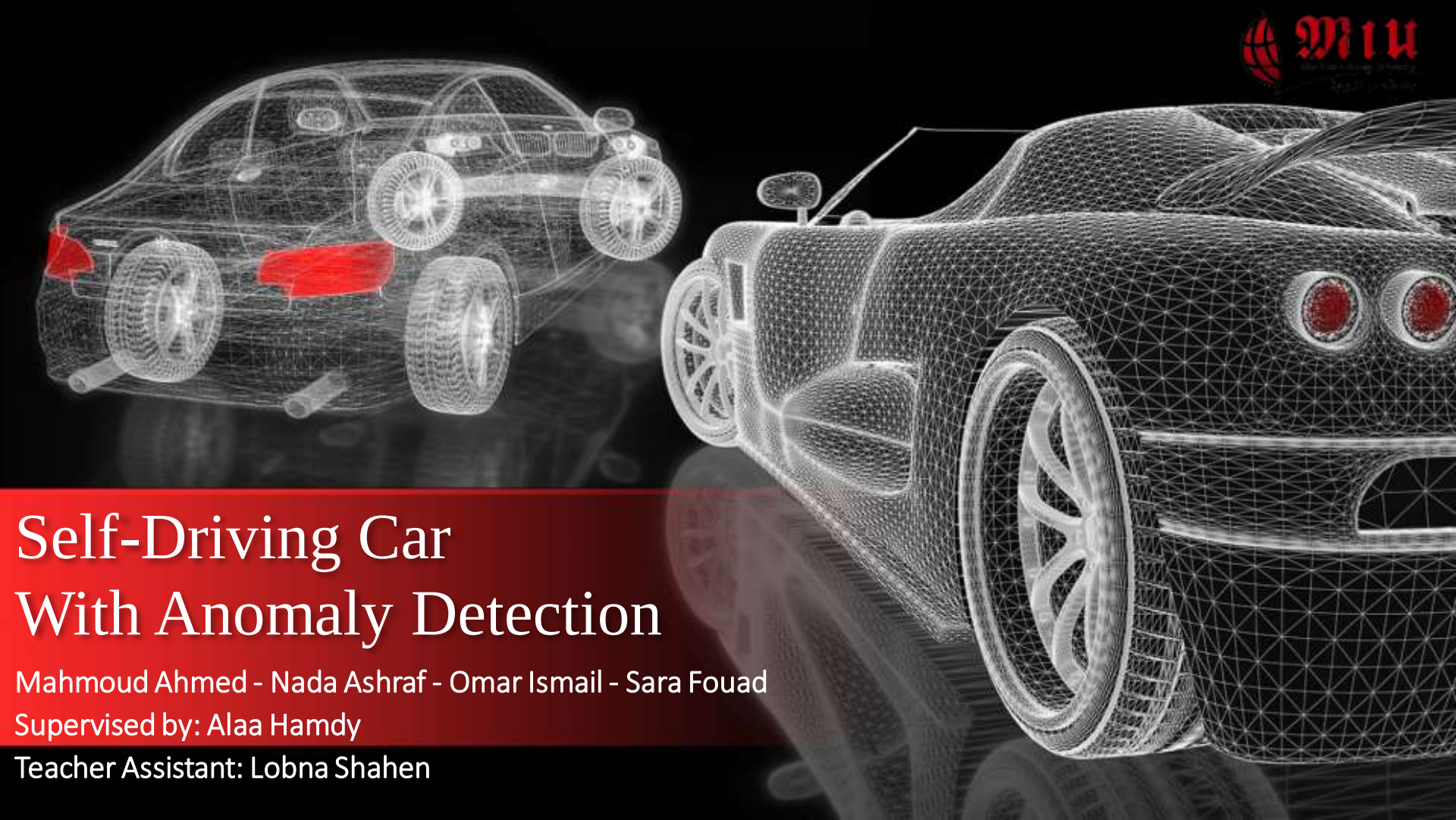
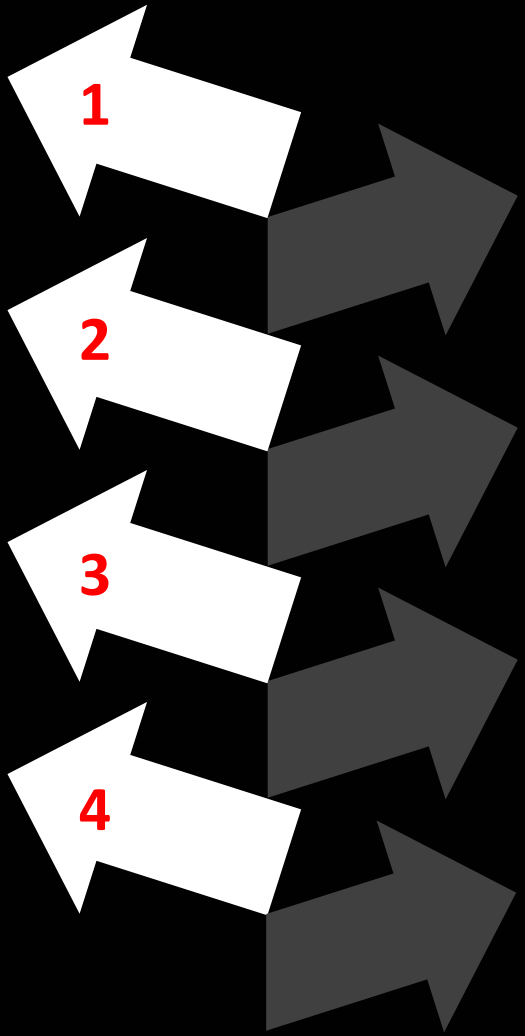


