SELF DRIVING CAR WITH ANOMALY DETECTION (WALL-CS)

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OUTLINE

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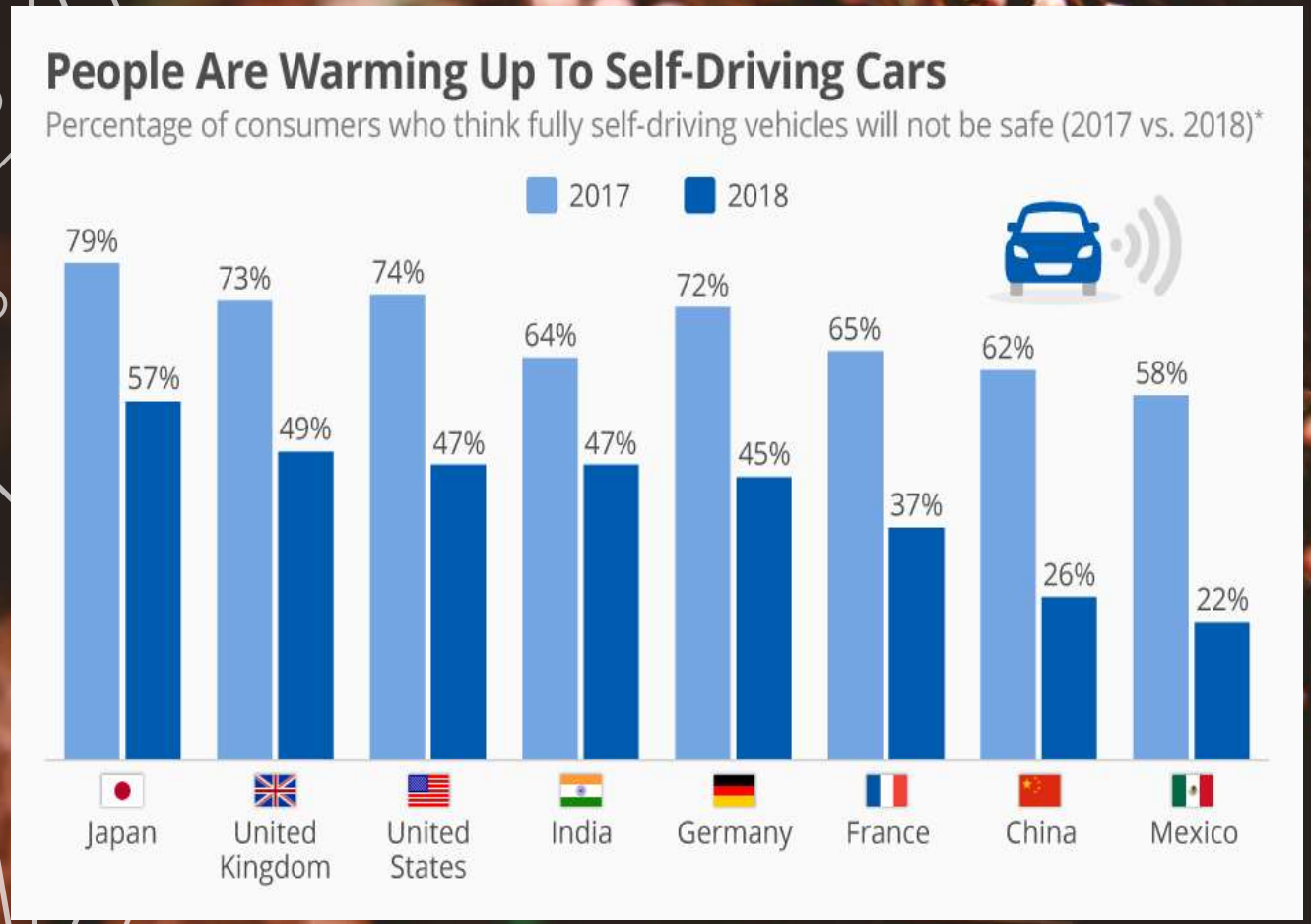
INTRODUCTION(1/2)



1.25 million people die in car crashes each year

There are 30k people die each year due to cancer as a result of car air pollution

Capmas has reported that In 2016 there are 14700 accidents occurred in Egypt

There are 1.5 million accidents occur each year, autonomous vehicle could save half million lives each year

www.who.int
www.asirt.org
www.capmas.gov.eg

INTRODUCTION(2/2)

Potholes apparently cause a small number of accidents but it cause damage to primarily tire and suspension failures

INTRODUCTION(2/2)

Bumps are double edged weapon * it may disturb drivers, cause accidents and sometimes it can't be seen due to faded road signs

INTRODUCTION(2/2)

Autonomies cars are eco friendly

INTRODUCTION(2/2)

Roads will be more safe

INTRODUCTION(2/2)

People will be more productive

INTRODUCTION(2/2)

