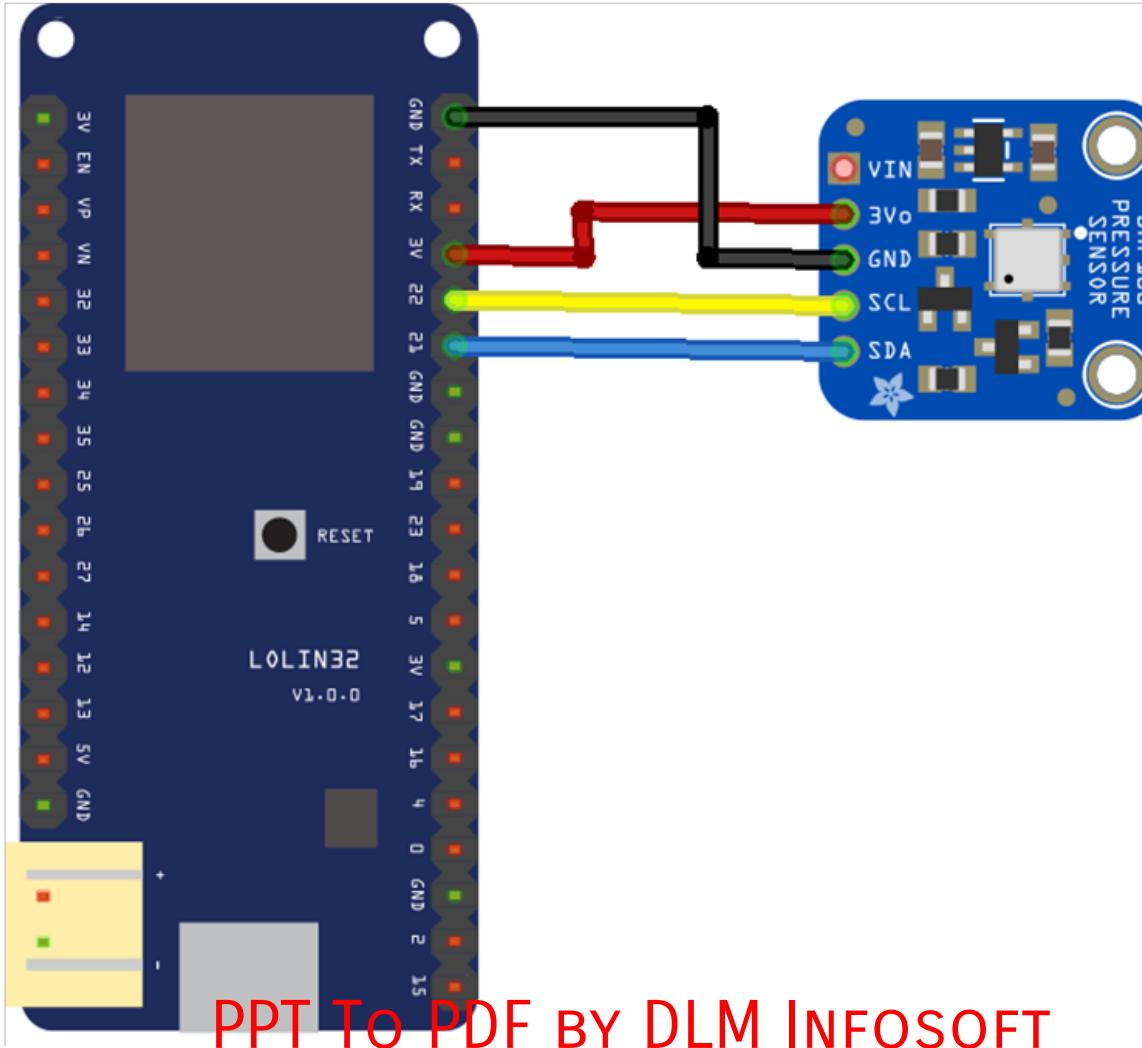


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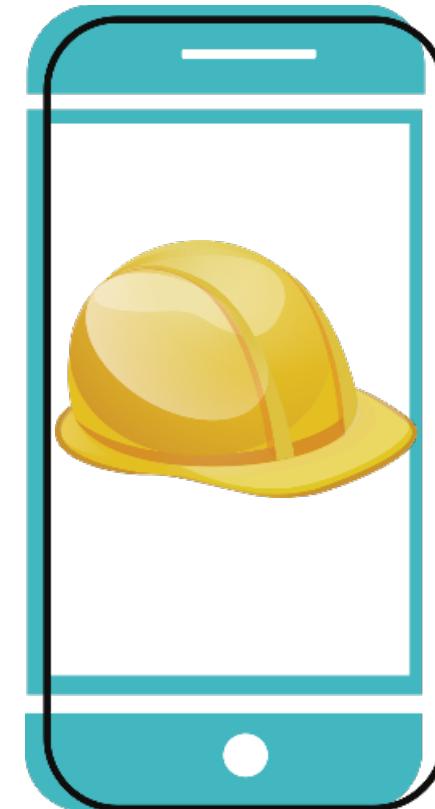
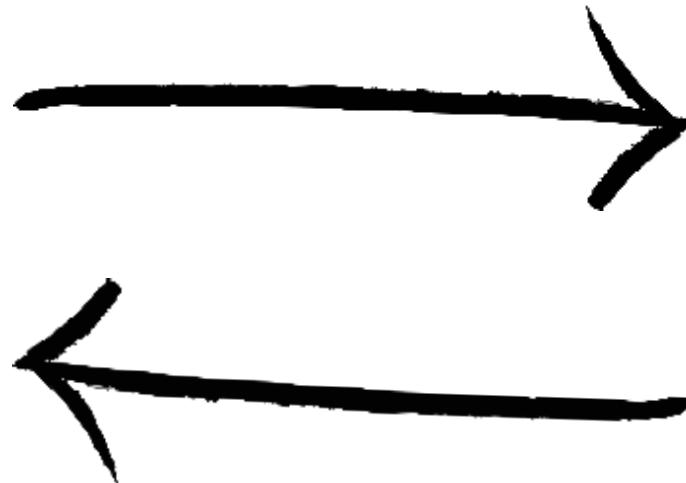
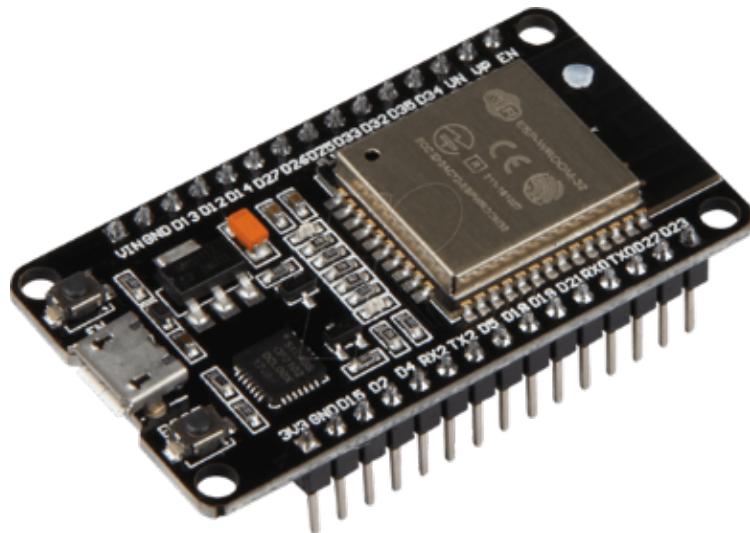
- you can decide which pins are UART, I2C, or SPI
- I2C communication protocol

