Self-Driving Car Using Disparity Map

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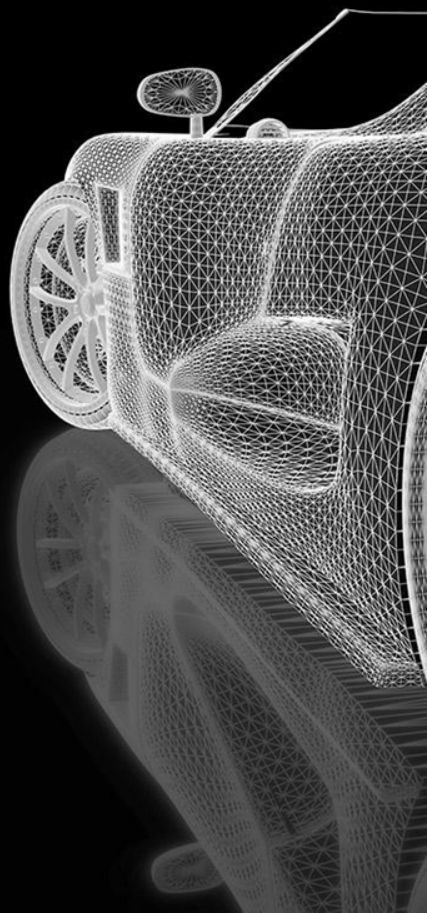
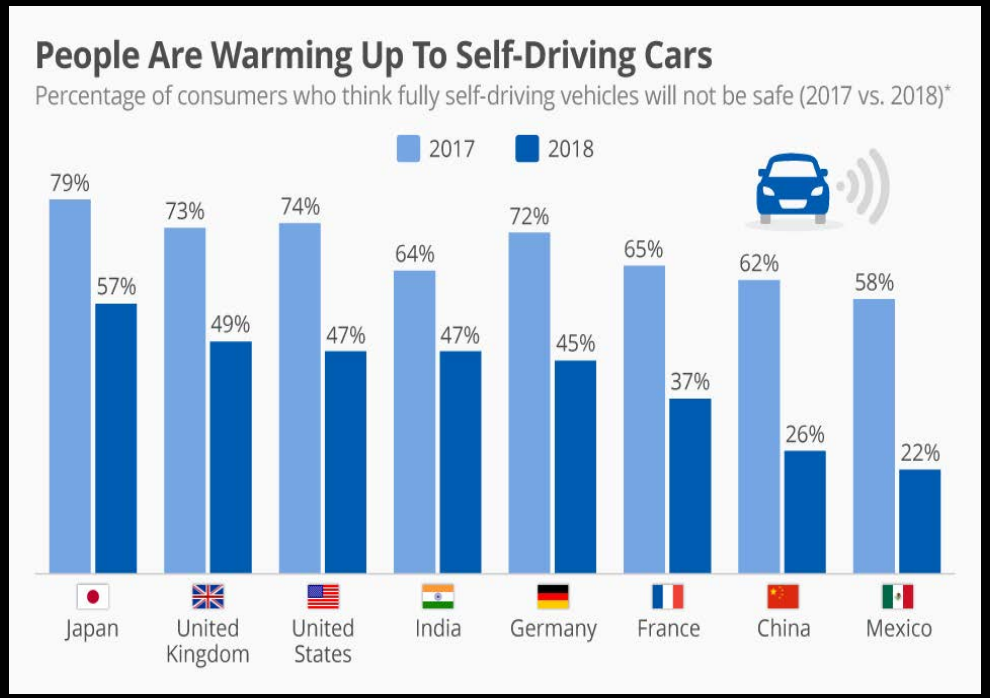
Demo



Introduction (1/2)



1.25 million people die in car crashes each year

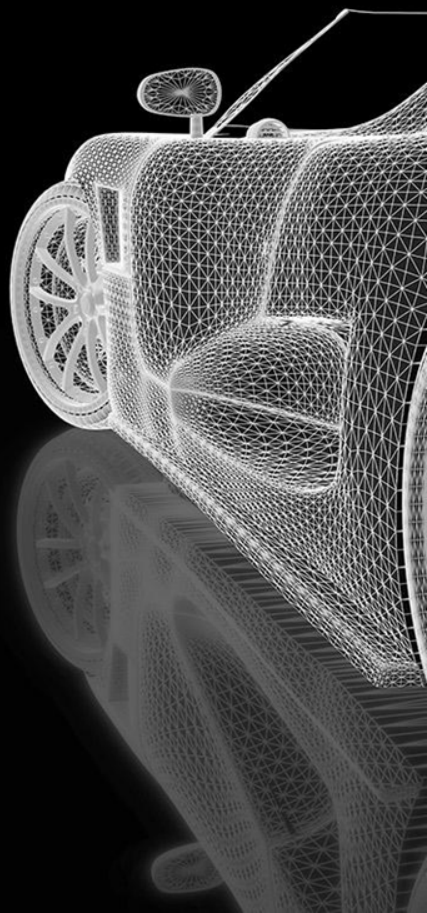
There are 30k people die each year due to cancer as a result of car air pollution

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

Problem Statement

Self Driving cars are still not totally legal in lots of countries as they are still not safe enough to be relied on in public.