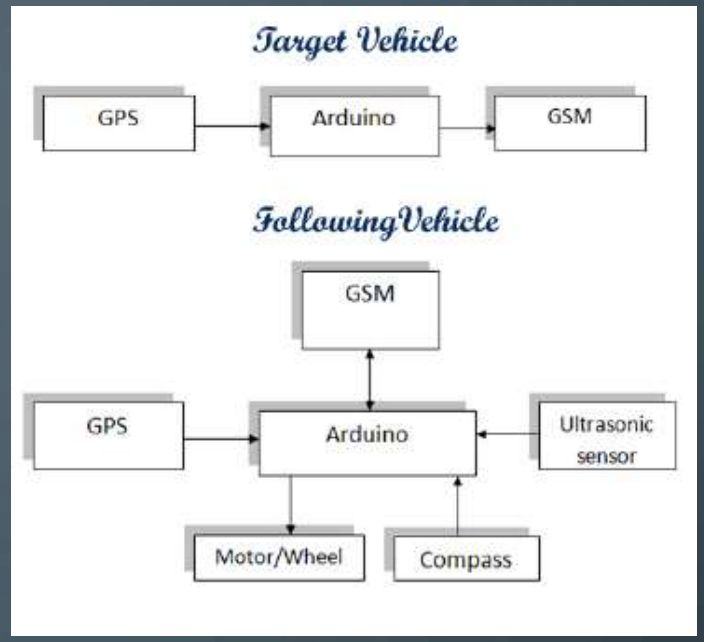
Autonomies cars can save money

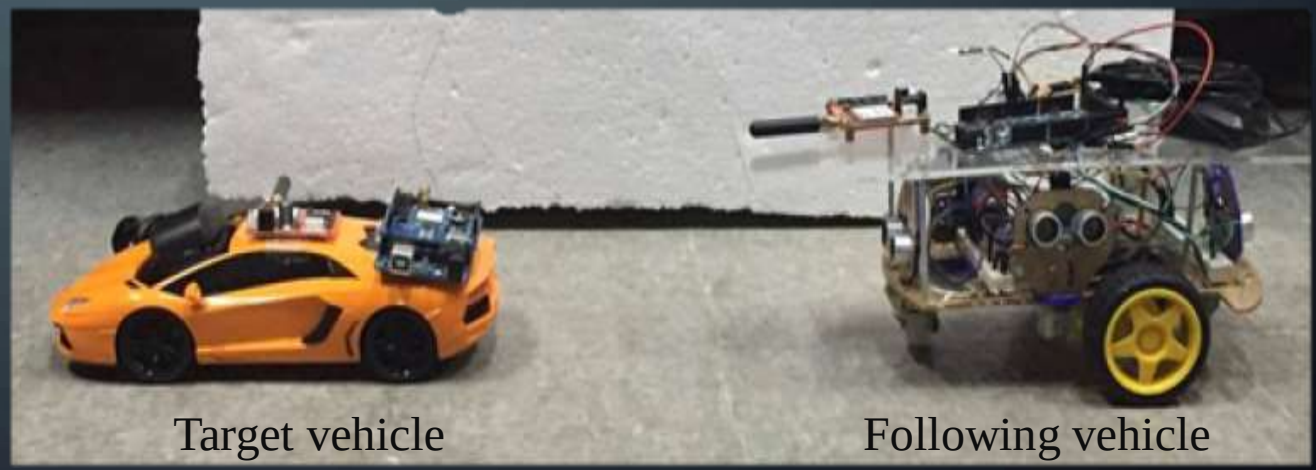
RELATED WORK (1/3)

- Sensors used (GPS, GSM, US, Compass).
- Modified the concept of google car.
- Aims of this system

  1)Make driver more relaxed in traffic jam.

  2)Create automated vehicle whose destination is dynamic.





Target vehicle Following vehicle

Memon, Qudsia & Ahmed, Muzamil & Ali, Shahzeb & Rafique, Azam & Shah, Wajiha. (2016). Self-driving and driver relaxing vehicle. 10.1109/ICRAI.2016.7791248.

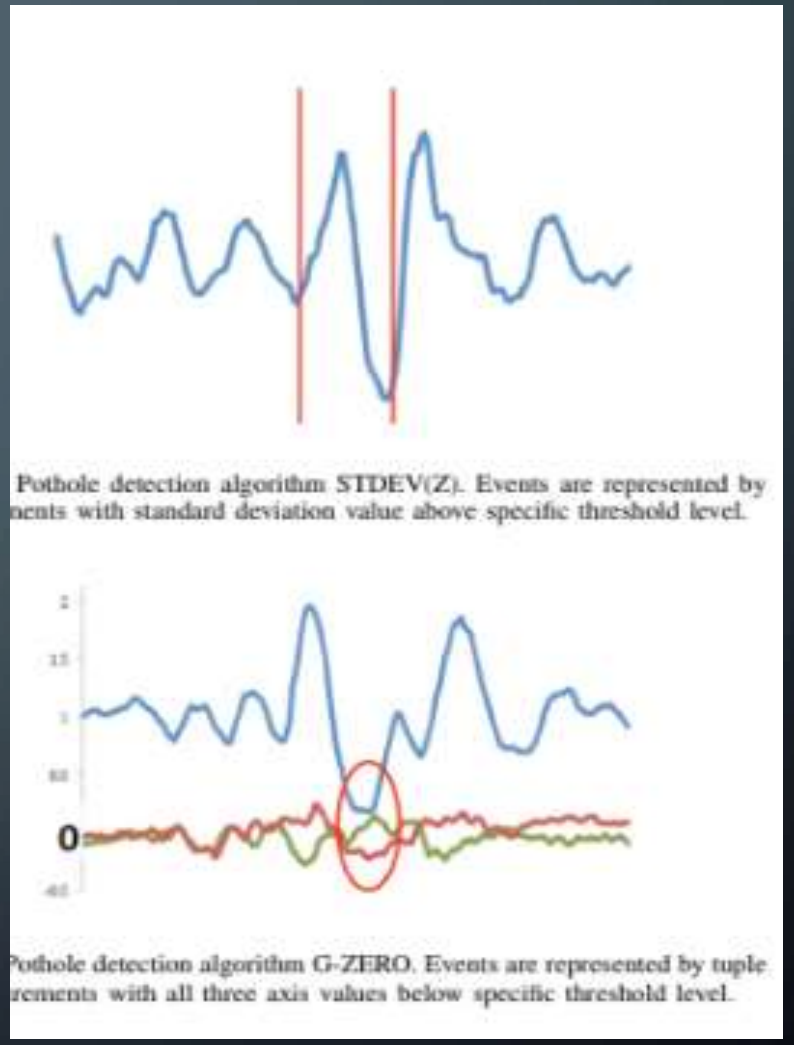
RELATED WORK(2/3)

- Hardware : Raspberry Pi 3, Arduino UNO, Camera, RC Scale and Adafruit Driver
- Machine learning : CNN
- Train parameters by using data collected and then make a road tests on the model to drive itself in the outdoor environment.