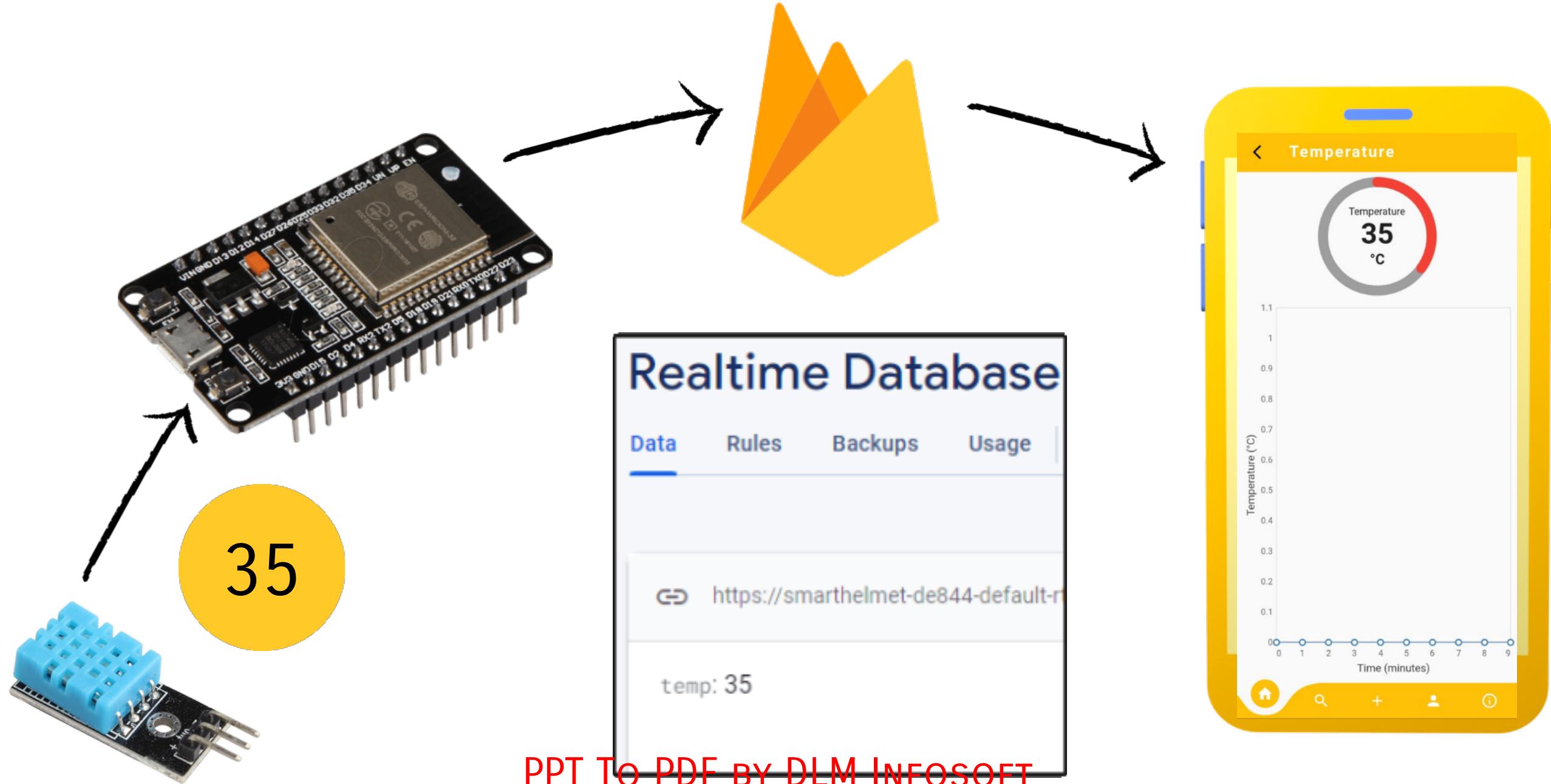


# BMP180 with ESP32



# ESP32 AND MOBILE APP





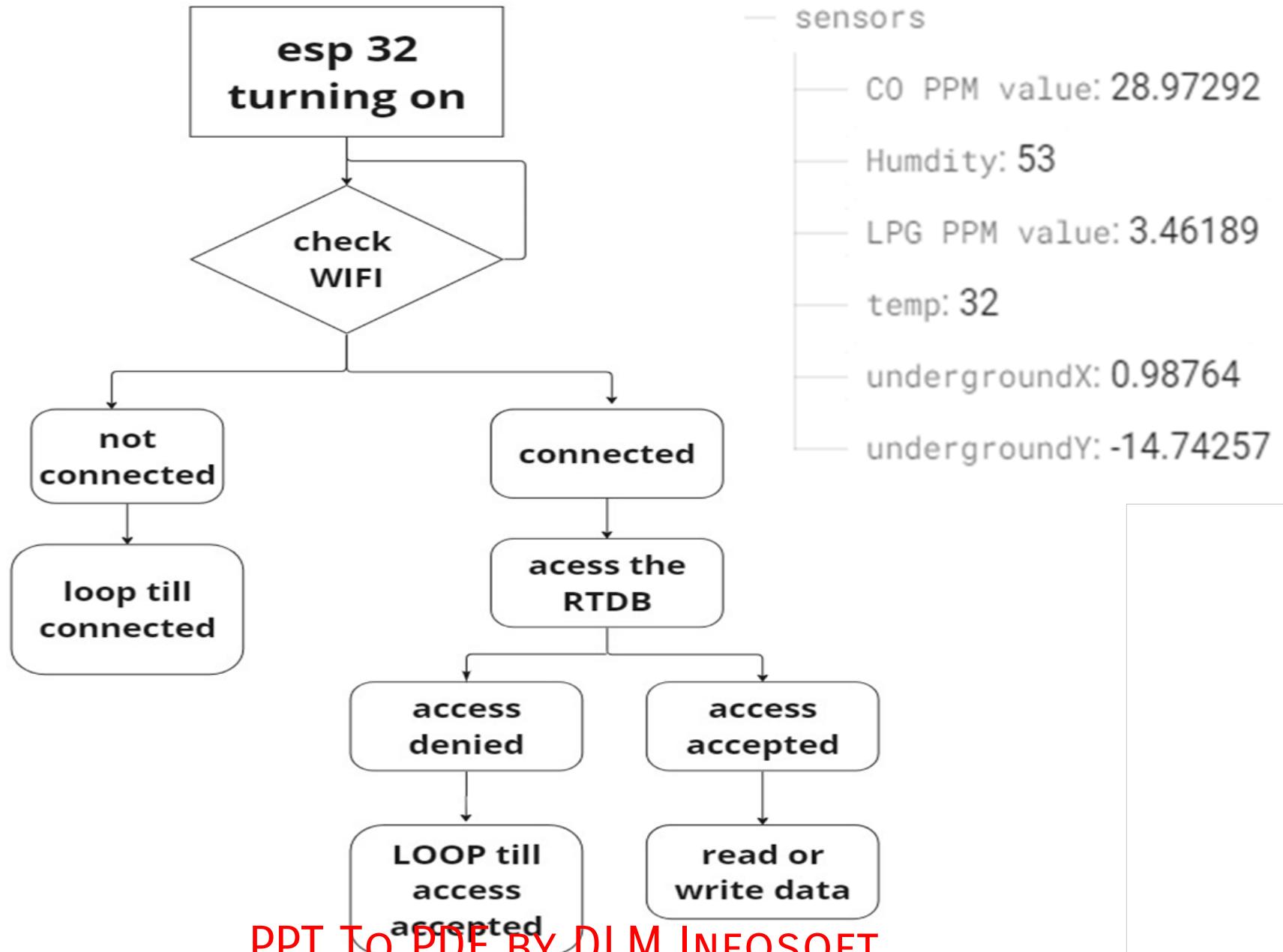
# BLOCK DIAGRAM

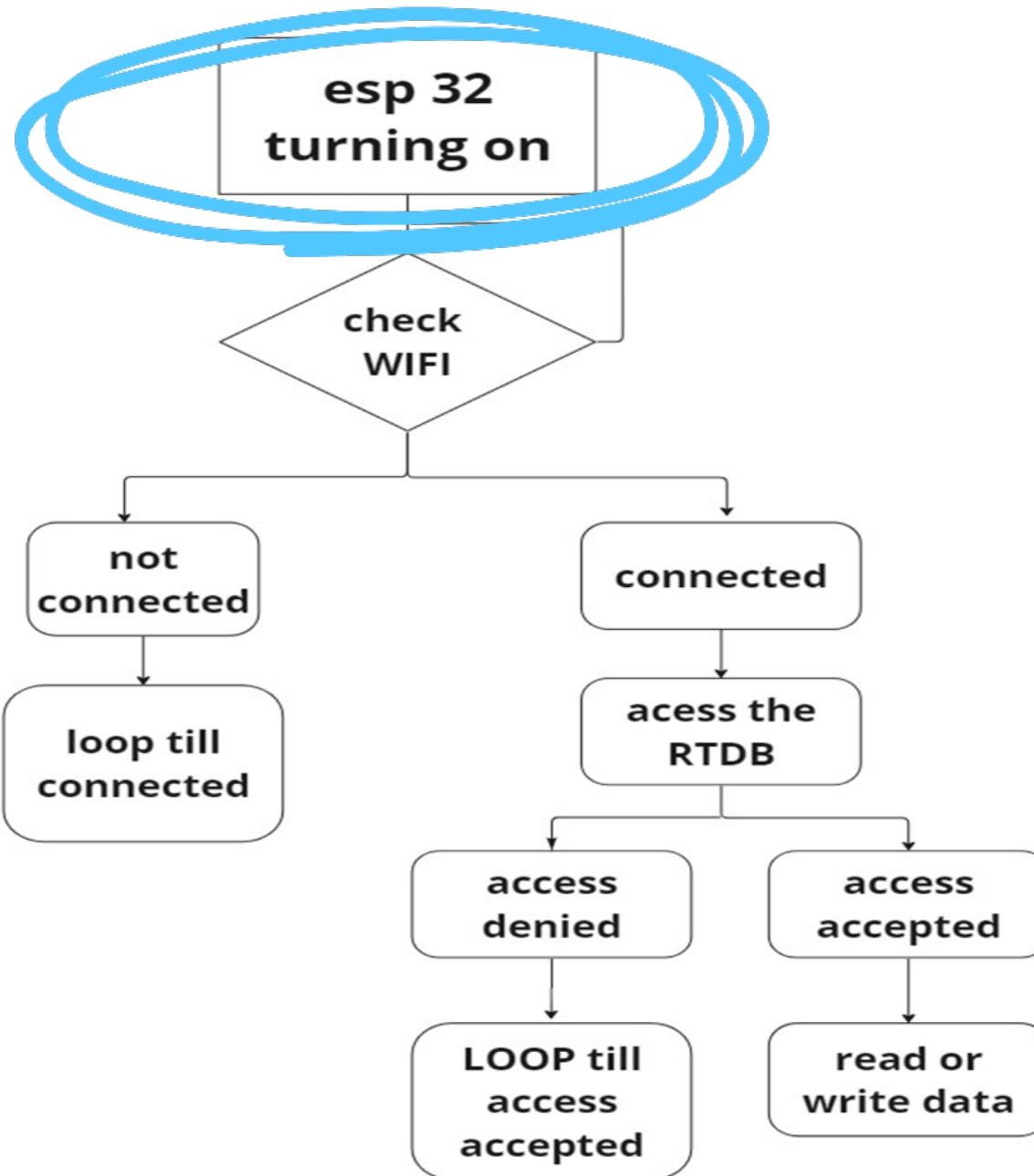


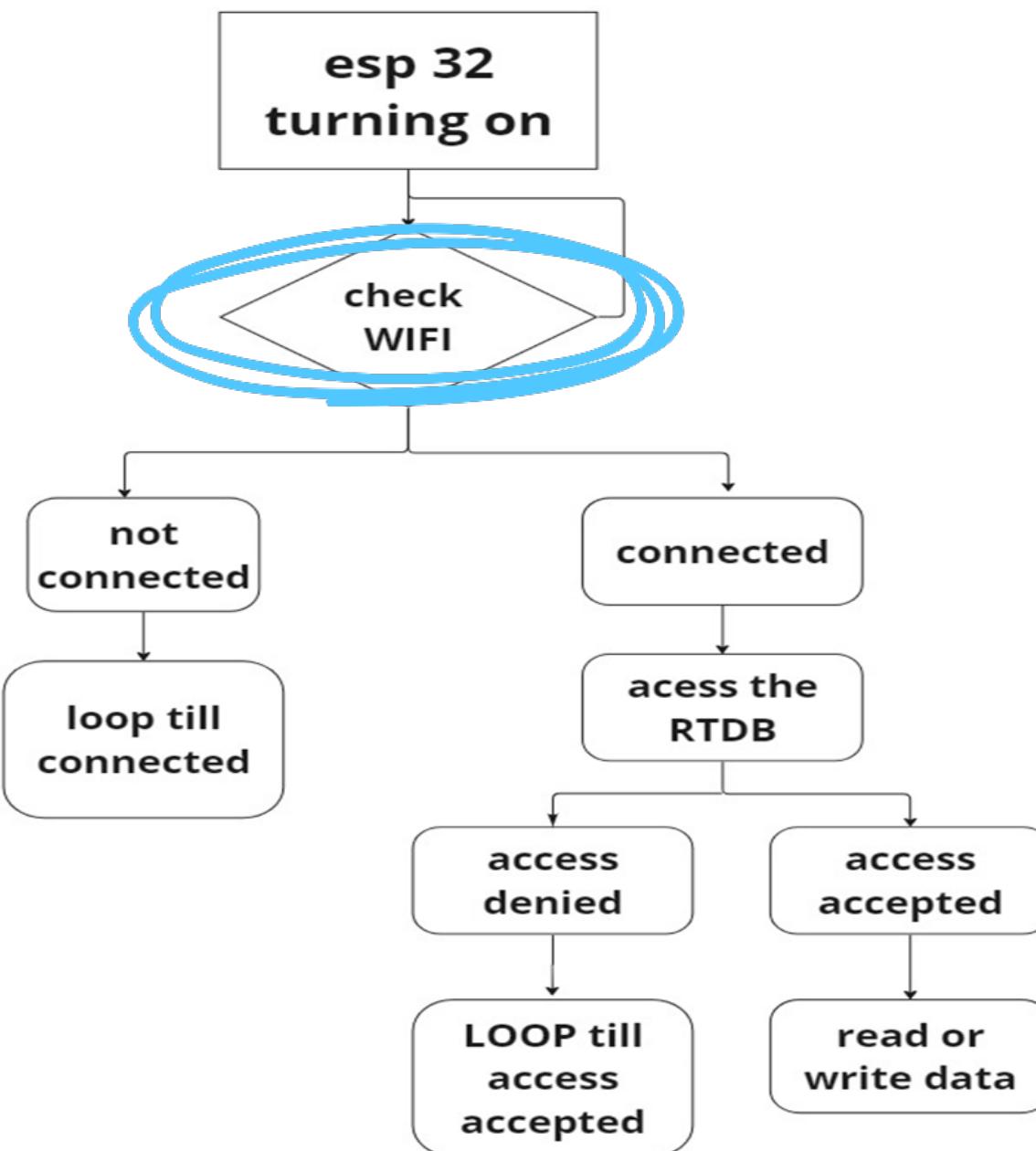
# FIREBASE

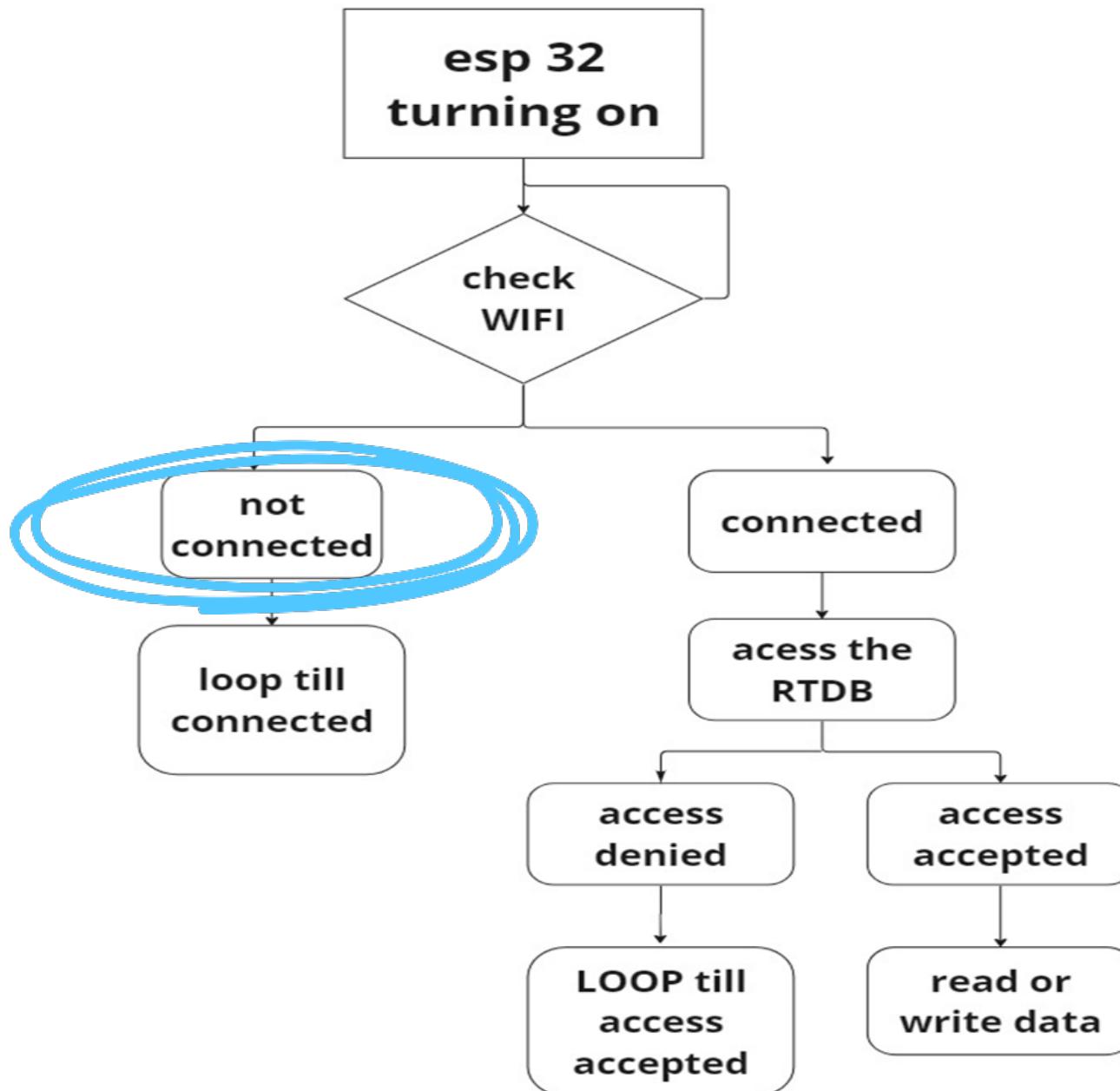
# FIREBASE REAL TIME DATA BASE

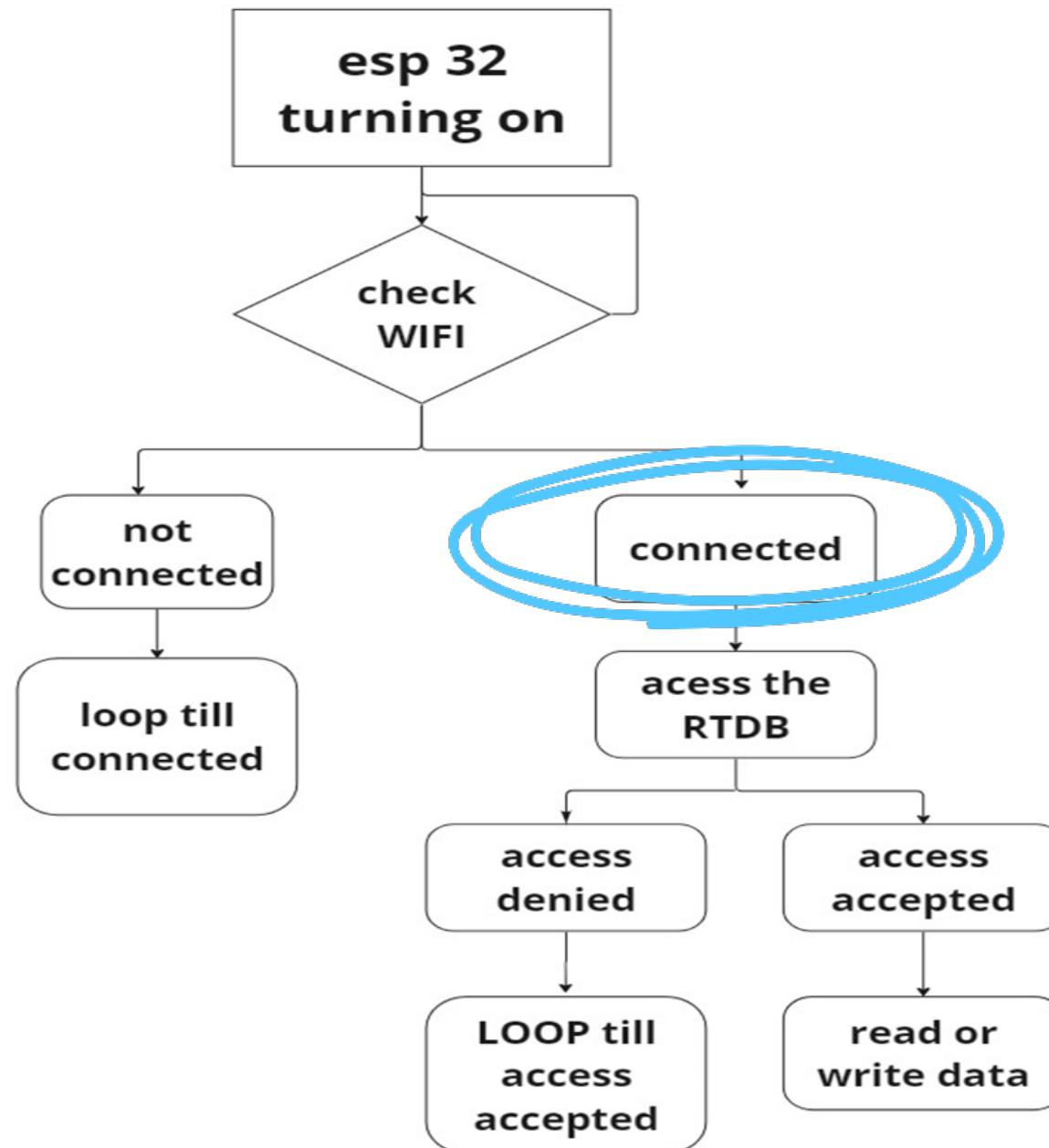
- DATA SYNCHRONIZATION EVERY TIME DATA CHANGES
- REMAINS RESPONSIVE EVEN WHEN OFFLINE
- REALTIME DATABASE SECURITY RULES