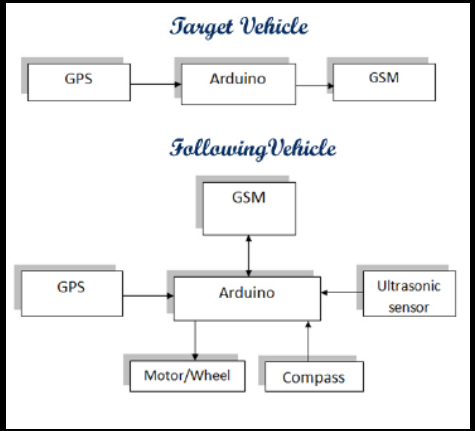
Related work

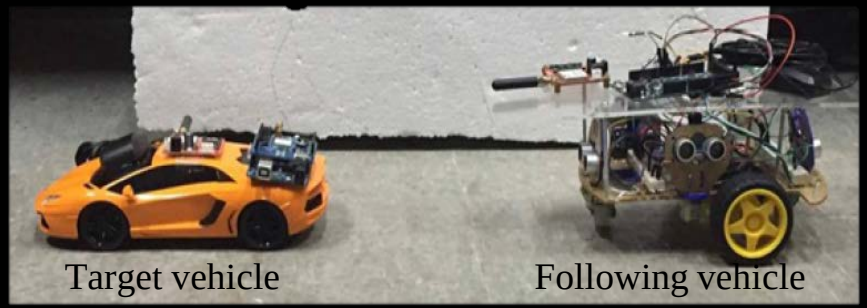
Sensors used (GPS, GSM, US, Compass).

Modified the concept of google car.

Aims of this system

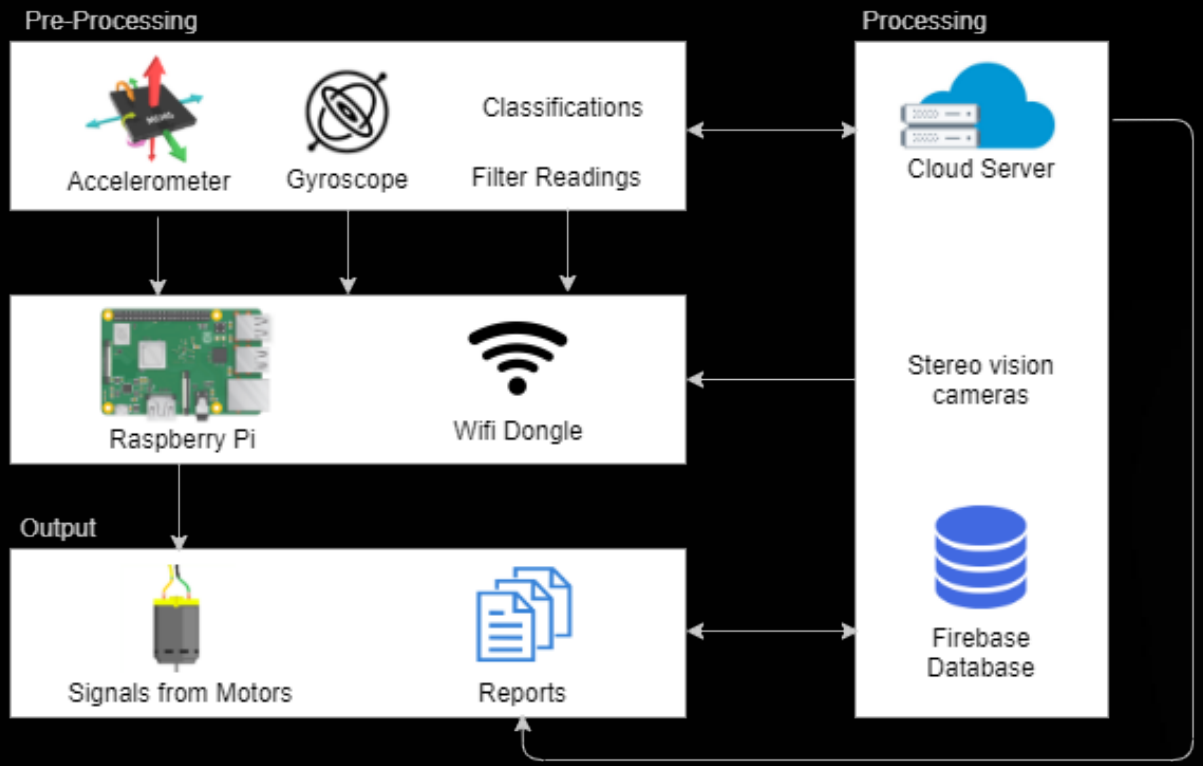
1) Make driver more relaxed in traffic jam.
2) Create automated vehicle whose destination is dynamic.

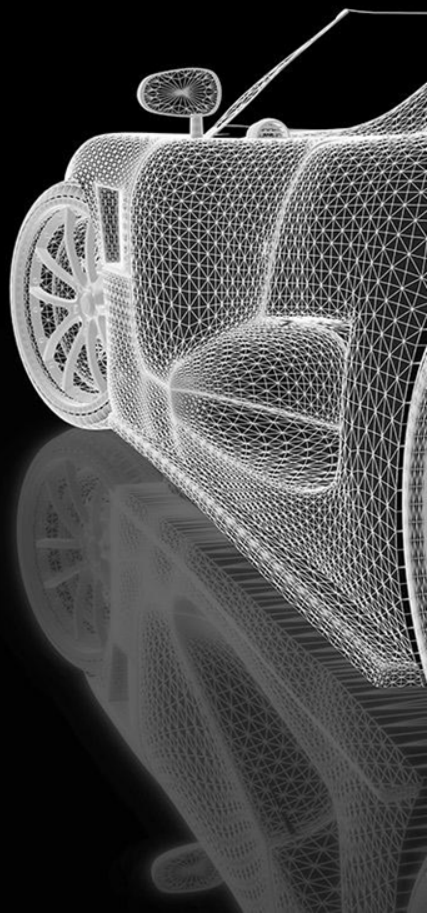




Memon, Qudsia & Ahmed, Muzamil & Ali, Shahzeb & Rafique, Azam & Shah, Wajiha. (2016). Self-driving and driver relaxing vehicle. 10.1109/ICRAI.2016.7791248.