Self-Driving Car With Anomaly Detection

Mahmoud Ahmed - Nada Ashraf - Omar Ismail - Sara Fouad
Supervised by: Alaa Hamdy
Teacher Assistant: Lobna Shahen



Objectives

Block Diagram

Functional Requirements

Non-Functional Requirements

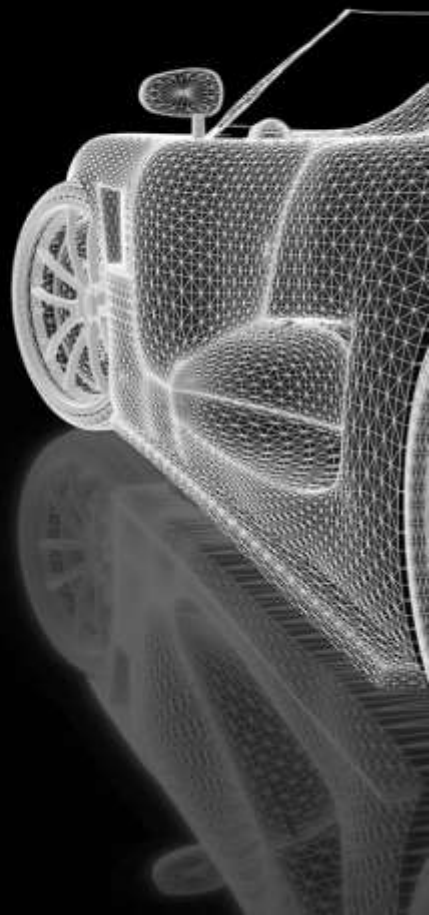
Wireframes