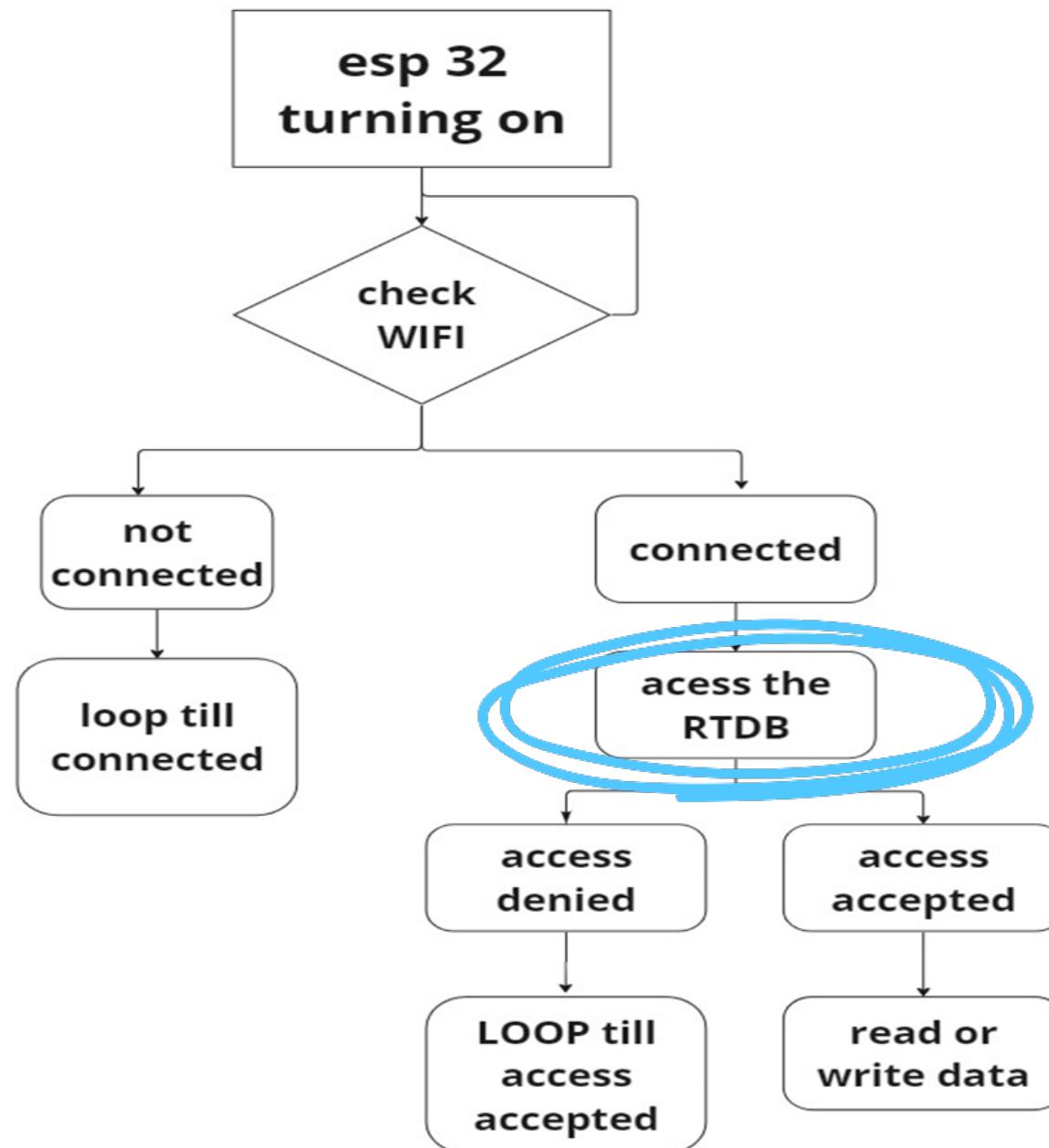


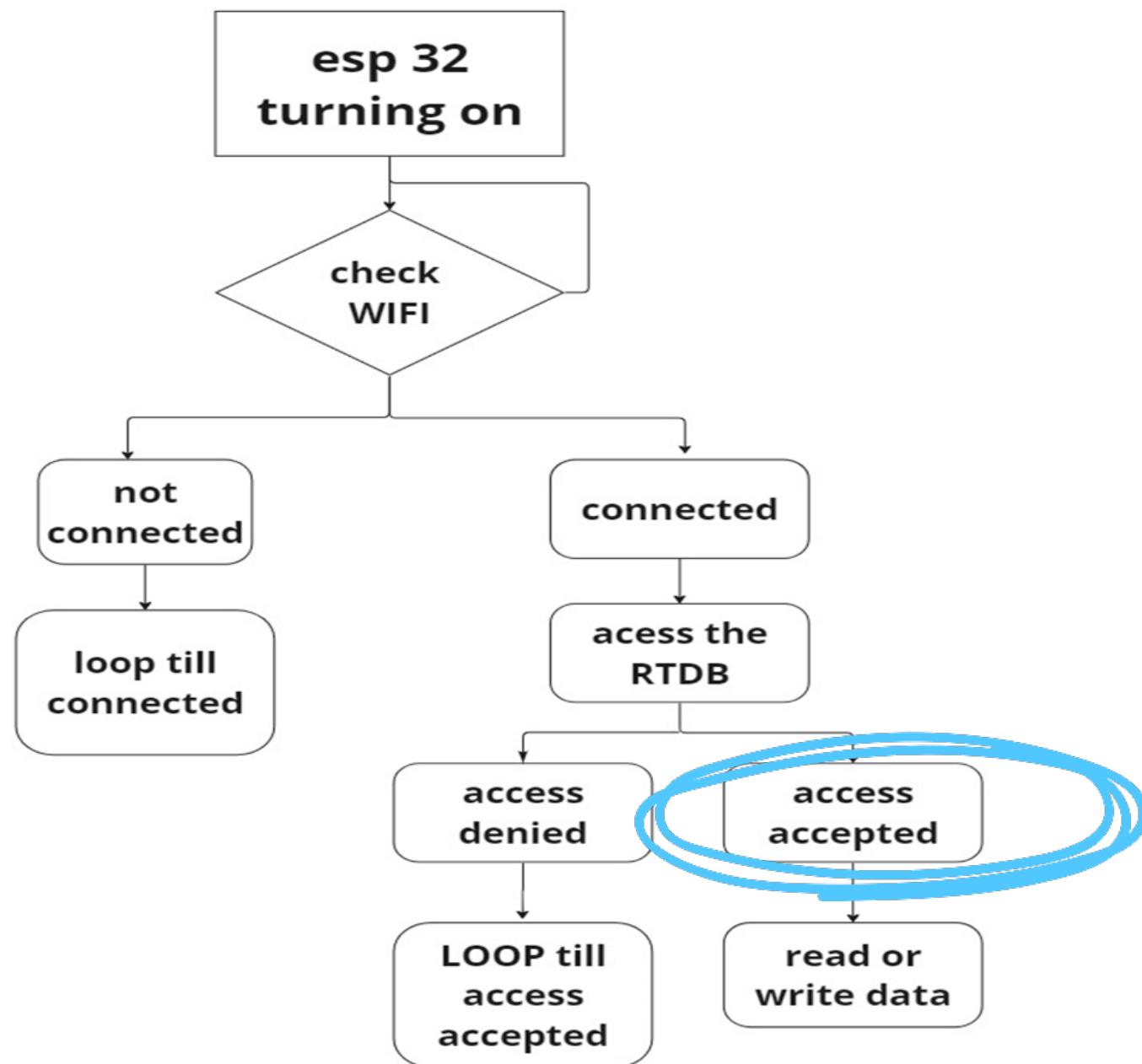


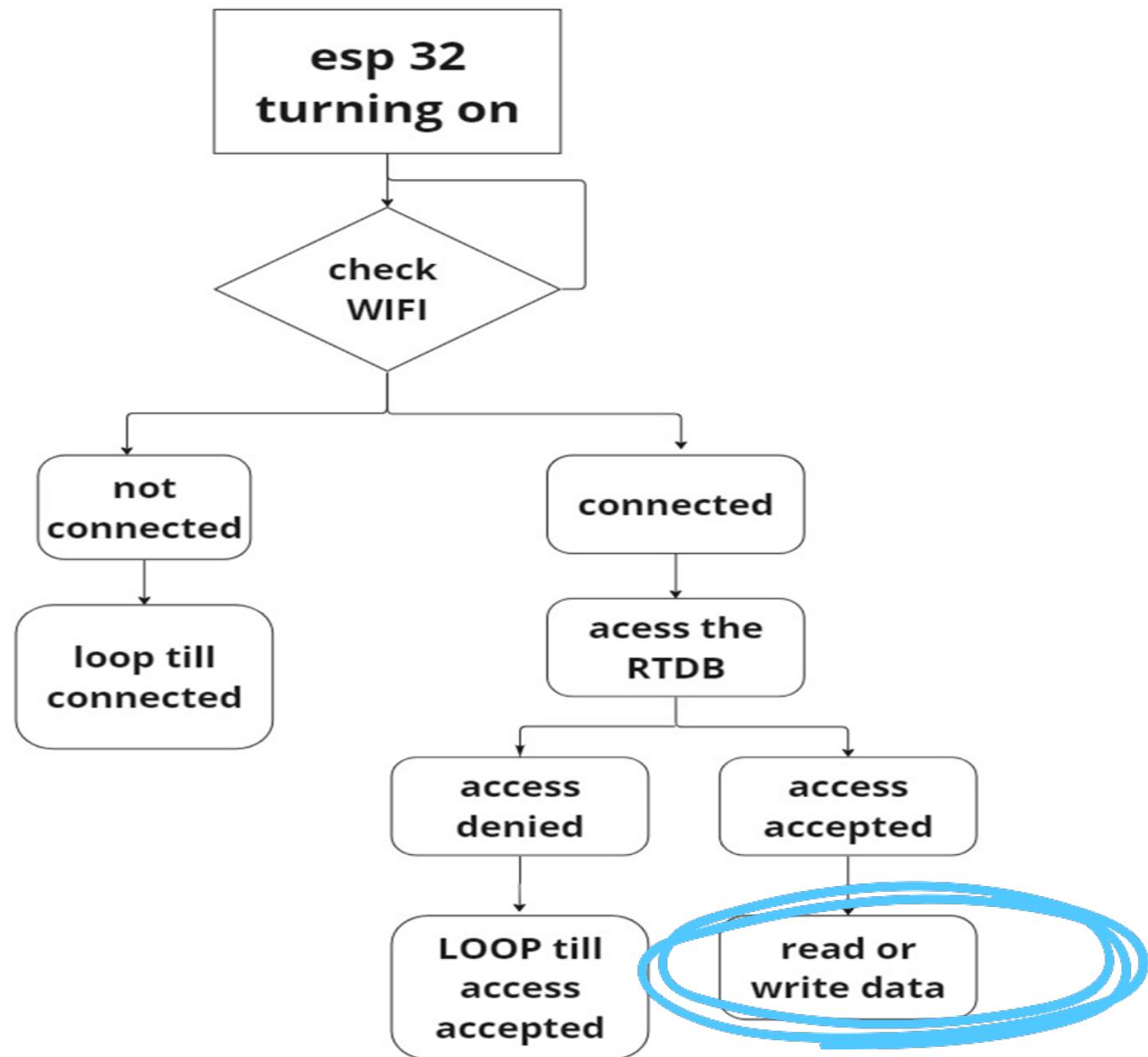


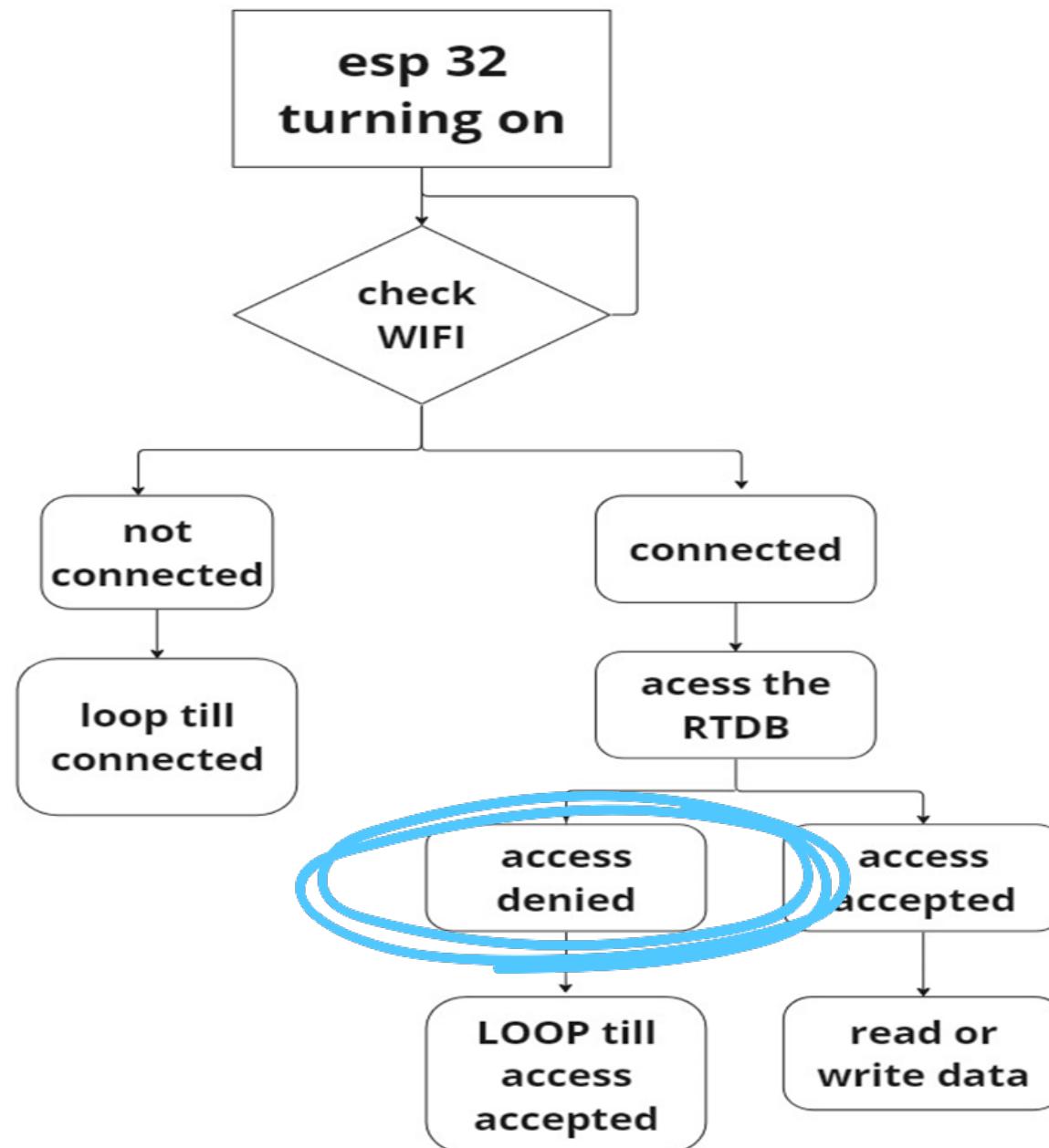


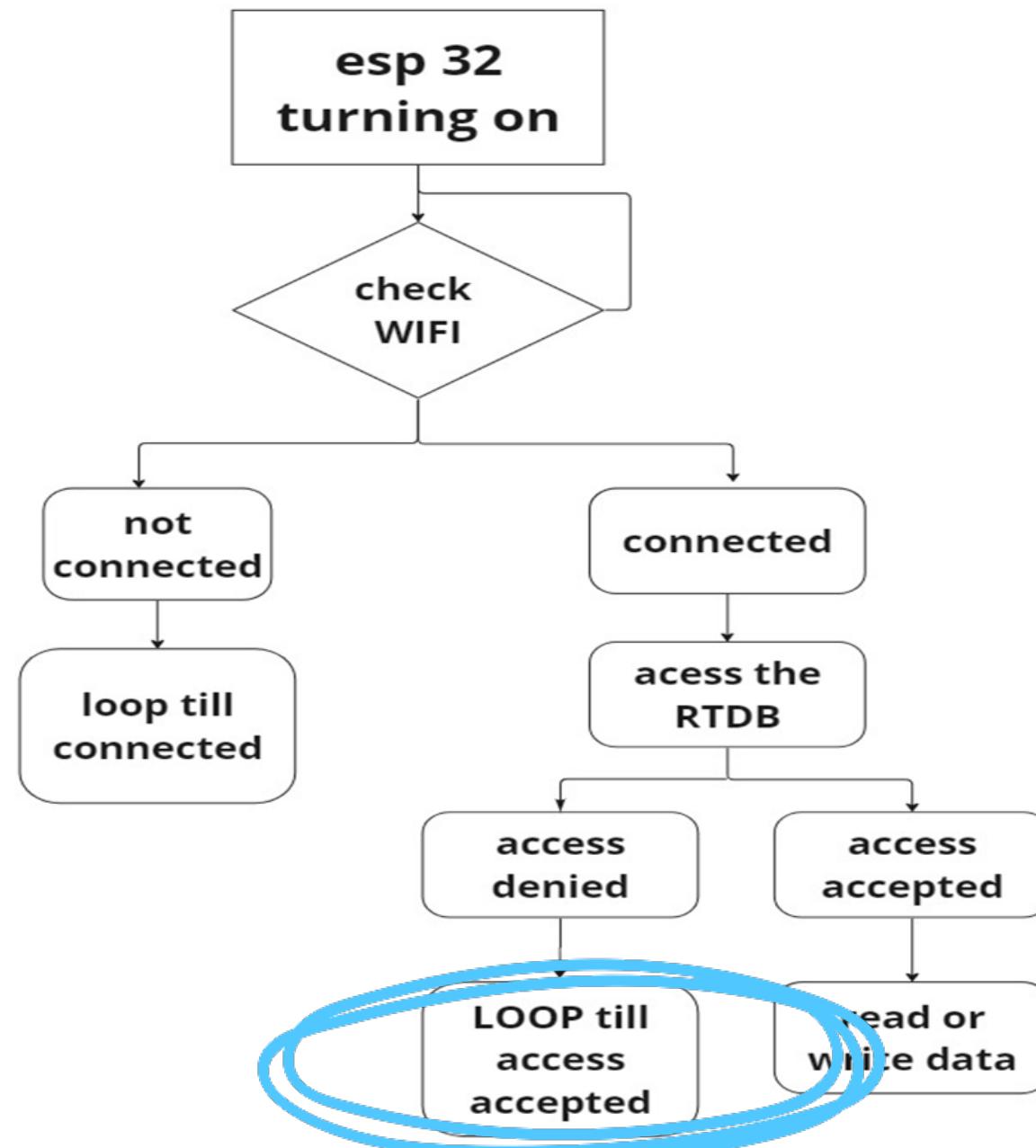


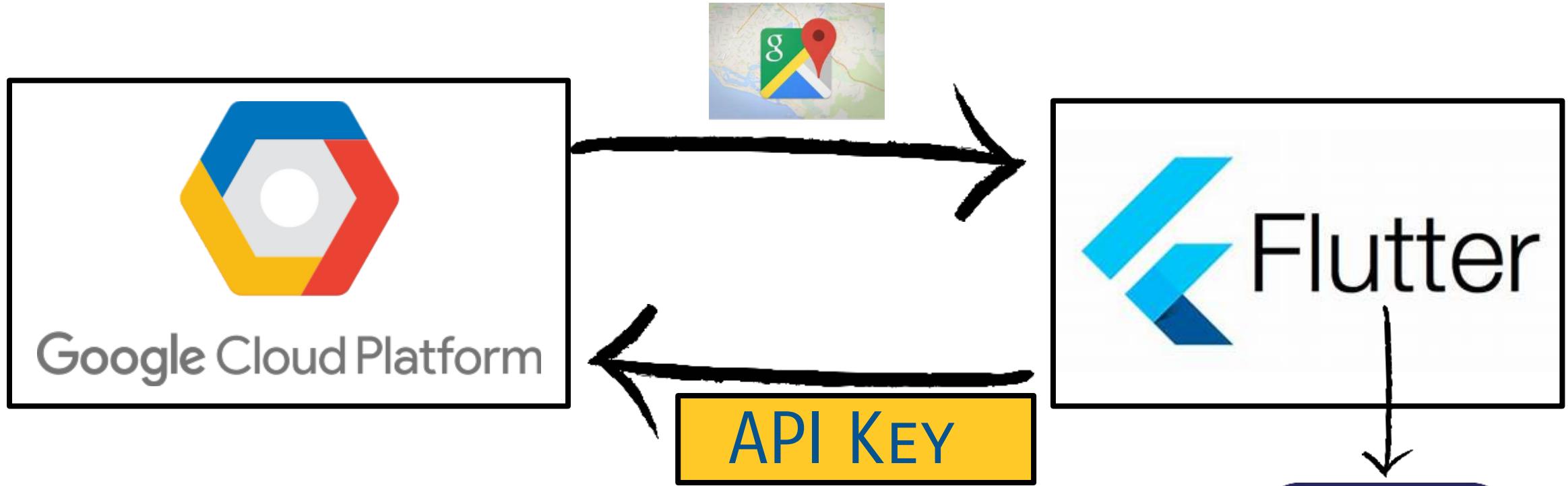








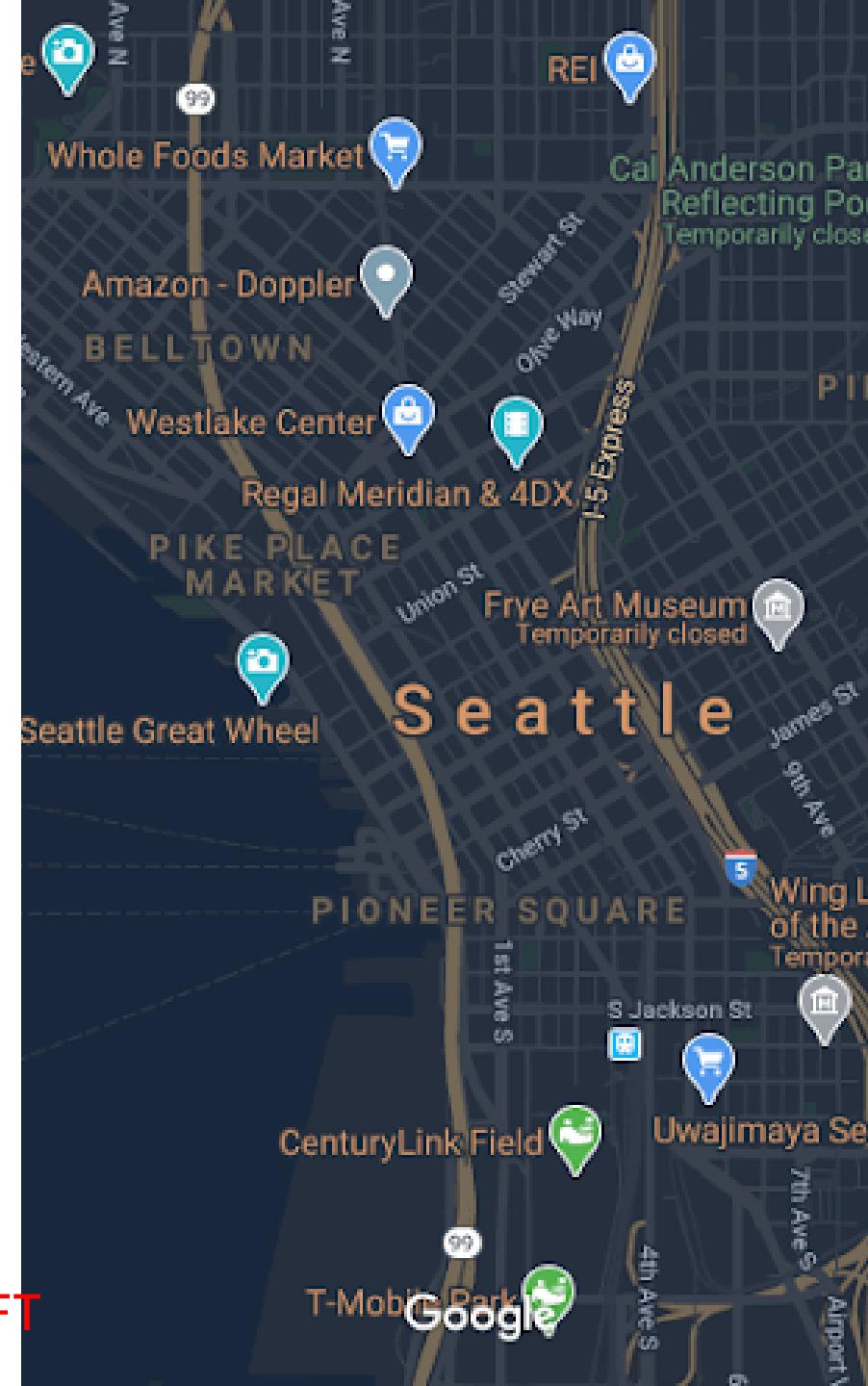




- **CREATE GOOGLE CLOUD PROJECT**
- **ENABLE ANDROID SDK LIBRARY**
- **CREATE API KEY**

# CLOUD-BASED MAPS

- STYLING FEATURES THAT MAKE IT EASY TO STYLE, CUSTOMIZE, AND MANAGE YOUR MAPS USING THE GOOGLE CLOUD CONSOLE.
- NO NEED TO UPDATE YOUR APPS CODE EACH TIME YOU MAKE A STYLE CHANGE.



# STYLING FEATURES

- ADD ELEMENT STYLES AT DIFFERENT ZOOM LEVELS

Feature type	Element type	Stylers
School	All	<input checked="" type="checkbox"/> Customize across zooms
Sports complex		<input checked="" type="checkbox"/> Add stop: z12
• Road	• Geometry	
• Highway	Fill	