System Overview





Methodology(1 / 3)

Machine learning method (SVM)

Accuracy 95.36% - 98.61%

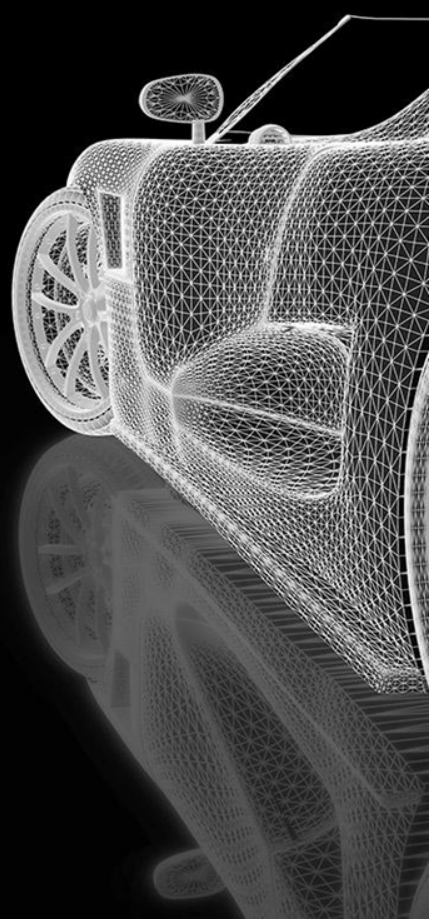


Table1: Anomalies detection accuracy with different algorithms on our dataset

Classification algorithm	NaiveBayes	SVM	KNN	Decision Tree
Accuracy	95.8%	98.6%	96.5%	97.9%

Table2: Anomalies detection accuracy with different algorithms on a real dataset

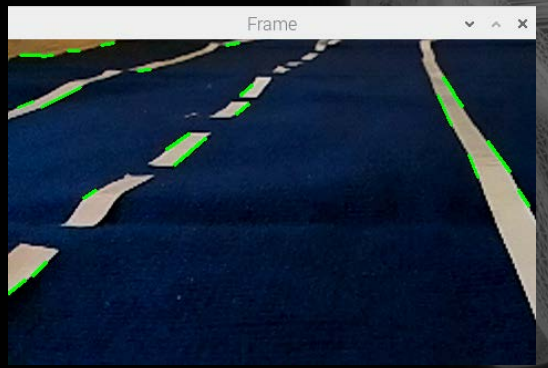
Classification algorithm	NaiveBayes	SVM	KNN	Decision Tree
Accuracy	55.0%	72.1%	66.7%	68.1%

Methodology(2 / 3)

Blurry → Gray → Edge detection → Hough Transform

Advantages:

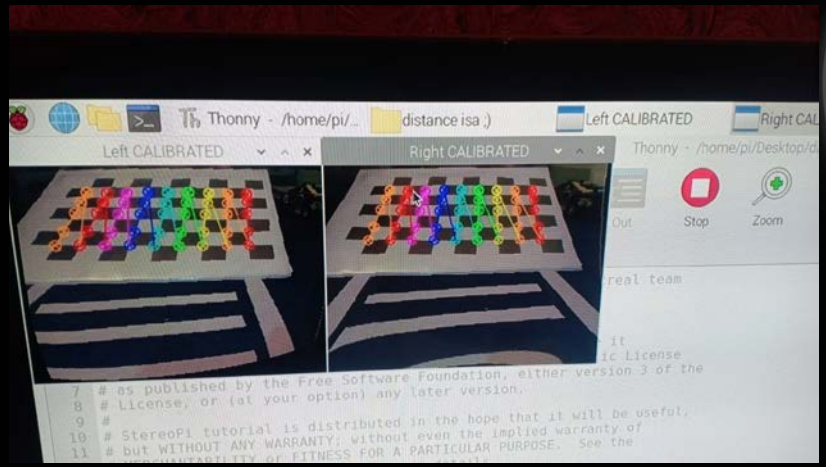
- It gets high accuracy.
- It is faster in video frames recognition.
- It detects the right lane so that the car takes the right decision and send the signals to the Arduino.