Do, Truong-Dong & Duong, Minh-Thien & Dang, Quoc-Vu & Le, My-Ha. (2018). Real-Time Self-Driving Car Navigation Using Deep Neural Network. 7-12. 10.1109/GTSD.2018.8595590.

RELATED WORK(3/3)

- Using mobile sensors(Accelerometer, microphone)
- Algorithms: Z-thresh, Z-diff, STDEV, G-zero
- Accuracy above 90%.
- Aim: automated detection of potholes without any interaction from human



Pothole detection algorithm STDEV(Z). Events are represented by
nents with standard deviation value above specific threshold level.

Pothole detection algorithm G-ZERO. Events are represented by tuple
rements with all three axis values below specific threshold level.

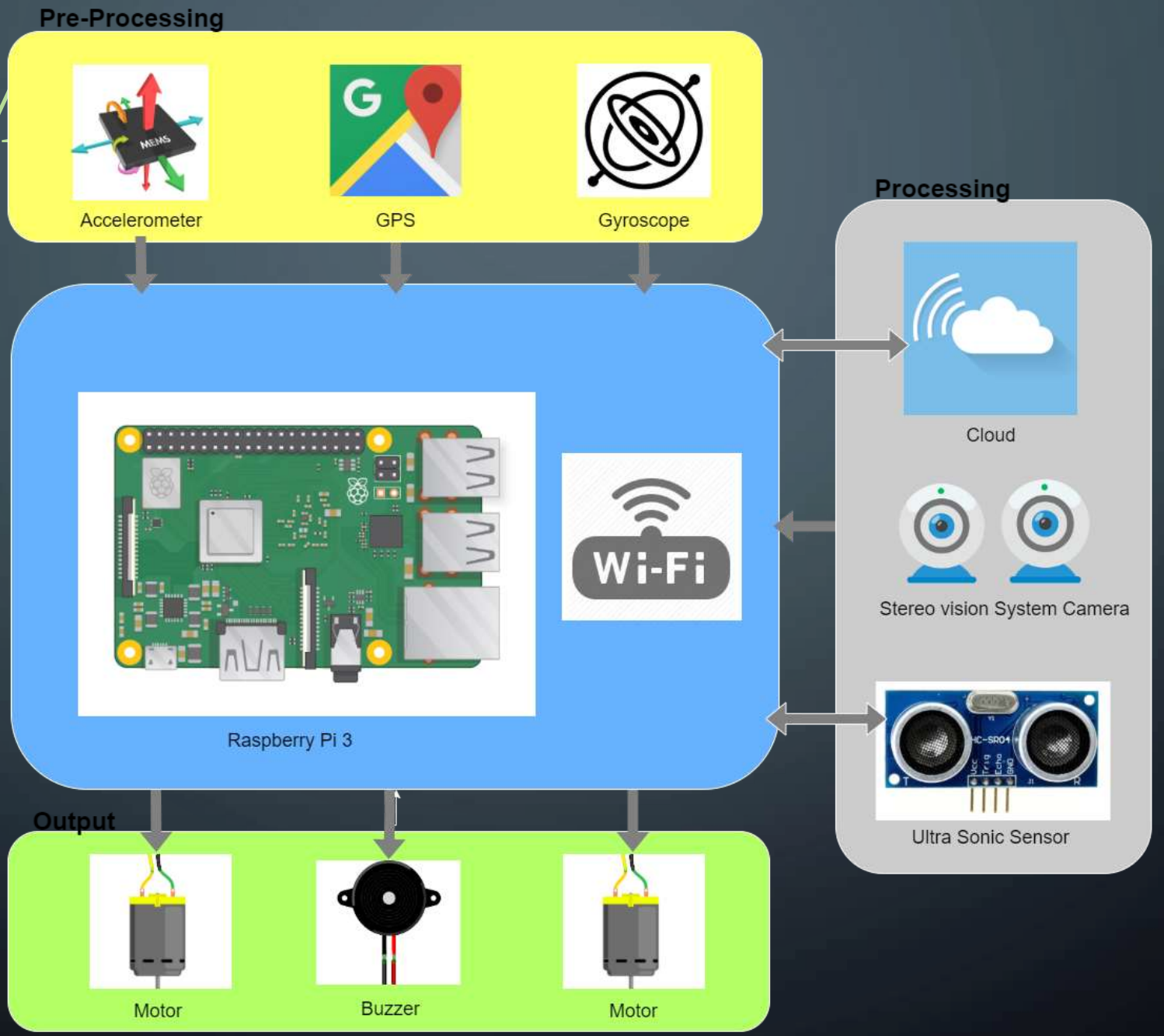
Mednis, Artis & Strazdins, Girts & Zviedris, Reinholds & Kanonirs, Georgijs & Selavo, Leo. (2011). RealTime Pothole Detection Using Android Smartphones with Accelerometers. 1 - 6.10.1109/DCOSS.2011.5982206

Points of comparison	Self-driving and driver relaxing vehicle	Real-Time Self-Driving Car Navigation Using Deep Neural Network	Real-time Pothole Detection Using Android Smartphones with Accelerometers	Our Proposed System
Sensors	GPS GSM UltraSonic Compass	Raspberry Pi 3 Arduino UNO Camera RC Scale Adafruit Driver	Accelerometer Microphone	Gyroscope Accelerometer GPS Ultrasonic Stereo Vision (External sensors)
Algorithms	Not Mentioned	CNN	Z-thresh Z-diff, STDEV G-zero	SVM CNN
Accuracy	Not mentioned	Not mentioned	Above 90%	----