Use-case

Class Diagram

Related Work

Demo



Objective

Implementing Self-Driving Car

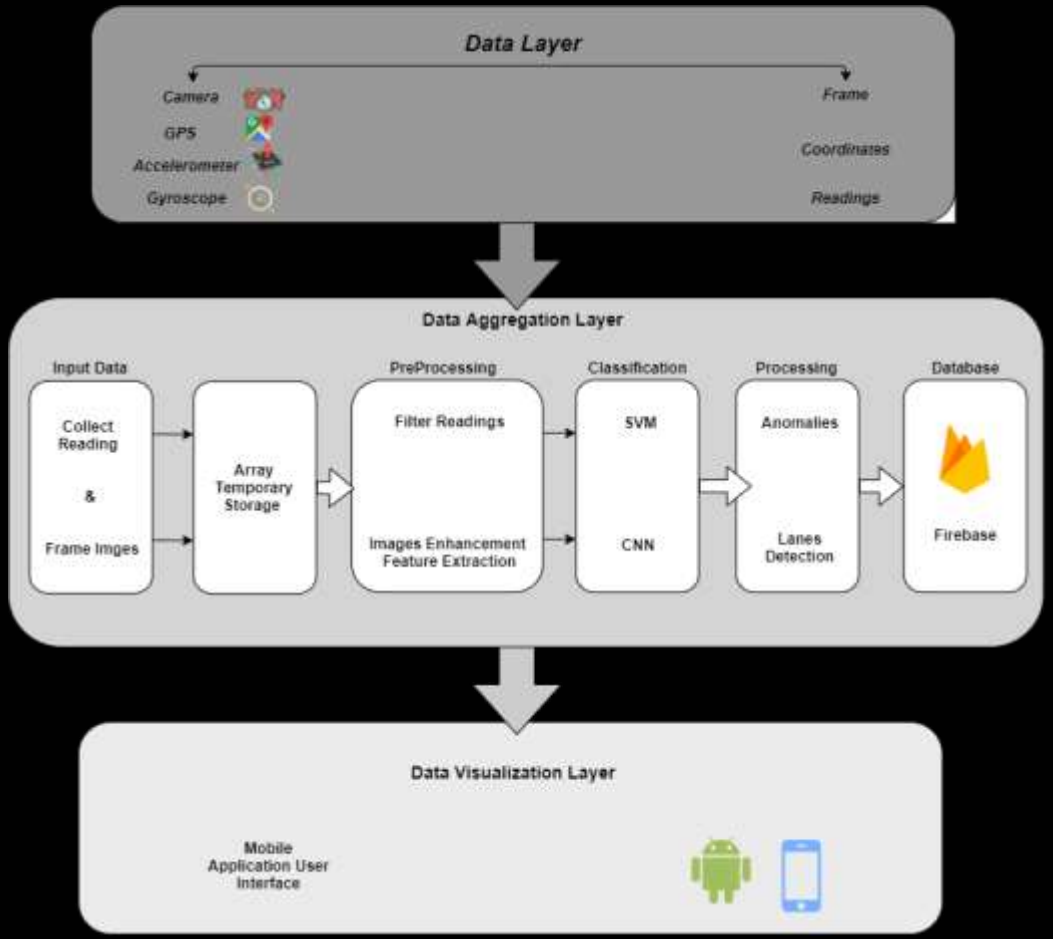
Measures distance between vehicles and obstacles using stereo vision

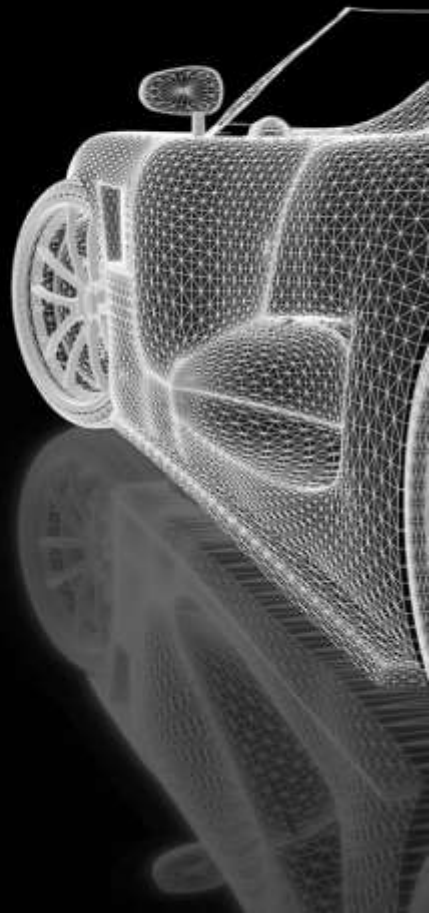
Take intelligent decision with the obstacles