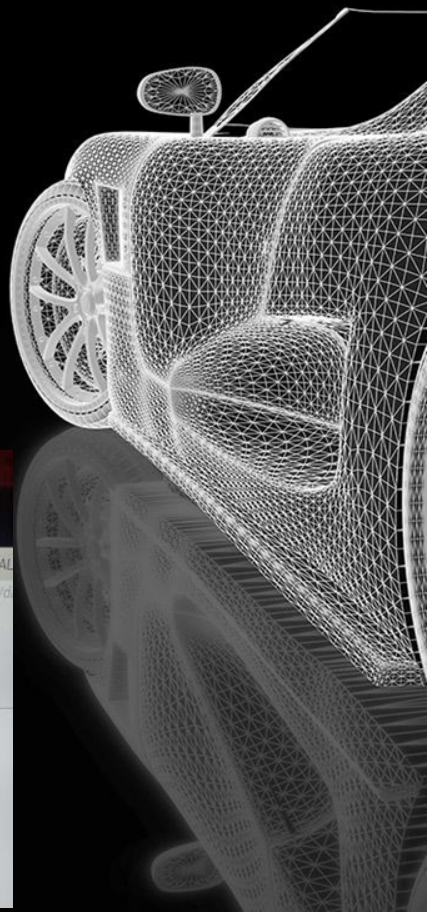


Methodology(3 / 3)

Disparity Pre-processing phase:

- ✔ Fix the cameras in a certain way.
- ✔ Collect dataset of chessboard for the calibration.
- ✔ Apply calibration.
- ✔ Apply tuning.

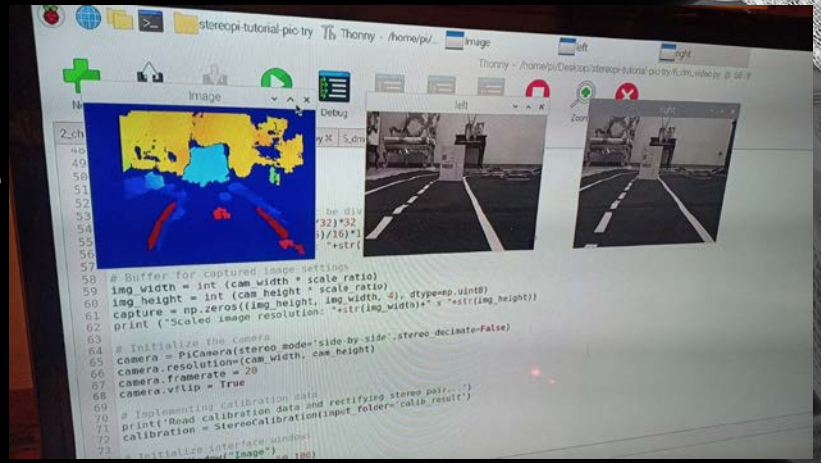




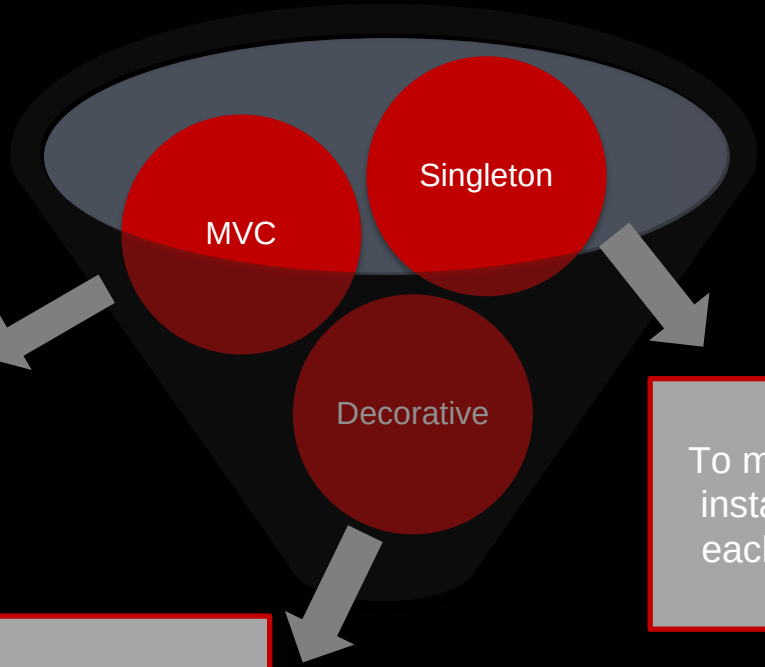
Methodology(3 / 3)

Disparity Processing phase:

- ✔ Show Disparity Map.
- ✔ Extract the histogram from the disparity map.
- ✔ Applying threshold.
- ✔ Take decision according to the
- ✔ density frequency repetition.



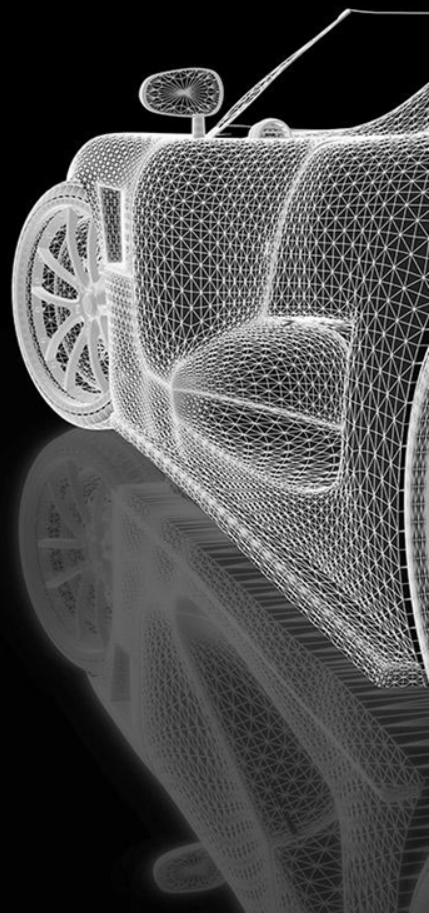
Design Patterns



Model
Viewer
Controller

To make one instance for each object

Provides the driver and the admin profile



Achievements

MobiSPC

Conference Title : [MobiSPC-Conf] 2020 Final CFPs: The 17th International Conference on Mobile Systems and Pervasive Computing Publication, Leuven, Belgium.