PROBLEM STATEMENT

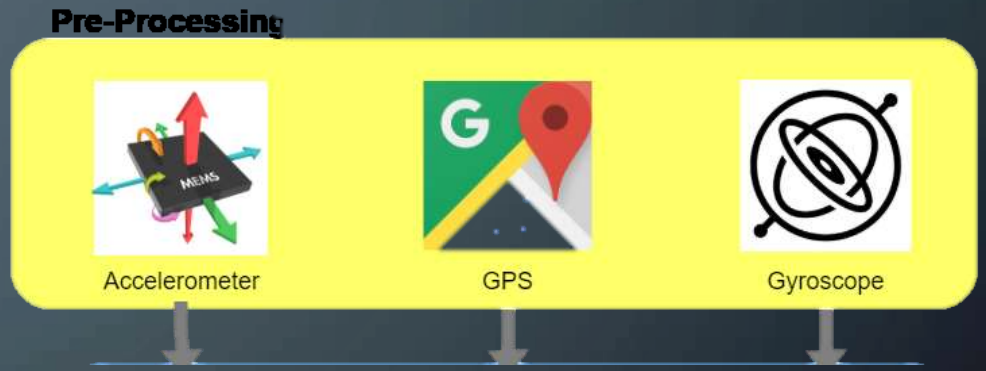
Implementing a self-driving car which detects road anomalies and measures distance between vehicles and obstacles using stereo vision to take intelligent action with them

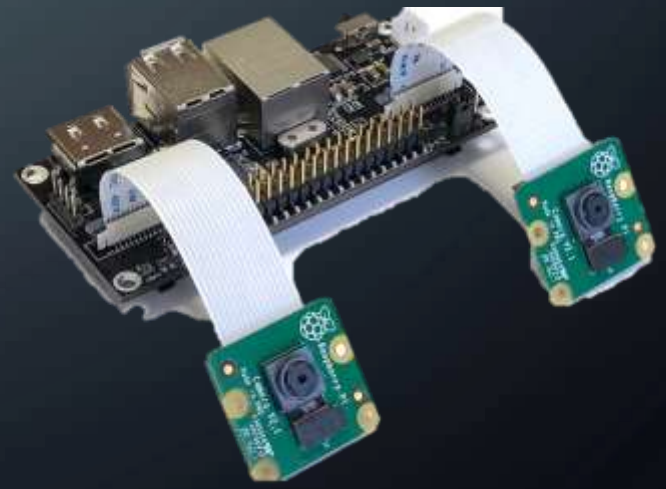
SYSTEM


Pre-Processing
Accelerometer
GPS
Gyroscope
Processing
Cloud
Stereo vision System Camera
Ultra Sonic Sensor
Raspberry Pi 3
Wi-Fi
Output
Motor
Buzzer
Motor

SYSTEM OVERVIEW (PRE-PROCESSING)

- Get sensors reading (Accelerometer, Gyroscope, GPS, Ultrasonic)
- Getting images from Stereo vision (dual camera)
- Filtering the readings from the sensors to remove the noise

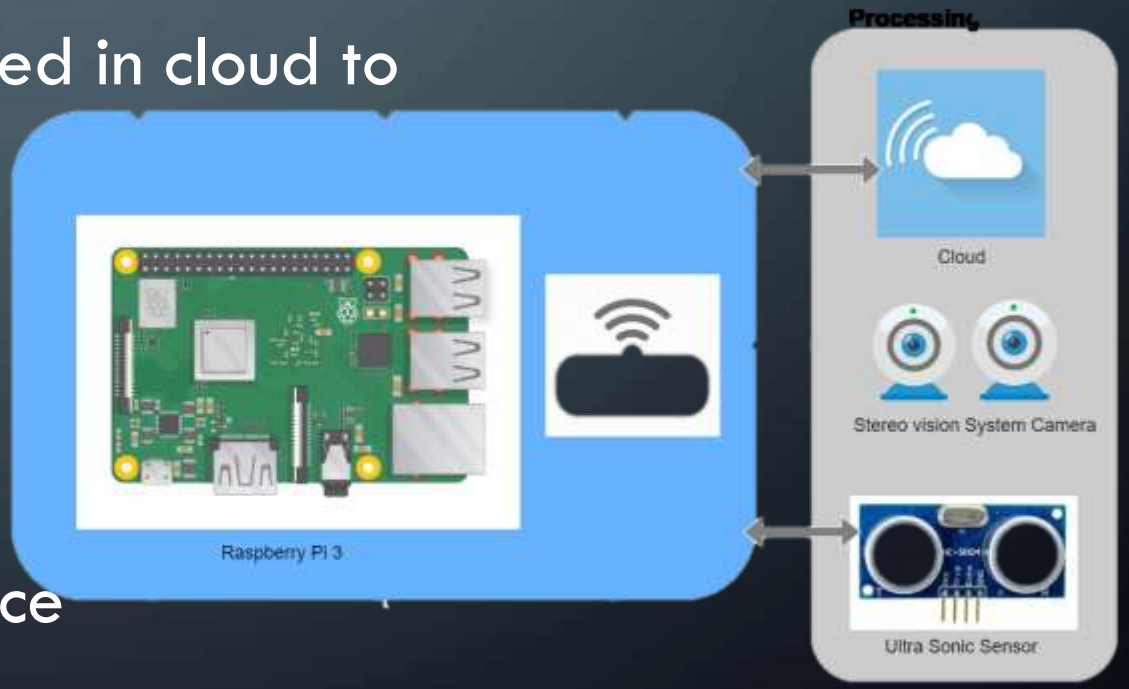




Stereo vision cameras

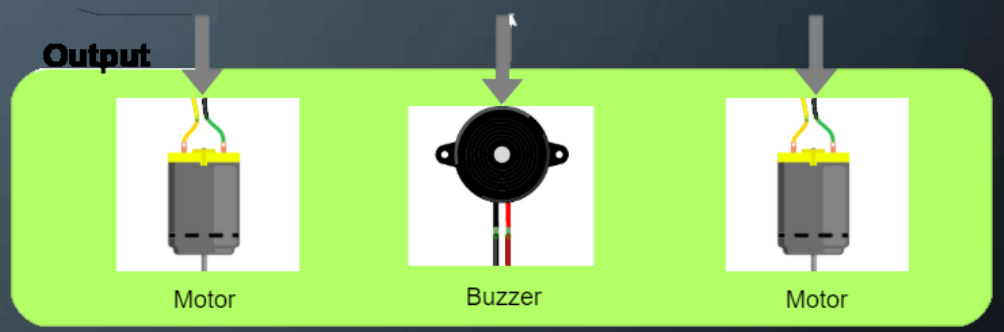
SYSTEM OVERVIEW (PROCESSING)