• Controlled access	• Stroke	
• Arterial	Labels	
• Local	Text	
Drivable	Fill	
Trail	Stroke	
Transit	Icon	
• Line		Visibility
Rail		<input type="radio"/> Inherit
		<input type="radio"/> On
		<input type="radio"/> Off

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# • POI (POINT OF INTEREST) FILTERING

Feature type

- All
- Administrative
- Country
- Province
- Locality
- Neighborhood
- Land parcel
- Landscape
- Commercial Corridors
- Human-made
  - Buildings
  - Natural
  - Landcover
  - Terrain
- Points of interest
  - Attraction
  - Business
  - Shopping
    - Food and Drink
    - Gas Station
    - Car Rental
    - Lodging

Element style

Customize across zooms

Visibility

Inherit

On

Off

Color

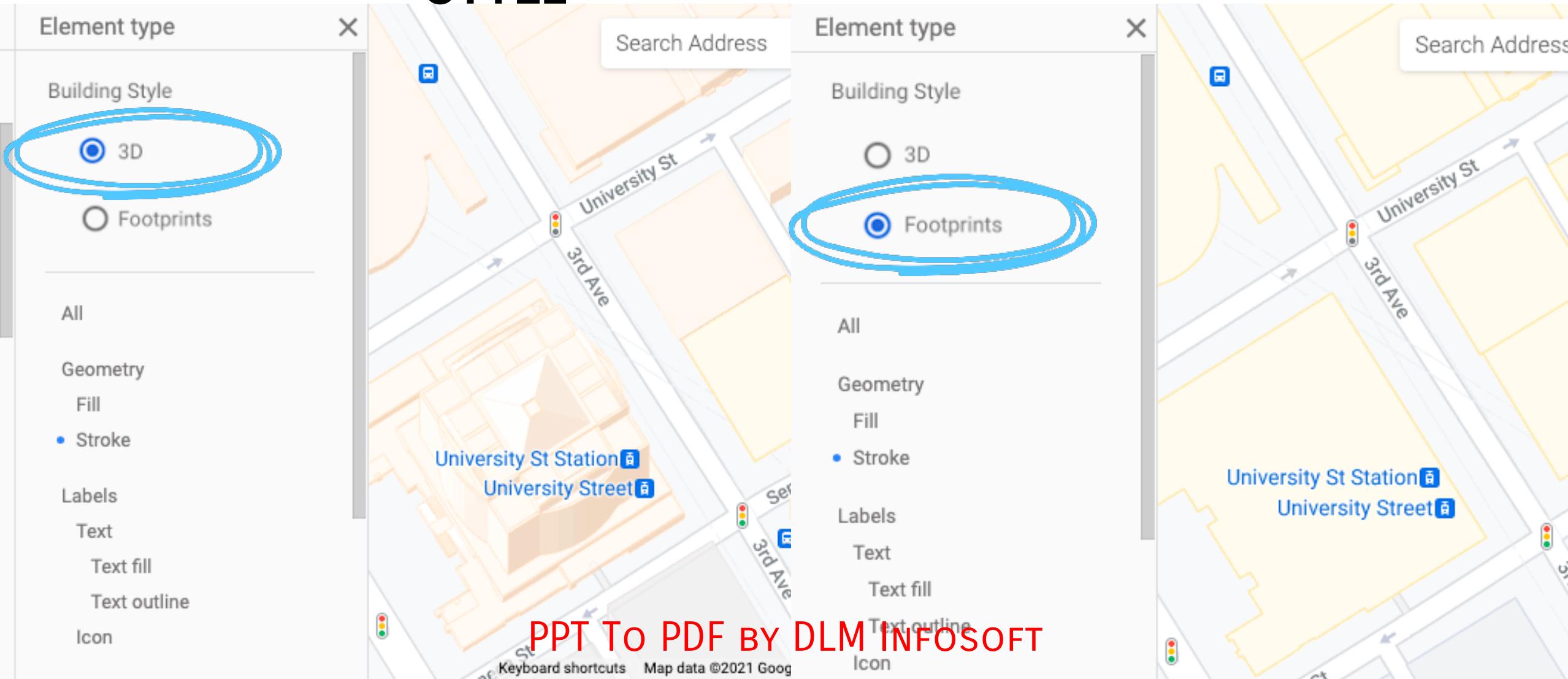
Stroke Width

The effect of the following stylers will change whenever Google updates the base map style.