Year: **2020**

Title: Self-driving car using disparity map

Authors: Mahmoud Fathy, Nada Ashraf, Omar Ismail, Sara Fouad
Lobna Shaheen, Alaa Hamdy

Status: Accepted and waiting for publishing

NON SOLUS

ELSEVIER

DELL Technologies

Forwarded message

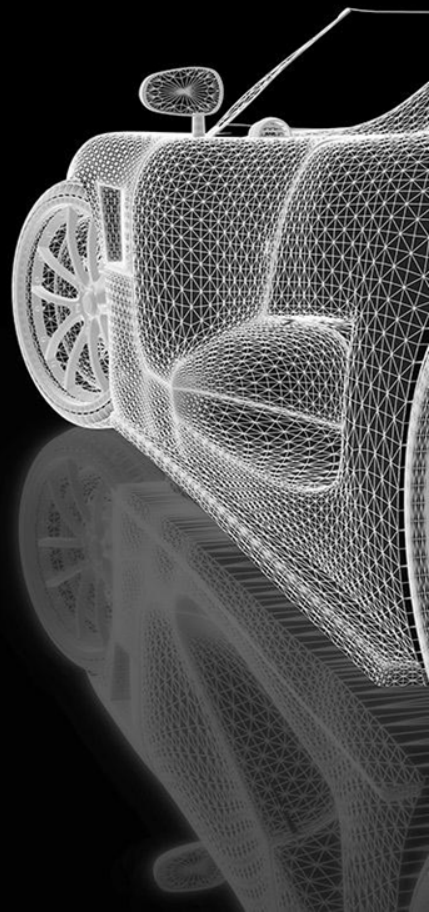
From: **EnvisiontheFuture**
<EnvisiontheFuture@emc.com>
Date: Fri, Jan 31, 2020 at 4:01 PM
Subject: Result of Dell Technologies Envision the Future – Graduation Project Competition
To:

Dell Customer Communication - Confidential

Dear Professor and Team Leader,

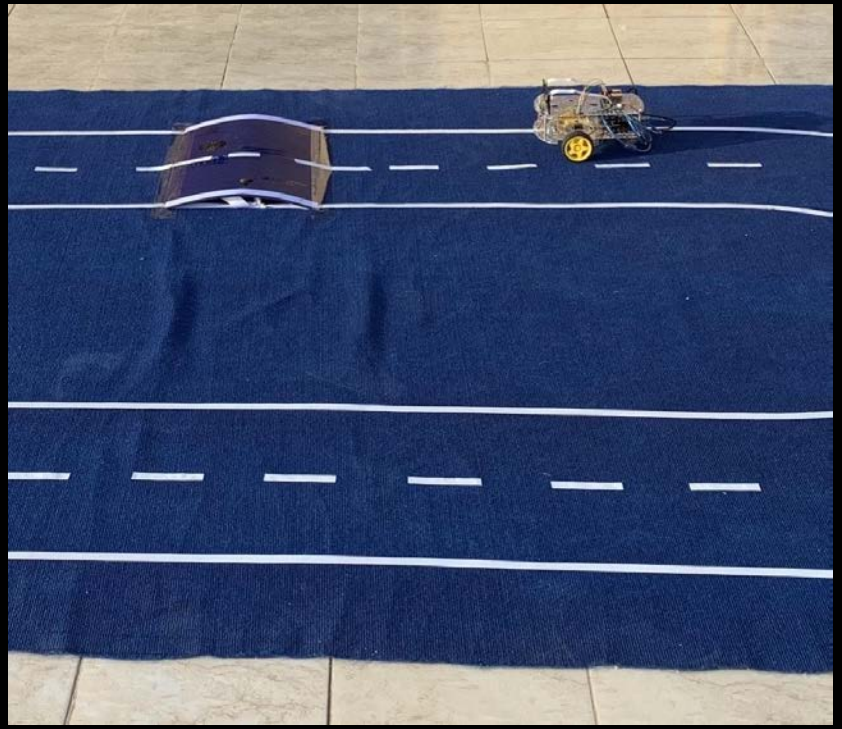
Congratulations! Your team's Graduation Project Abstract has been shortlisted for moving to the next phase of the Dell Technologies Envision the Future Competition. This decision is based on the blind evaluation of a panel of distinguished experts who have reviewed the 227 project abstracts that we have received from more than 100 universities, representing 14 countries among the region with total participation number of 1,019 students.