- Uses SVM algorithm to classify sensors reading
- Uses CNN algorithm to classify images
- Bumps and holes location will be stored in cloud to use it later.
- Uses Ultrasonic to help sensors reading in anomalies data.
- Uses stereo vision to measure distance between vehicles and obstacles through disparity map.



SYSTEM OVERVIEW (OUTPUT)

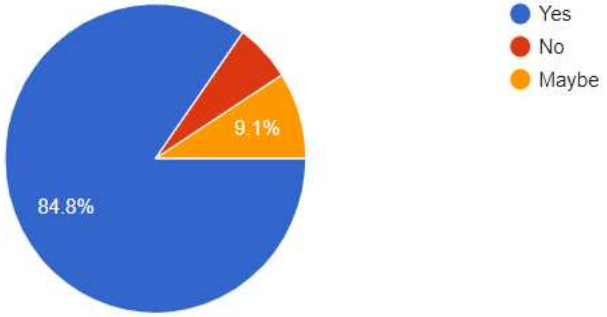
- Car alerts the driver that there is an anomaly through buzzer.
- Car slows down or changes lane before any detected anomaly.
- Car avoids crashing with any obstacle in its way using (stereo vision).



MOTIVATION

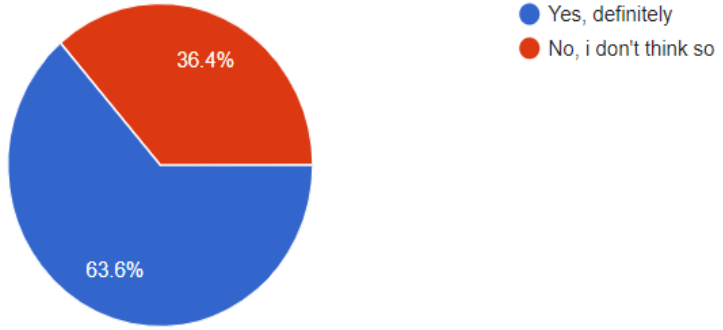
Do you like to be given a chance to try self-driving car ?

33 responses



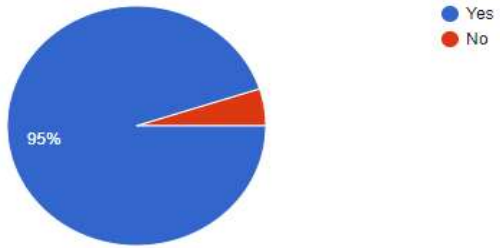
Do you think that self-driving (autonomous) cars are safer than normal cars

33 responses



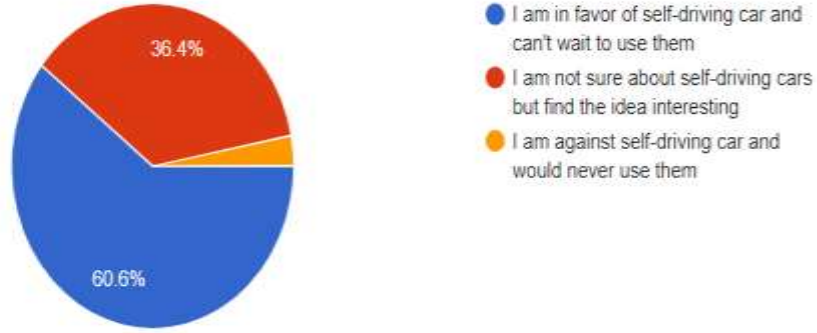
Would you like a sensor device in your car to alert before passing by a speed bump? هل ترغب بجهاز استشعار بالسياره يقوم بتنبيهك قبل ان تمر على المطب الصناعى؟