Search Address

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# CUSTOMIZING THE BUILDING STYLE



Google Cloud Platform

Home DASHBOARD ACTIVITY CUSTOMIZE

Pins appear here X

Cloud Launcher

Billing

APIs & Services >

Support >

IAM & admin >

Getting started

COMPUTE

App Engine >

Compute Engine >

Kubernetes Engine >

Cloud Functions

Project info

Project name: My First Project

Project ID: vernal-branch-195307

Project number: 790525983815

Go to project settings

Resources

This project has no resources

Go to APIs overview

Trace

No trace data from the past 7 days

Get started with Stackdriver Trace

API APIs

Requests (requests/sec)

Time	Requests (requests/sec)
12 PM	1.0
12:15	0.8
12:30	0.6
12:45	0.4
	0.2
	0

Google Cloud Platform status

All services normal

Go to Cloud status dashboard

Billing

Estimated charges INR ₹0.00

For the billing period Feb 1 – 14, 2018

View detailed charges

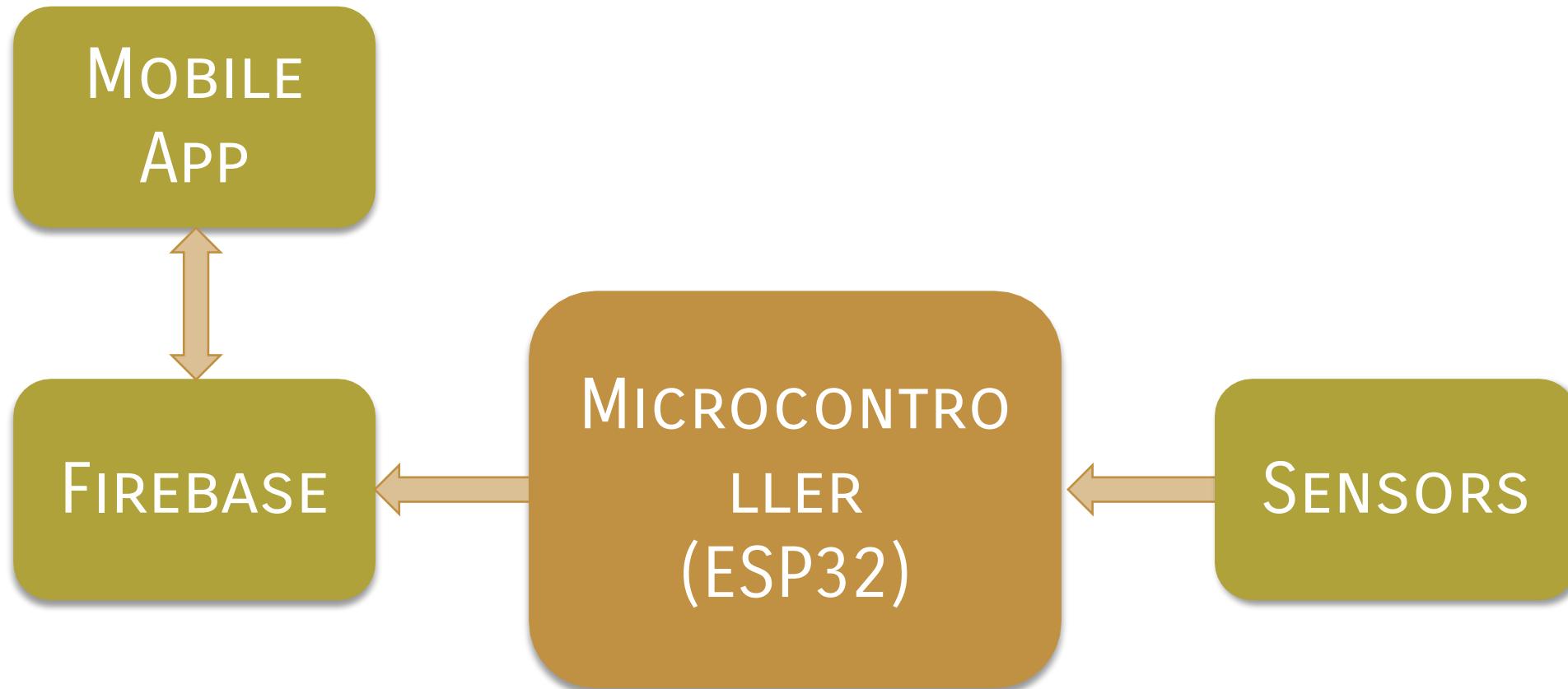
Error Reporting

No sign of any errors. Have you set up Error Reporting?

Learn how to set up Error Reporting

PPT TO PDF BY DLM INFO SOFTWARE

# BLOCK DIAGRAM



# **MOBILE APPLICATION**

# SMART SAFETY HELMET MOBILE APP



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# NAME & ICON

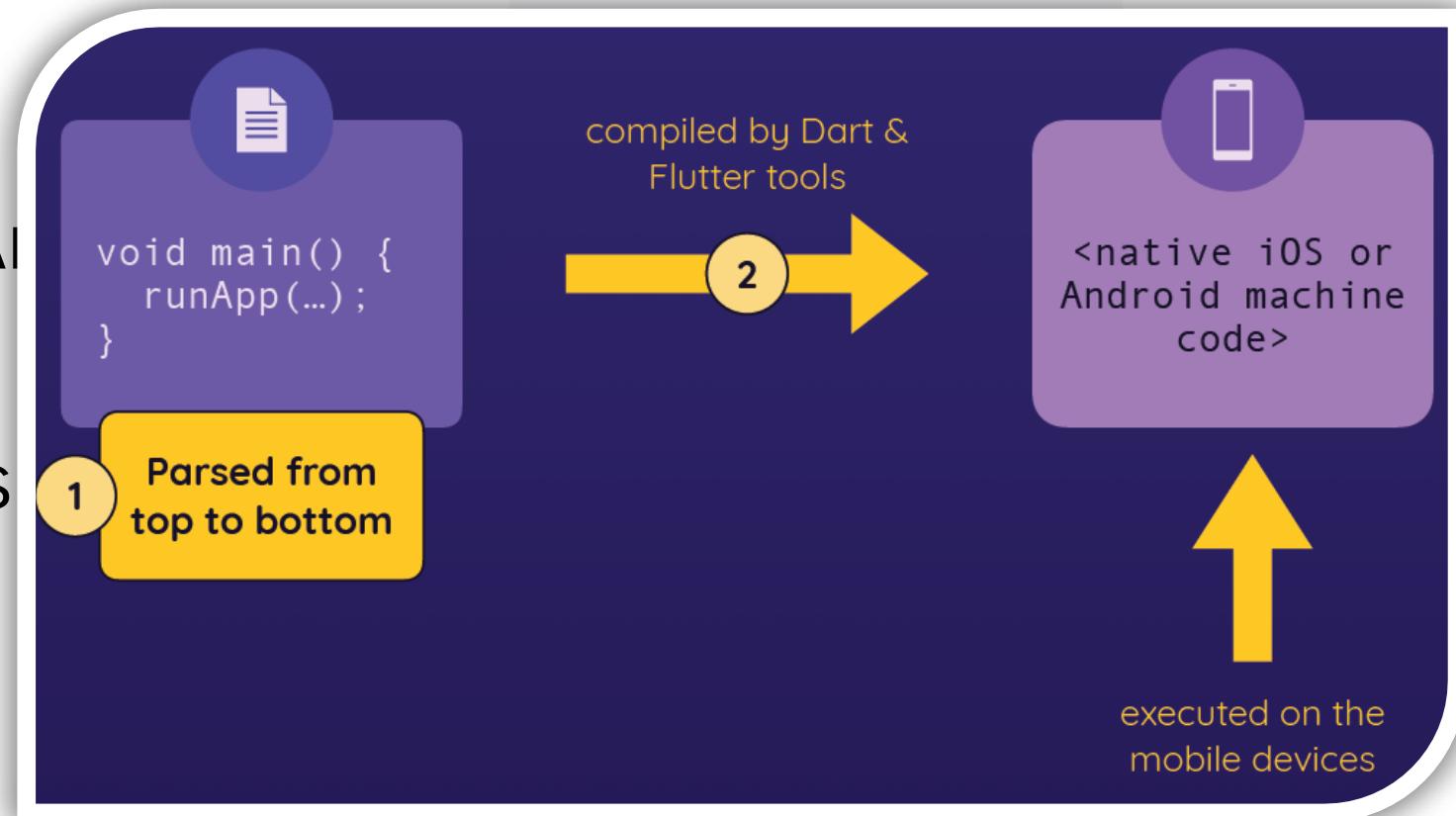


# LOGO



# SMART SAFETY HELMET APP USING FLUTTER

- MEET FLUTTER.
- WHY To USE FLUTTER ?
  - COMPILE TIME
  - CODE MAINTENANCE
  - PRODUCTIVITY AND CODE SHARING
  - WRITE ONCE, TEST ONCE,  
DEPLOY EVERYWHERE.
  - FUTURE Of CODING WEBAPPS

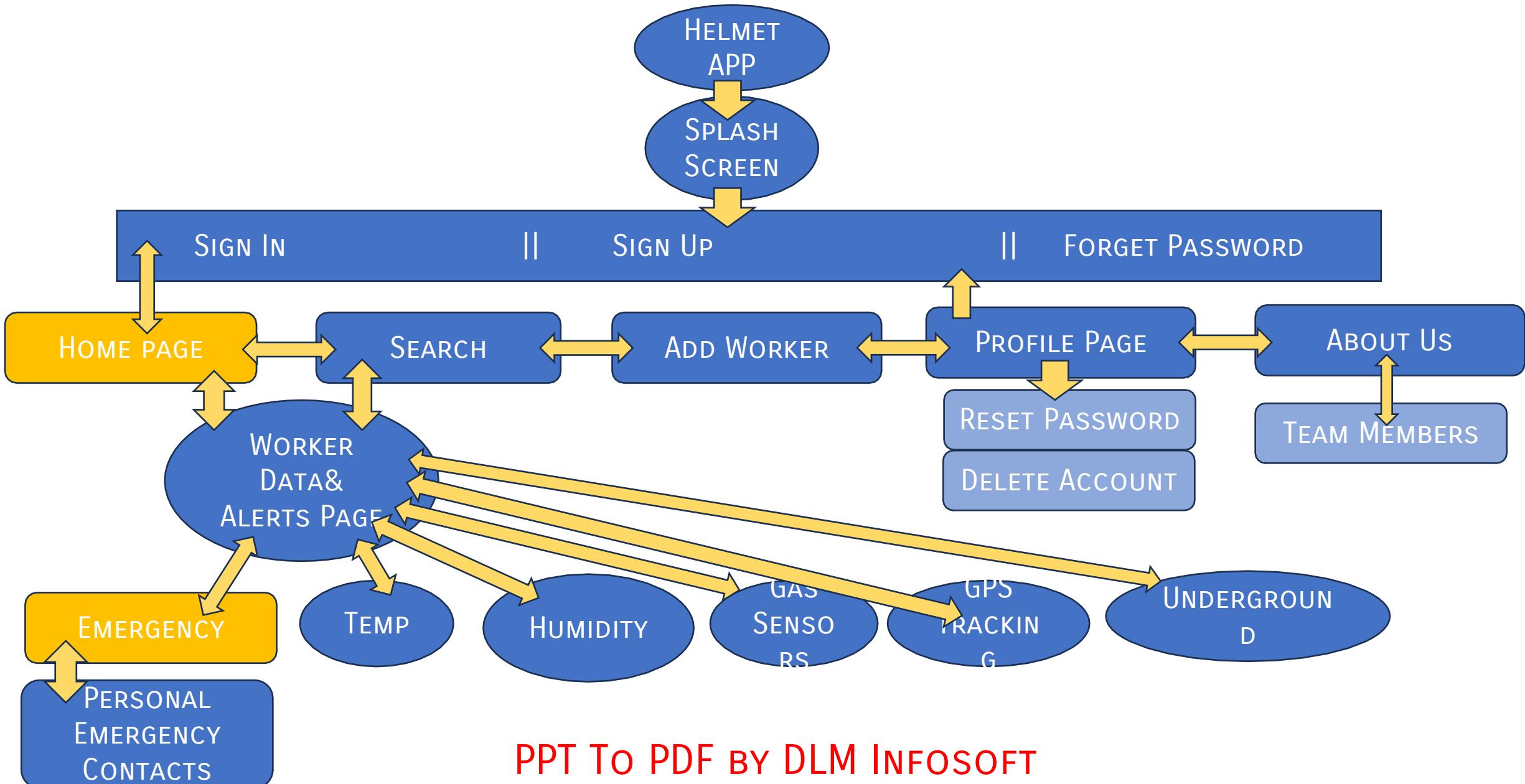


# FLUTTER IS THE MOST COMMON PLATFORM IN CORPORATIONS

FLUTTER IS THE MOST WELL-KNOWN CROSS-PLATFORM MOBILE FRAMEWORK THAT DEVELOPERS USE. ACCORDING TO THE 2021 SURVEY, 42% OF SOFTWARE DEVELOPERS USE FLUTTER.