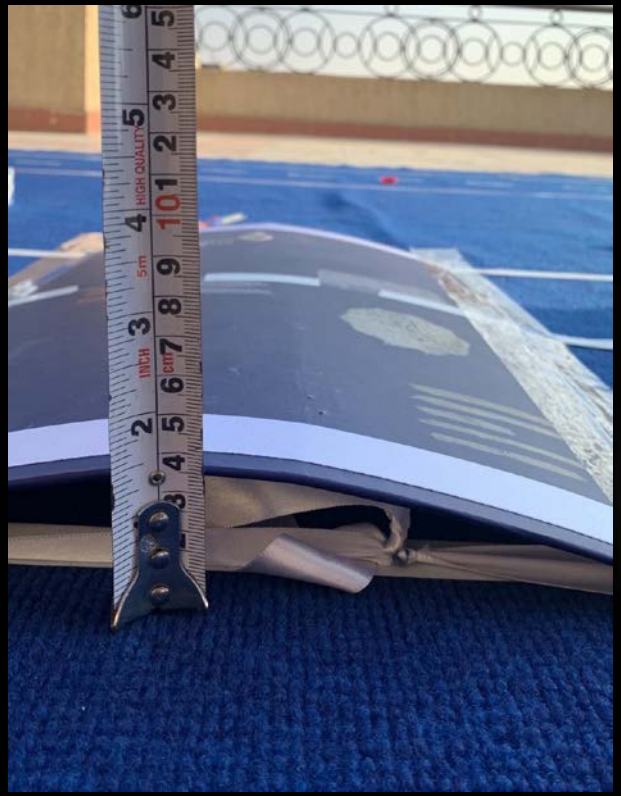
Your team is expected to develop and submit a Design report and a video by Thursday Sunday 1st of March.