60 responses



What's your opinion about self-driving car

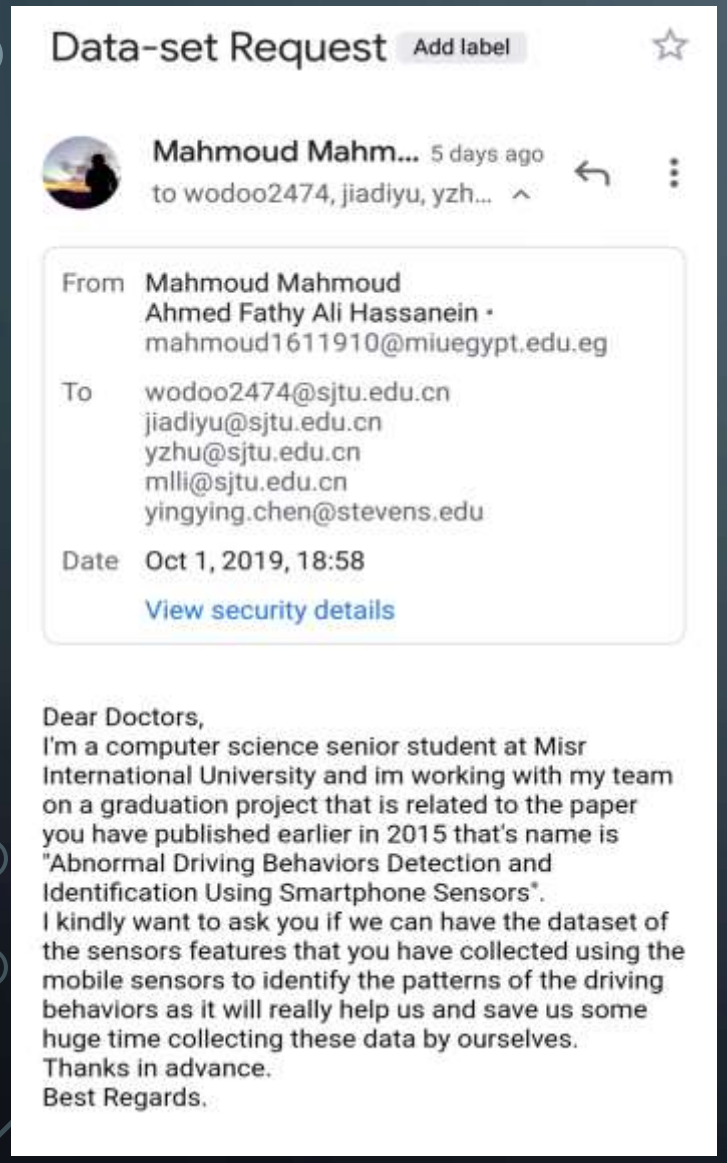
33 responses



EXPECTED RESULTS

- Take intelligent decisions during self driving
- Avoid clash with any obstacle
- Detect speed bumps and potholes
- Slow down before passing by a bump
- Changing lane when there is a hole

SUPPORTIVE DOCUMENTS(1/1)



Data-set Request Add label

Mahmoud Mahm... 5 days ago
to wodoo2474, jiadiyu, yzh...

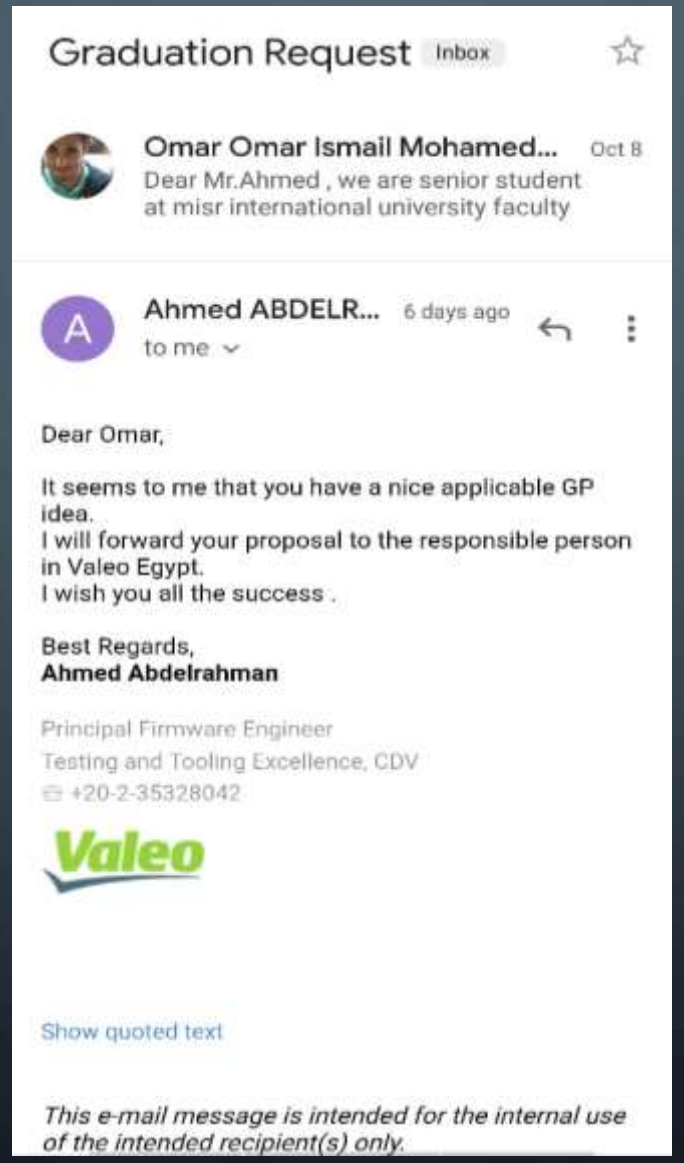
From Mahmoud Mahmoud
Ahmed Fathy Ali Hassanein
mahmoud1611910@miuegypt.edu.eg

To wodoo2474@sjtu.edu.cn
jiadiyu@sjtu.edu.cn
yzhu@sjtu.edu.cn
mlli@sjtu.edu.cn
yingying.chen@stevens.edu

Date Oct 1, 2019, 18:58

View security details

Dear Doctors,
I'm a computer science senior student at Misr International University and im working with my team on a graduation project that is related to the paper you have published earlier in 2015 that's name is "Abnormal Driving Behaviors Detection and Identification Using Smartphone Sensors".
I kindly want to ask you if we can have the dataset of the sensors features that you have collected using the mobile sensors to identify the patterns of the driving behaviors as it will really help us and save us some huge time collecting these data by ourselves.
Thanks in advance.
Best Regards.



Graduation Request Inbox

Omar Omar Ismail Mohamed... Oct 8
Dear Mr.Ahmed , we are senior student at misr international university faculty

Ahmed ABDELR... 6 days ago
to me

Dear Omar,

It seems to me that you have a nice applicable GP idea.
I will forward your proposal to the responsible person in Valeo Egypt.
I wish you all the success .