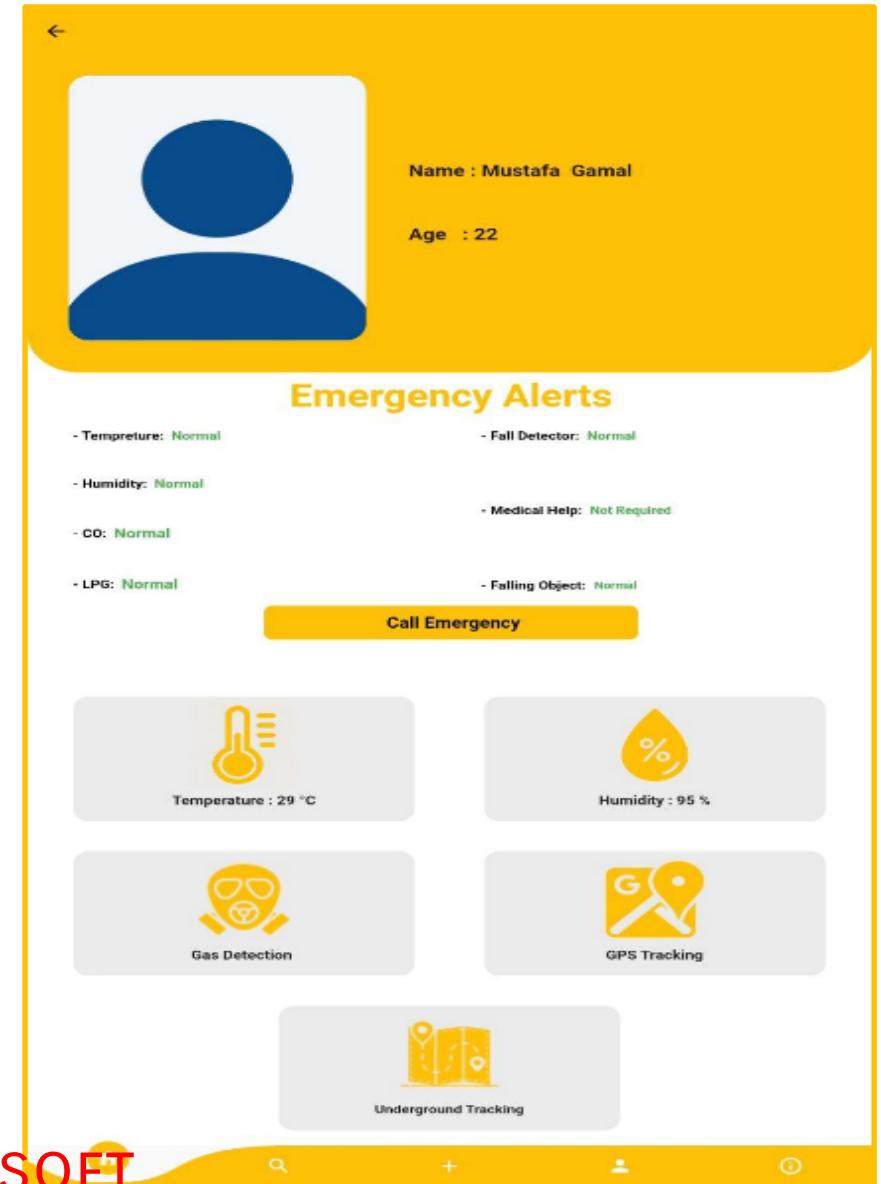


# SMART SAFETY HELMET APP ROUTINGS



# REAL-TIME DATA FROM SENSORS TO APP THROUGH FIREBASE:

- WHAT IS FIREBASE?
- MEET FETCHDATA.DART.
- SENSORS PAGES.
- EMERGENCY ALERTS:
  - TEMPERATURE. - FALL DETECTOR.
  - HUMIDITY. - MEDICAL ASSISTANCE.
  - CO & LPG . - FALLING OBJECT.



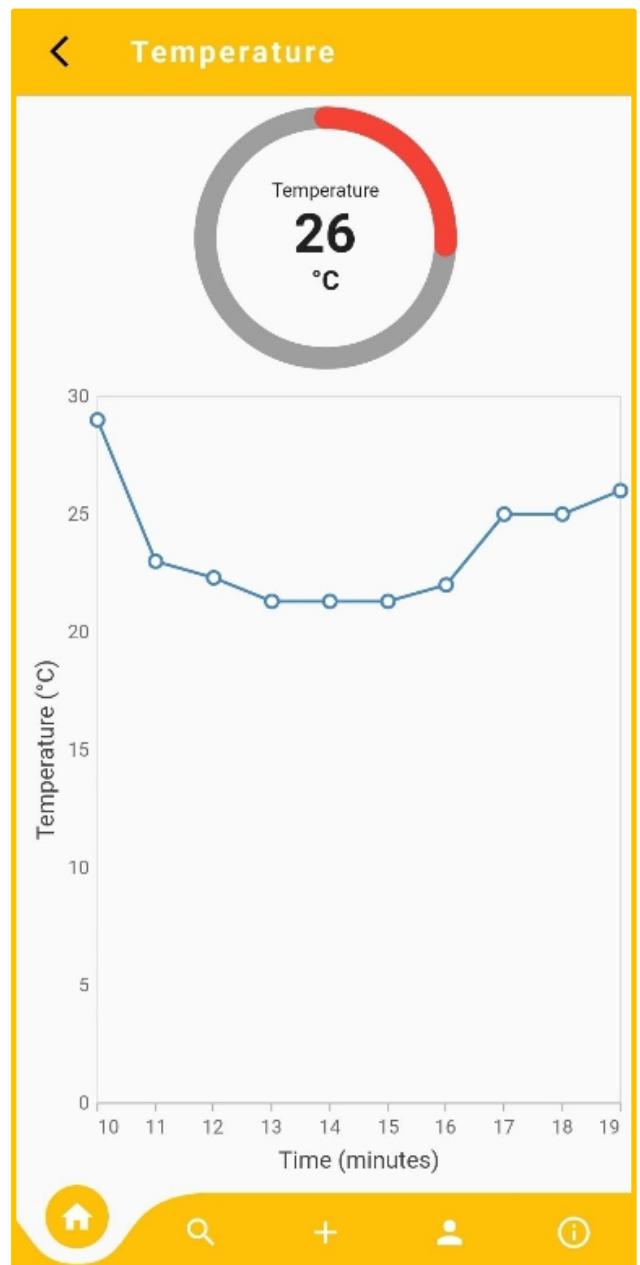
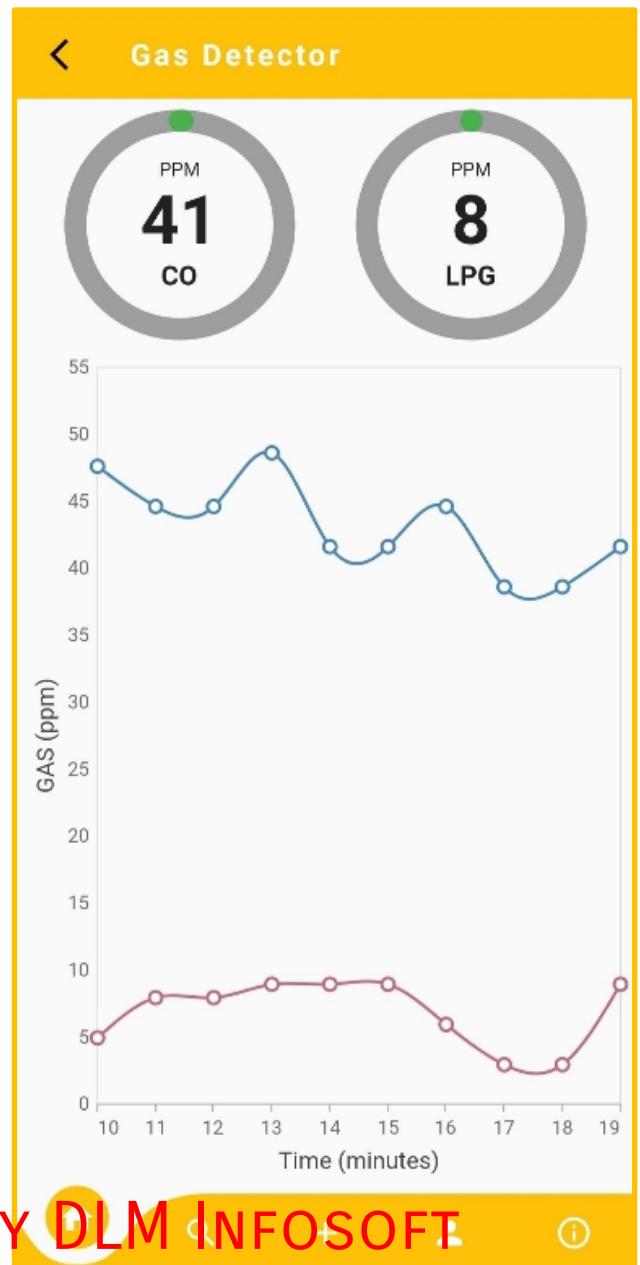
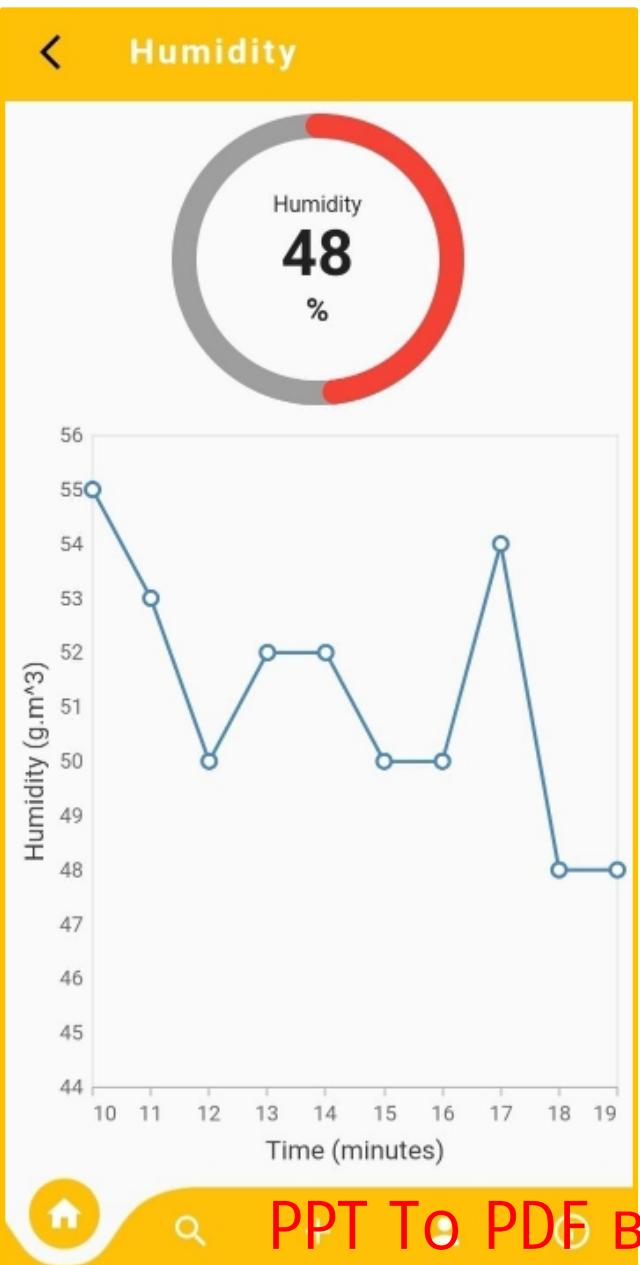
# REAL-TIME CIRCLE PROGRESS ANIMATION &

## GRAPHS:

GRAPH:

LAST 10 MIN  
READING.

CIRCLE  
PROGRESS:  
INSTANTANEOUS  
CHANGE APPEARS.



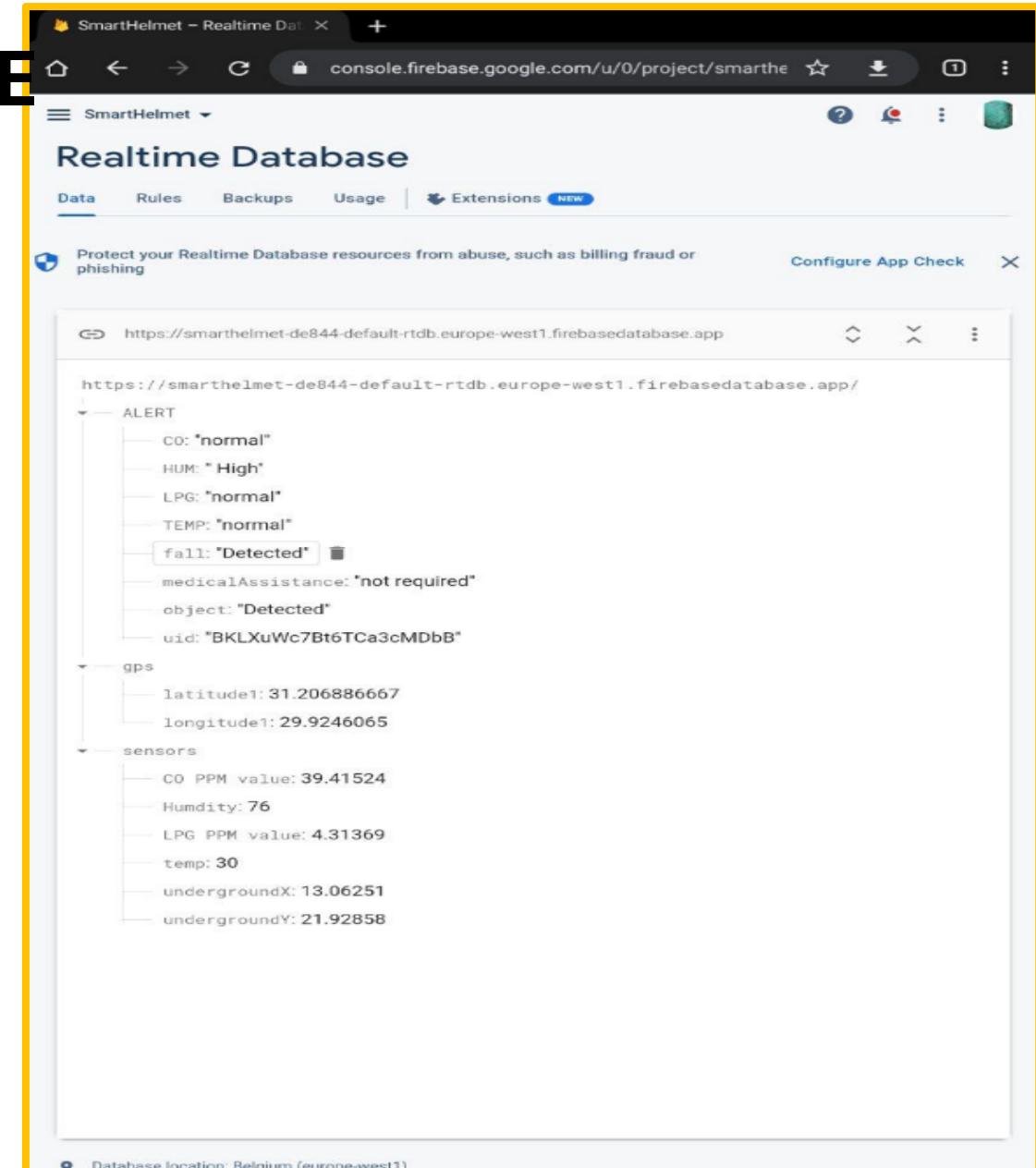
MEET FIREBASE REAL TIME NOTIFICATIONS, ALERTS,& SENSORS DATA :