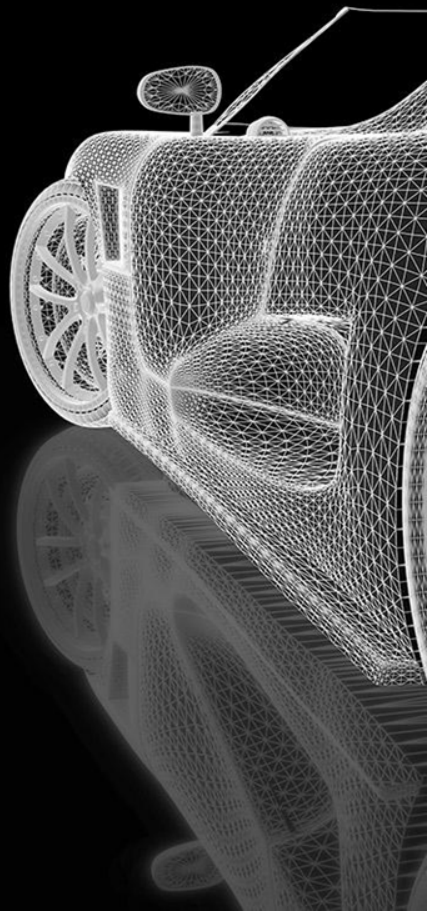


Car Environment

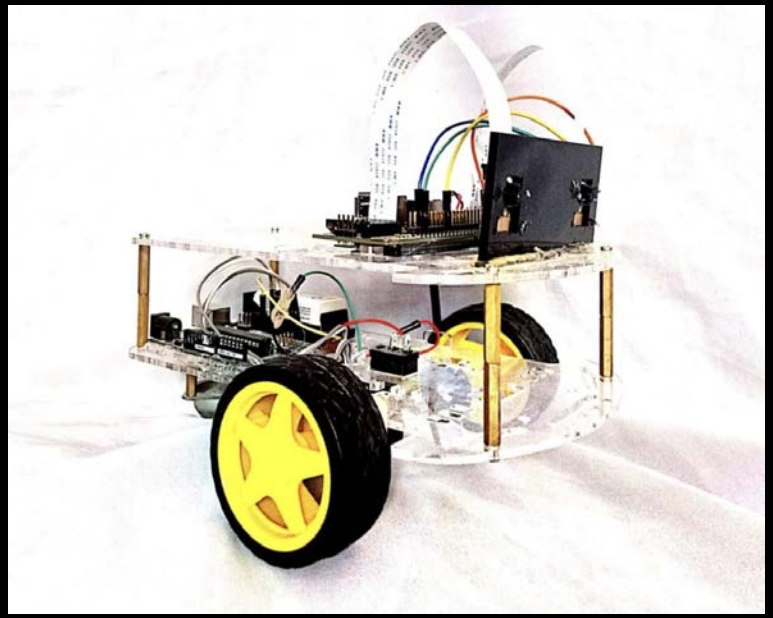
Car Environment

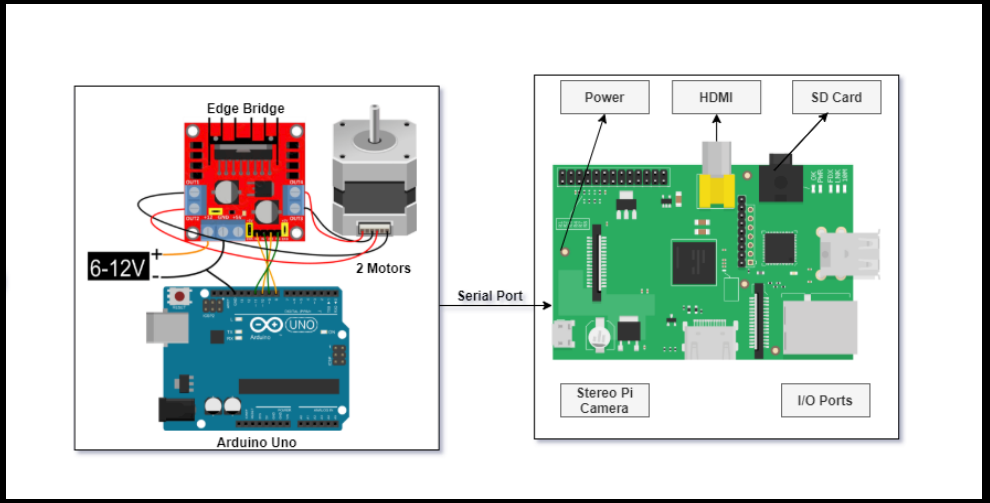






Car Hardware





Techniques and tools used

MySQL

Java

php

ARDUINO

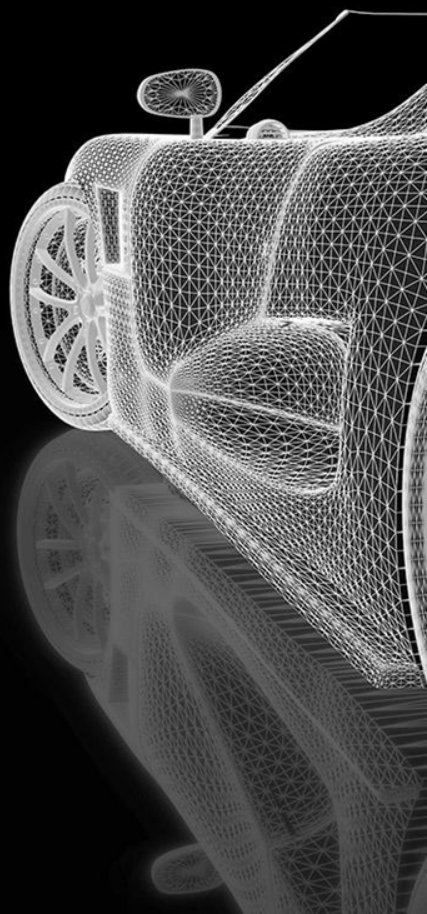
python

Plan for final project

- Add wifi dongle to transfer data from the car to mobile application.
- Run the project subsystems in parallel.

Future Work

- Apply the prototype on a real life-time car.
- Add GPS to save the location of the anomalies.
- Recognizing road signs and traffic lights



Demo

Distance Measurement

www.BANDICAM.com

File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help

MainActivity | Pixel API 27 | Git:

carapp > app > src > main > java > com > example > carapp > Model > UserModel

Android

- app
  - manifests
  - java
    - com.example.carapp
      - Controller
      - Database
      - Entites
      - Model
        - CarModel
        - ReportsModel
        - UserModel
        - UsertypeModel
      - View
        - AddDriver
        - AdminActivity
        - adminProfile
        - baseProfile
        - DriverActivity
        - DriverList
        - DriverListRecyclerViewA
        - driverProfile
        - MainActivity
        - ReportDetails

UserModel.java | Anomaly.java | AddDriver.java | DriverActivity.java | activity_driver_list.xml | admin_profile.xml

```
        this.context = context;
        this.requestApi = new RequestApi(context);
        this.usertypeModel = new UsertypeModel(context);
        this.carmodel  = new CarModel(context);
    }

    public void selectSingleUser(HashMap<String, String> con, final LoginCallBack

        requestApi.selectApi(new VolleyCallBack() {
            @Override
            public void onSuccess(String result) {
                try {
                    JSONObject obj = new JSONObject(result);
                    // error, message , array

                    if(obj.getBoolean( name: "error")){
                        loginCallBack.onFailer(obj.getString( name: "message"));
                    }
                    else{
                        JSONArray arr = obj.getJSONArray( name: "users"); // array
                        final JSONObject userObject = (JSONObject) arr.get(0);

                        final User user = new User();
                        user.setId(userObject.getInt( name: "ID"));
                        user.setFirstName(userObject.getString( name: "Firstname"));
```

UserModel › selectSingleUser() › new VolleyCallBack › onSuccess()

Build: Build Output | Sync

- Build: completed successfully at 5/20/2020 9:31 PM
  - Run build C:\Users\modyn\Desktop\carapp
    - Load build
    - Configure build
    - Calculate task graph
    - Run tasks

1 s 965 ms
1 s 904 ms

date Recommended
radle Plugin is ready to update.

Plugin Updates
droid Studio is ready to update.

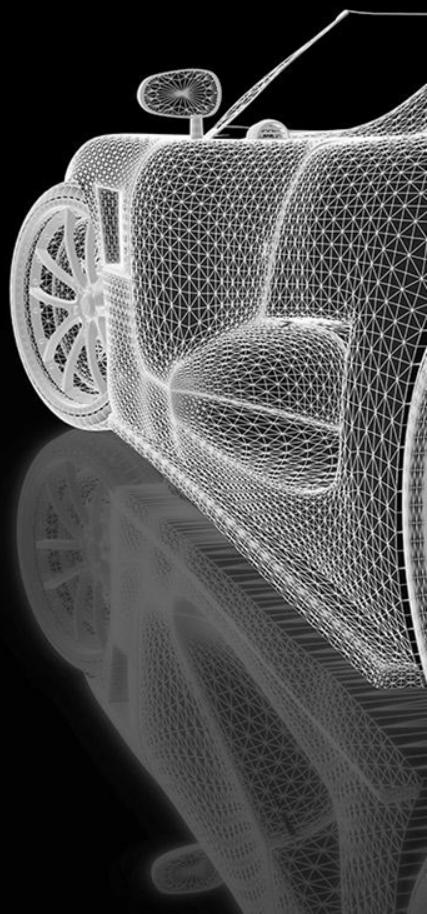
4: Run | 6: Logcat | TODO | Terminal | Profiler | 9: Version Control | Build | Event Log