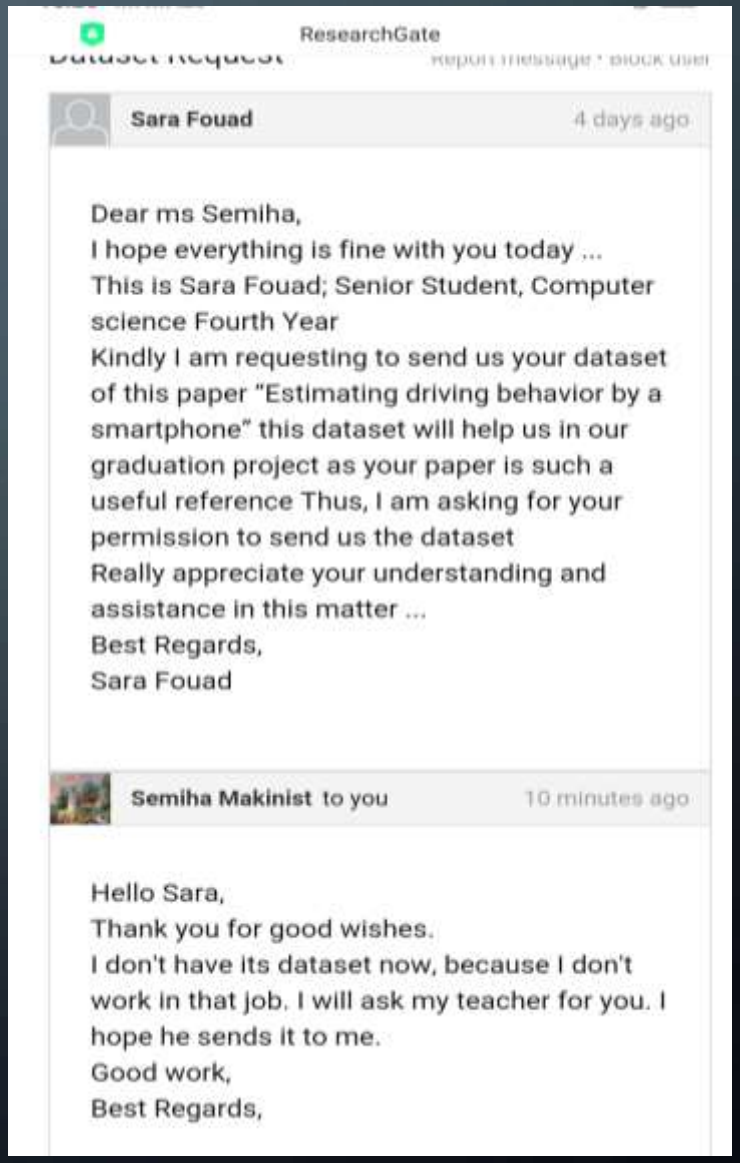
Best Regards,
Ahmed Abdelrahman

Principal Firmware Engineer
Testing and Tooling Excellence, CDV
+20-2-35328042

Valeo

Show quoted text

This e-mail message is intended for the internal use of the intended recipient(s) only.