# **Firebase in Smart Safety Helmet App**

# MODEL STRUCTURE OF REAL-TIME DATABASE AT FIREBASE SERVER:

THREE PARENT REAL-TIME NODES & SEVERAL CHILDREN:

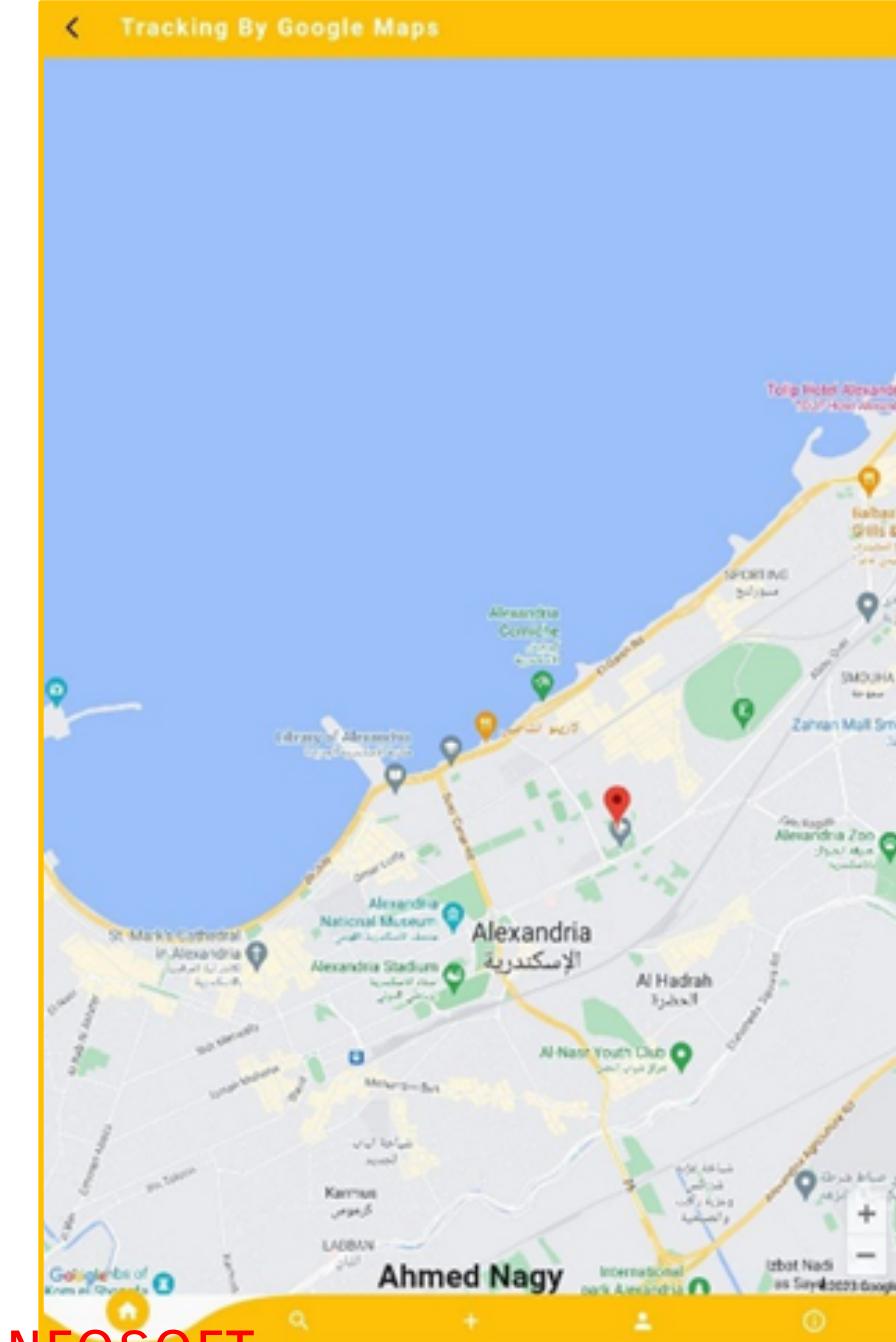
- **ALERT:** HUM, LPG, CO, TEMP, FALL, OBJECT, UID, MEDICALASSISTANCE.
- **SENSORS:** CO PPM VALUE, HUMDITY, LPG PPM VALUE, TEMP, UNDERGROUNDX, UNDERGROUNDY.
- **GPS:** LATITUDE1, LONGITUDE1.



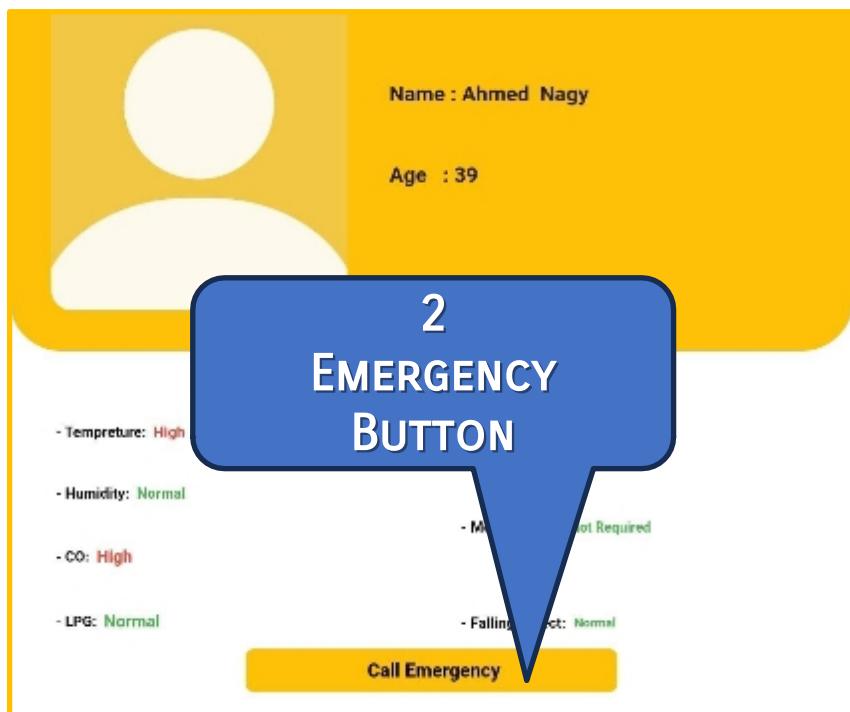
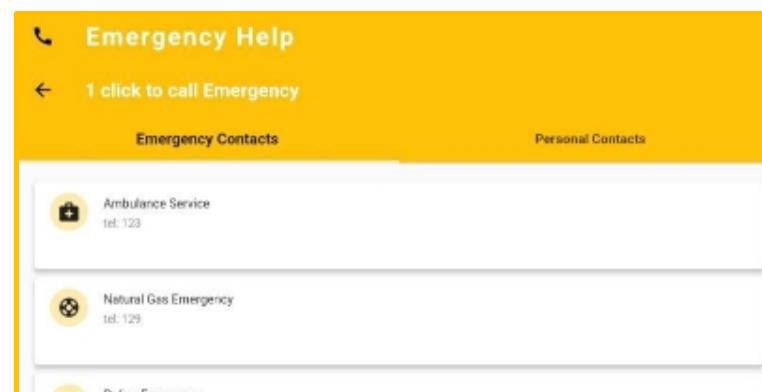
# REMARKABLE

## FEATURE:

- **GPS TRACKING** AT ANY INSTANCE.
- MEET PACKAGE:  
**FLUTTER\_GOOGLE\_MAPS**
- CREATE A GOOGLEMAP WIDGET AND SET ITS INITIAL POSITION.
- GET THE USER'S CURRENT LOCATION.
- UPDATE THE WIDGET WITH THE CURRENT LOCATION.
- DISPLAY THE WORKER INFO AND NAME.



# EMERGENCY SCENARIO



# EMERGENCY SCENARIO

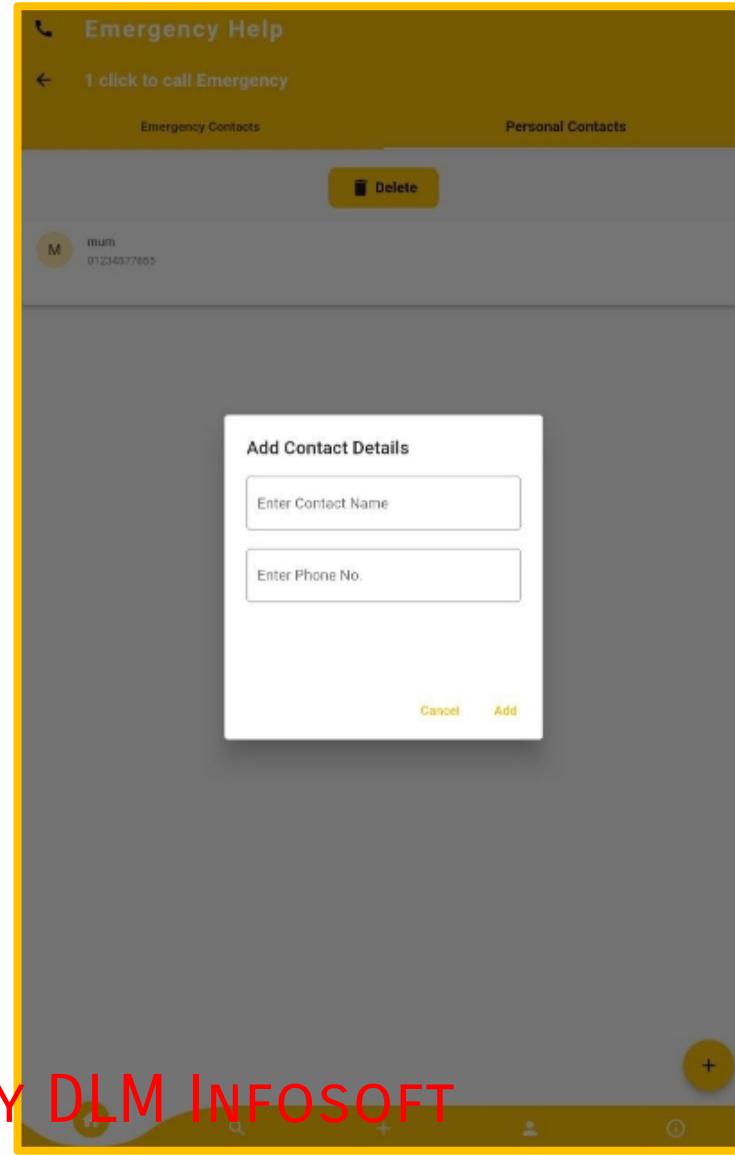
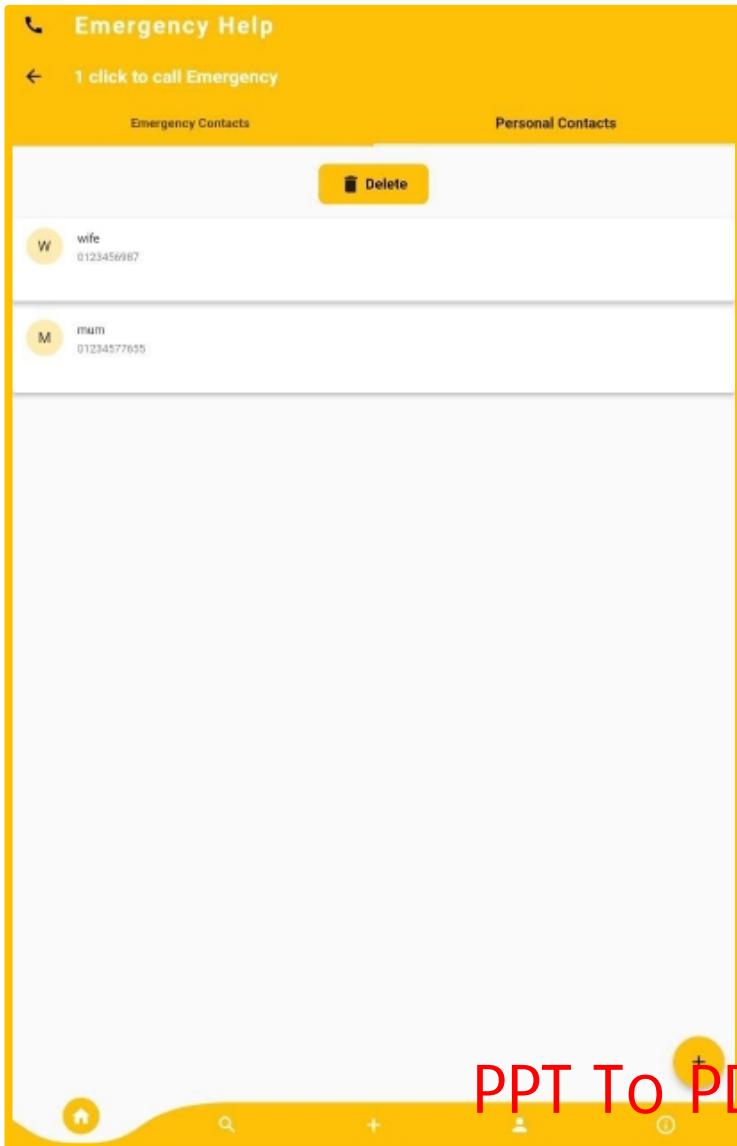
SUPERVISORS USE 1-CLICK TO CALL THE EMERGENCY SERVICES & THE PERSONAL EMERGENCY CONTACTS

- MEET **FLUTTER\_PHONE\_DIRECT\_CALLER**.
- MEET SQFLITE.
- **INSERTION & DELETION:** FROM DATABASE AND FROM UI.



# EMERGENCY SCENARIO

- **INSERTION & DELETION:** TWICE FROM DATABASE AND FROM UI.



# FIREBASE AUTHENTICATION

Reset Password

Enter your email

Email address

Reset Password



SMART  
Helmet

Sign up

SMART  
Helmet

User name

Phone number

Email address

Password

Has Uppercase

Has Lowercase

Has Special Character

At least one number

At least 8 digits

Create an account

Already have an account? [Sign in](#)

SMART  
Helmet

Email address

Password

Forgot Password ?