Install successfully finished in 420 ms.: App restart successful without requiring a re-install. (a minute ago)

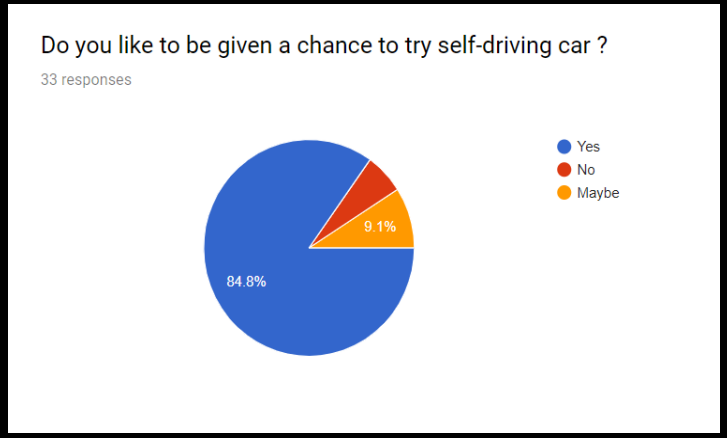
106:1 CRLF UTF-8 4 spaces Git: master

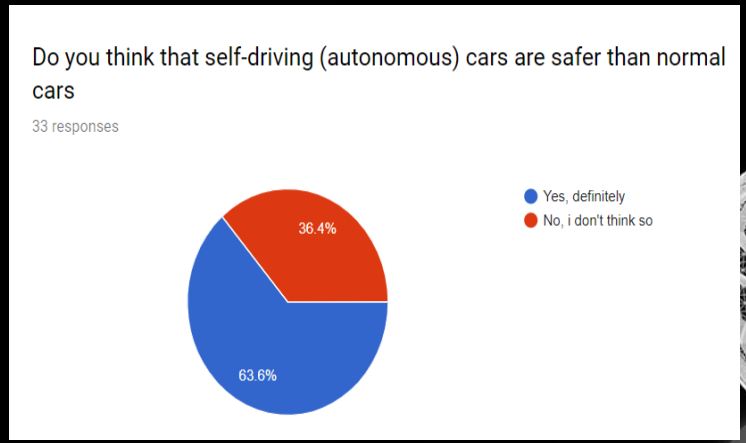
THANK YOU

Any Questions ?

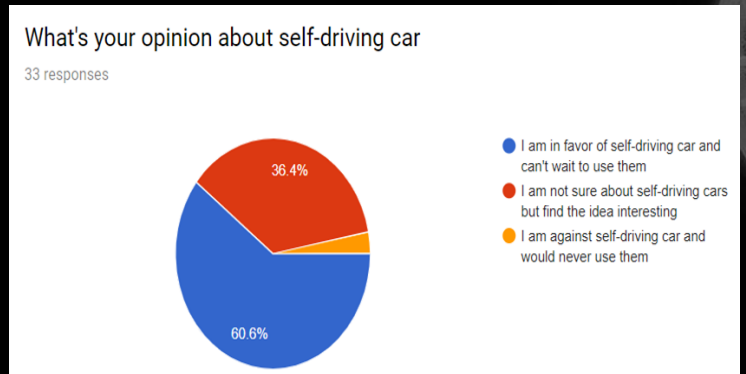
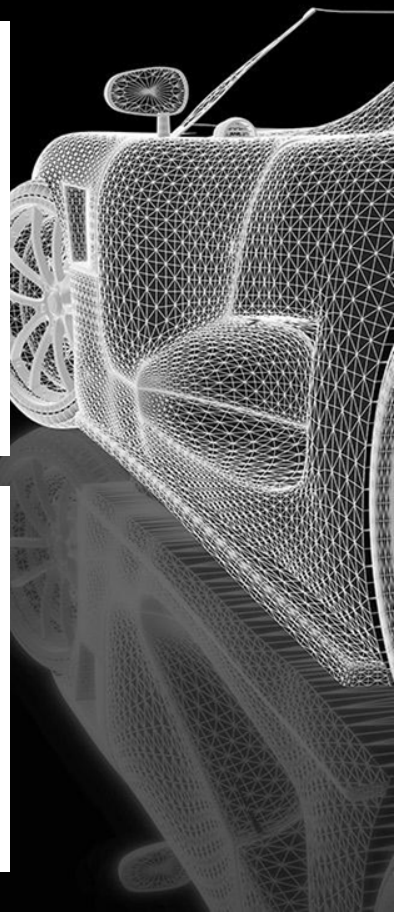


Motivation


Do you like to be given a chance to try self-driving car ?
33 responses
Yes
No
Maybe
9.1%
84.8%


Do you think that self-driving (autonomous) cars are safer than normal cars
33 responses
Yes, definitely
No, i don't think so
36.4%
63.6%

Would you like a sensor device in your car to alert before passing by a speed bump? هل ترغب بجهاز استشعار بالسيارة يقوم بتنبيهك قبل ان تمر على المطب الصناعي؟
60 responses
Yes
No
95%


What's your opinion about self-driving car
33 responses
I am in favor of self-driving car and can't wait to use them
I am not sure about self-driving cars but find the idea interesting
I am against self-driving car and would never use them
36.4%
60.6%