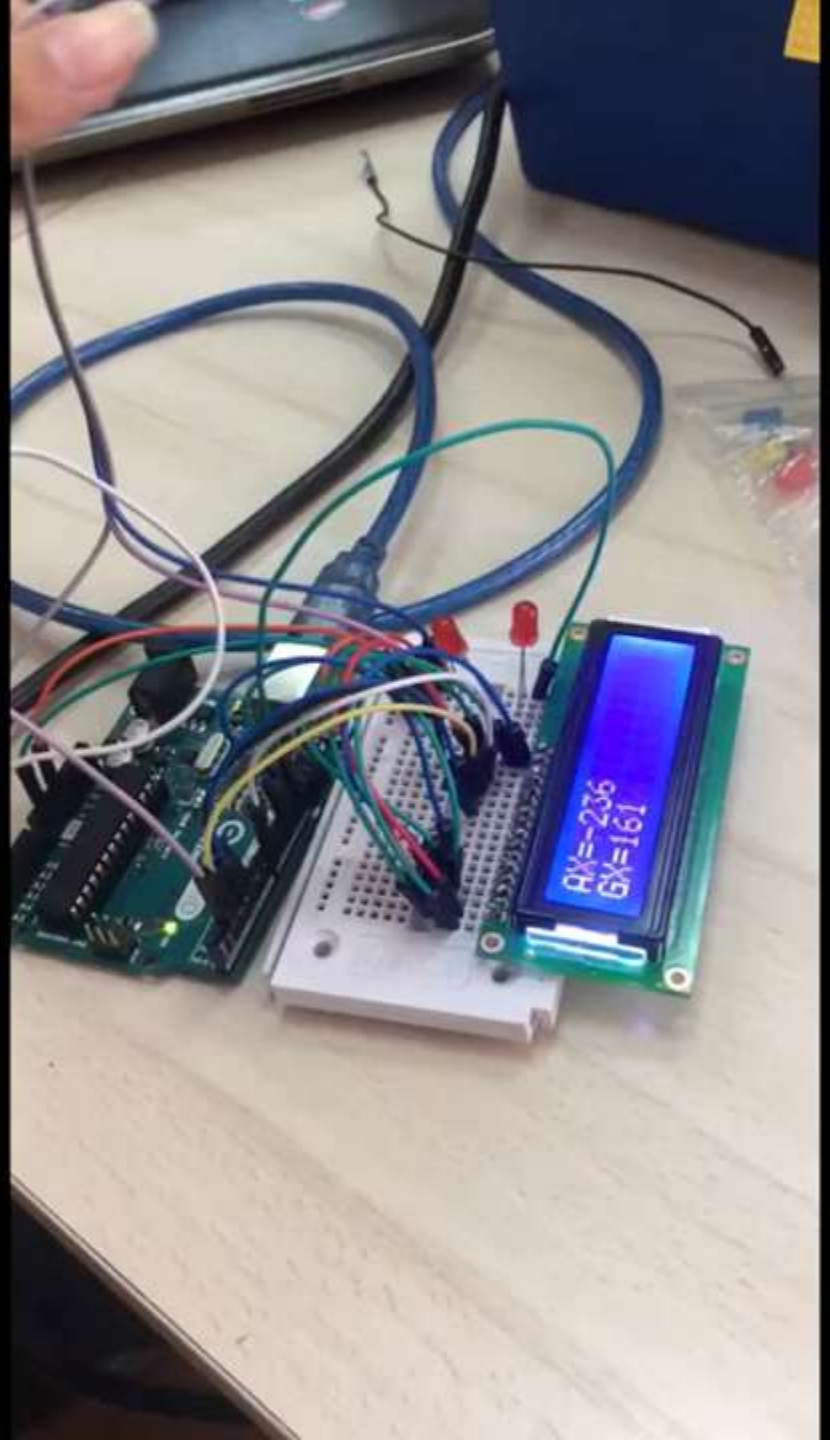
ResearchGate

Sara Fouad 4 days ago

Dear ms Semiha,
I hope everything is fine with you today ...
This is Sara Fouad; Senior Student, Computer science Fourth Year
Kindly I am requesting to send us your dataset of this paper "Estimating driving behavior by a smartphone" this dataset will help us in our graduation project as your paper is such a useful reference Thus, I am asking for your permission to send us the dataset
Really appreciate your understanding and assistance in this matter ...
Best Regards,
Sara Fouad

Semiha Makinist to you 10 minutes ago

Hello Sara,
Thank you for good wishes.
I don't have its dataset now, because I don't work in that job. I will ask my teacher for you. I hope he sends it to me.
Good work,
Best Regards,


AX=-236
GX=161

File Edit View Navigate Code Refactor Run Tools VCS Window Help untitled [C:\Users\modym\PycharmProjects\untitled] - ...\Arduino.py - PyCharm

untitled > Arduino.py

Arduino

Project

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venv library root
Arduino.py
External Libraries
Scratches and Consoles

Arduino.py

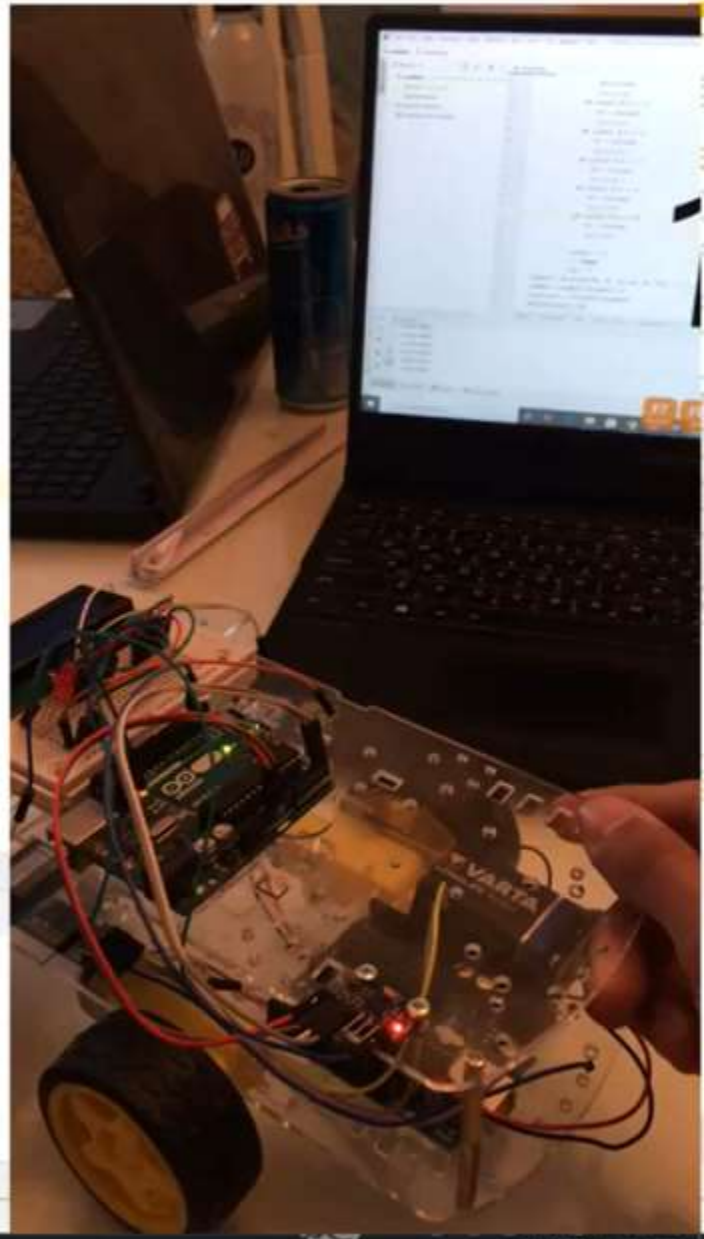
```
                    AX=int(num)
                    #print(AX)
                if counter % 6 == 1:
                    AY = int(num)
                    #print(AY)
                if counter % 6 == 2:
                    AZ = int(num)
                    #print(AZ)
                if counter % 6 == 3:
                    GX = int(num)
                    #print(GX)
                if counter % 6 == 4:
                    GY = int(num)
                    #print(GY)
                if counter % 6 == 5:
                    GZ = int(num)
                    #print(GZ)

                counter += 1
                z = False
                num = ""
    example = np.array([AX, AY, AZ, GX, GY, GZ])  # LIST OF LISTS
    example = example.reshape(1,-1)
    prediction = clf.predict(example)
    if(prediction == 0):
```

while 1 › for x in Str › else › if (z == True) › if counter % 6 == 5

Run: Arduino

```
CLEAN ROAD!
CLEAN ROAD!
CLEAN ROAD!
CLEAN ROAD!
CLEAN ROAD!
CLEAN ROAD!
```



Run TODO Terminal Python Console

Type here to search

ENG 11:00 PM 10/8/2019

ANY QUESTIONS ?