Log In

Do not have an account? [Sign Up](#)

# FIRESTORE DATABASE

Workers > k0fgCJ1y8h34ptfJqPm7

More in Google Cloud

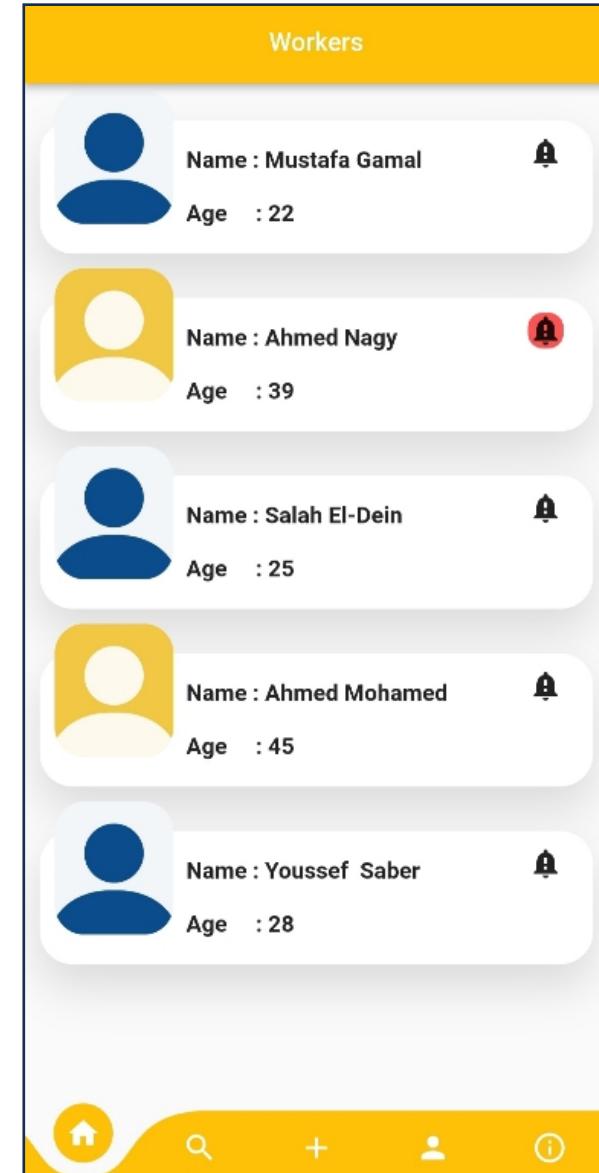
smarthelmet-de844	Workers	⋮
+ Start collection	+ Add document	+ Start collection
Users	50vie1XRD6GjZ0t0cOCI	+ Add field
Workers	BKLXuWc7Bt6TCa3cMdB	address: "130 El Tahrir Street, Dokkil, Giza, Egypt"
	k0fgCJ1y8h34ptfJqPm7	age: "25"
	xZ0Bv5mCjYwDUlk9zzPK	bloodgroup: "A+"
		firstName: "Salah"
		imgurl: "https://firebasestorage.googleapis.com/v0/b/smarthelmet-de844.appspot.com/o/639500646IMG-20230626-WA0160.jpg?alt=media&token=edfd061c-48a4-431c-94a8-d1d9b41dcc77"
		lastName: "El-Dein"
		uid: "k0fgCJ1y8h34ptfJqPm7"
		workernumber: "01017945088"

Users > xwlasK7GhhXD...  
More in Google Cloud

smarthelmet-de844	Users	⋮
+ Start collection	+ Add document	+ Start collection
Users	5Qw5c01AKdbMYUPURBox7Db8aHn2	+ Add field
Workers	7tpWmfR4CWUbxFr0n6EgNTbdwJ3	email: "yousouf.alghmrawy@gmail.com"
	BF2MEPIxsrasm5rGJIDYnfZzChT2	phone: "01017945088"
	Bp3SJLwZXUjXde6TArBwAnwIlc2	uID: "xwlasK7GhhXD...14cMNJ12"
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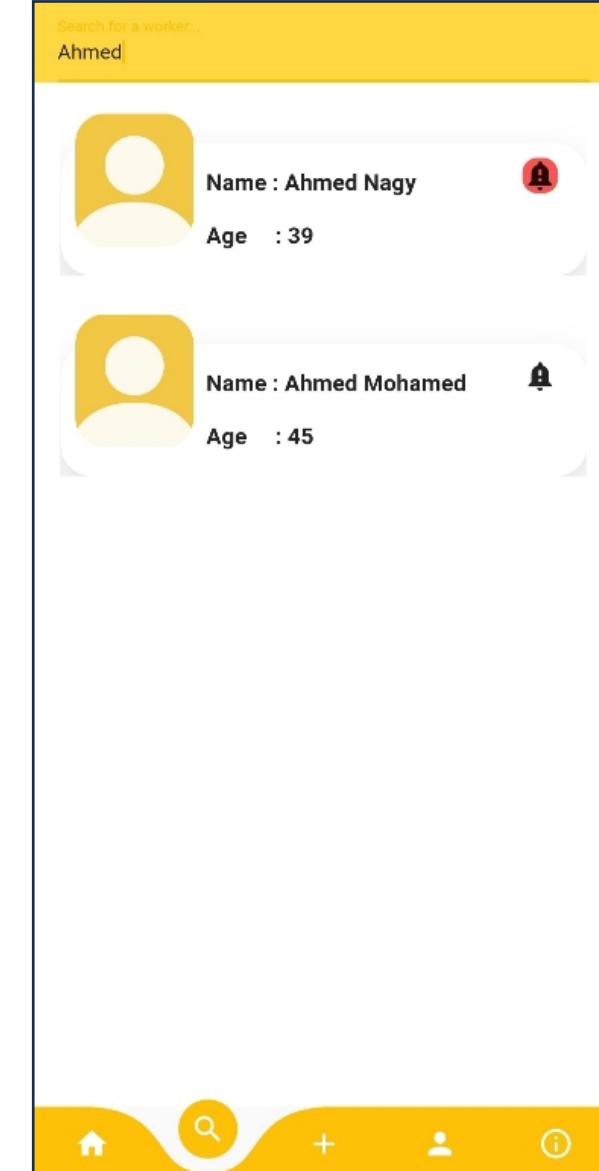
# HOME PAGE

- FIRESTORE DATABASE
  - WHEN THE APP STAR
  - WHEN ADDING NEW WORKER
- NAME , PHOTO AND AGE
  - HELP SUPERVISOR TO RECOGNIZE EACH WORKER
  - SHOWING AGE TO HELP MAKING DECISIONS



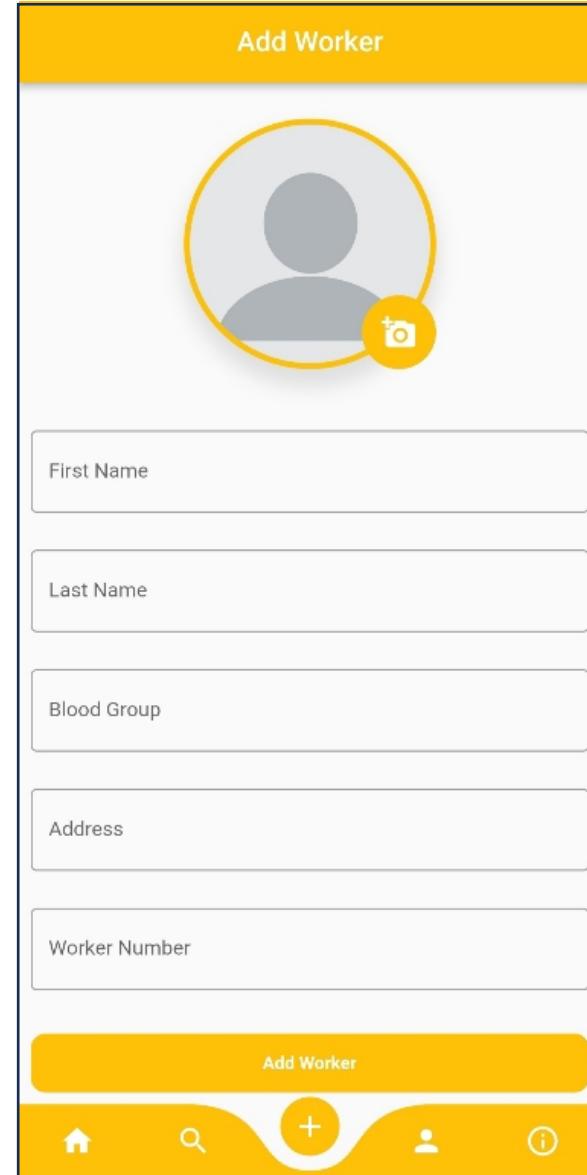
# SEARCH FOR WORKER

- COMPARE INPUT WITH FIRST NAME OF EACH DOCUMENT
- SHOW ALL WORKER WITH THE SAME FIRST NAME
- TAKING LESS TIME TO FIND THE SPECIFIC WORKER YOU WANT



# ADDING WORKERS

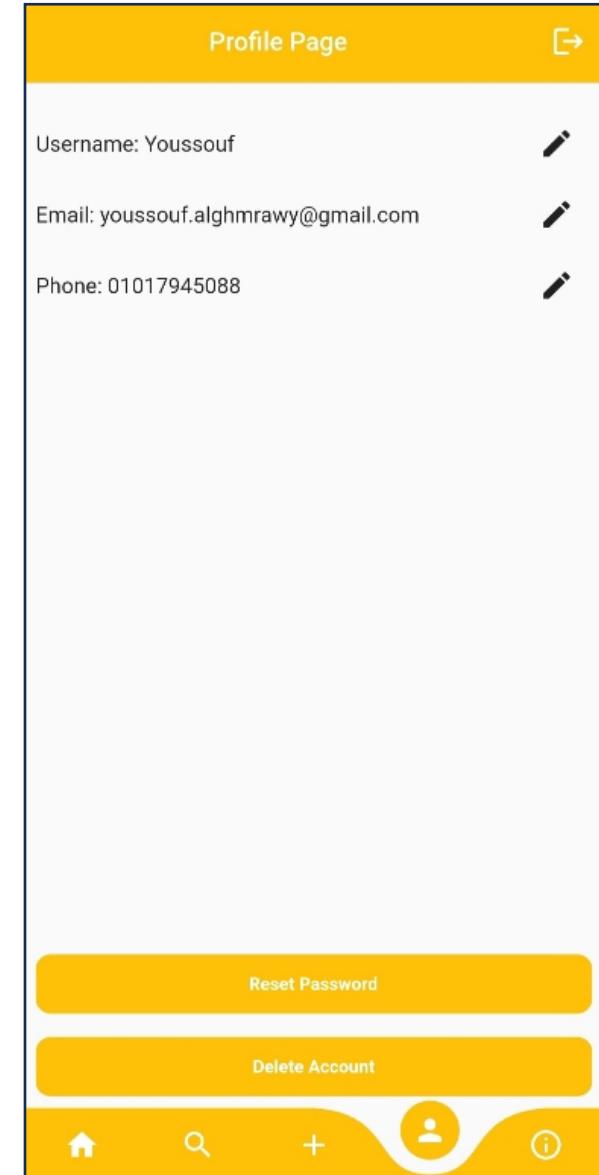
- FIREBASE STORAGE TO SAVE PHOTOS
- CHANGE THE NAME OF THE PHOTO TO PREVENT OVER WRITING
- EACH WORKER WILL HAVE HIS OWN DOCUMENT IN WORKER COLLECTION



# PROFILE PAGE

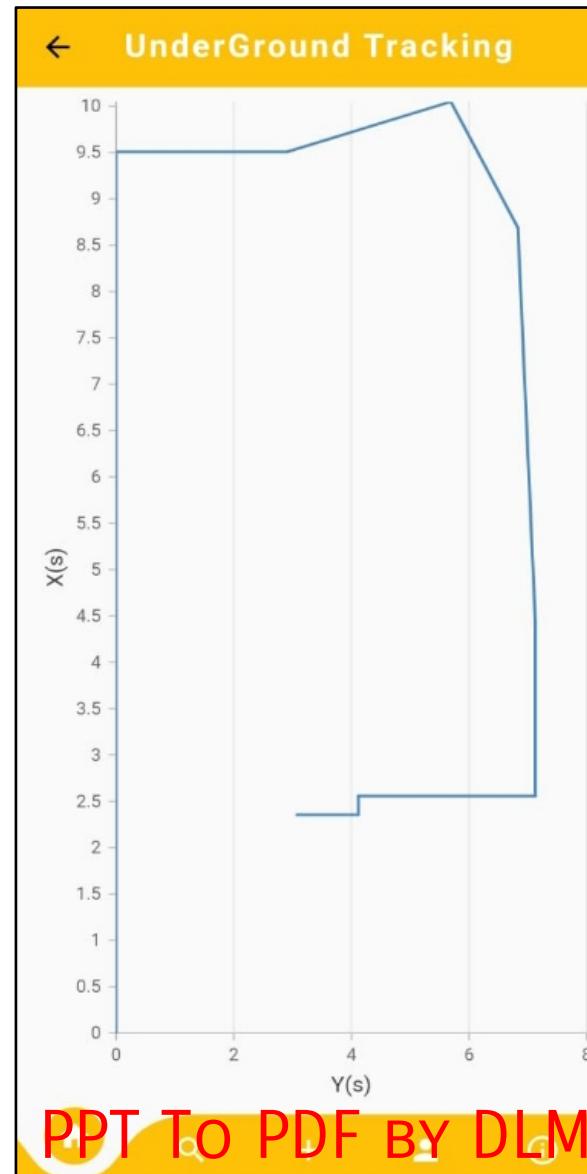
## SUPERVISOR PAGE

- SHOWING USER DATA
- CAN CHANGE ALL THE DATA
- RESET PASSWORD ,DELETING ACCOUNT AND LOG-OUT



# **UNDERGROUND/ INDOORS TRACKING**

- SITE MAP AND HOW IT WORKS
  - WHEN READING CHANGES IN THE REAL-TIME DATABASE



# **CONCLUSION & FUTURE WORK**

# CONCLUSION:

THESE ARE THE ALGORITHMS' ACCURACIES:

ALGORITHM	ACCURACY
OBJECT DETECTION	86%
FALL DETECTION	84%
INDOORS TRACKING	85%

# FUTURE WORK

- IMPLEMENT MACHINE LEARNING IN OBJECT AND FALL DETECTION ALGORITHMS
- IMPROVE INDOORS TRACKING USING RFID
- CHANGING THRESHOLDS FROM THE APPLICATION
- ALERTS PAGE
- UPLOADING MAPS

# **PROJECT DEMONSTRATION**



# THANK YOU