Detect anomalies

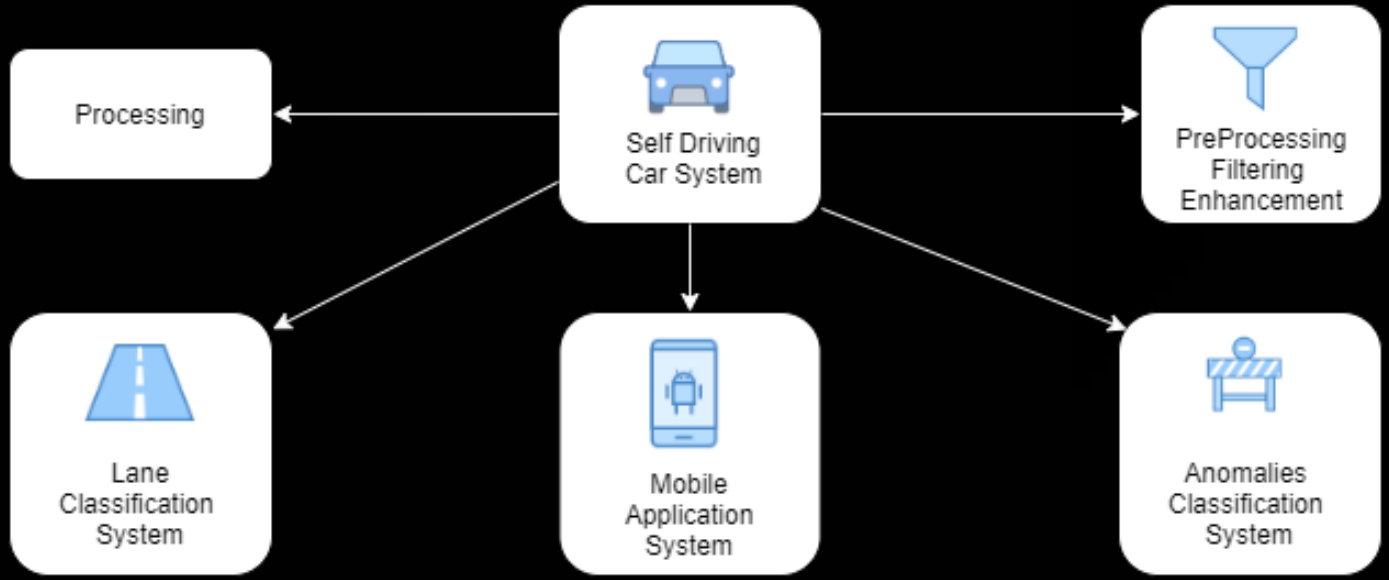
Alert the driver

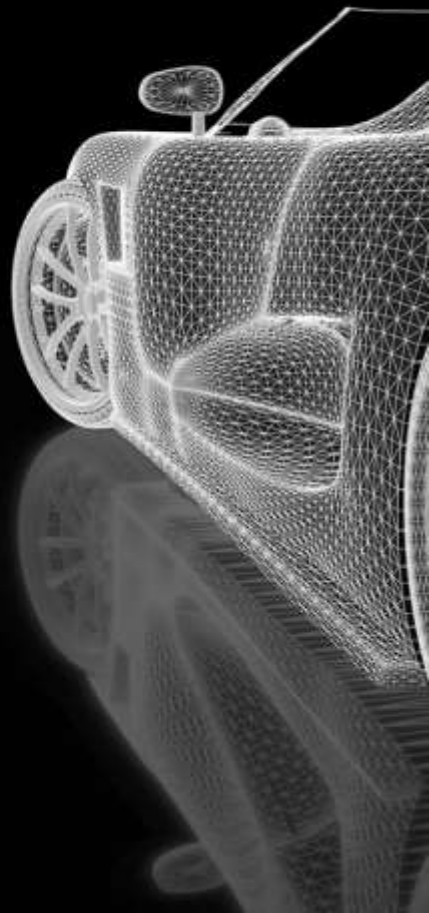
Block Diagram 1/2



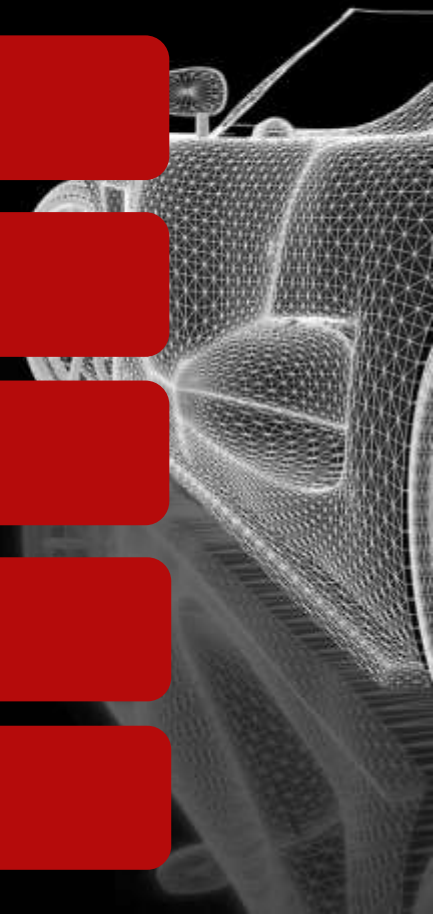


Block Diagram 2/2





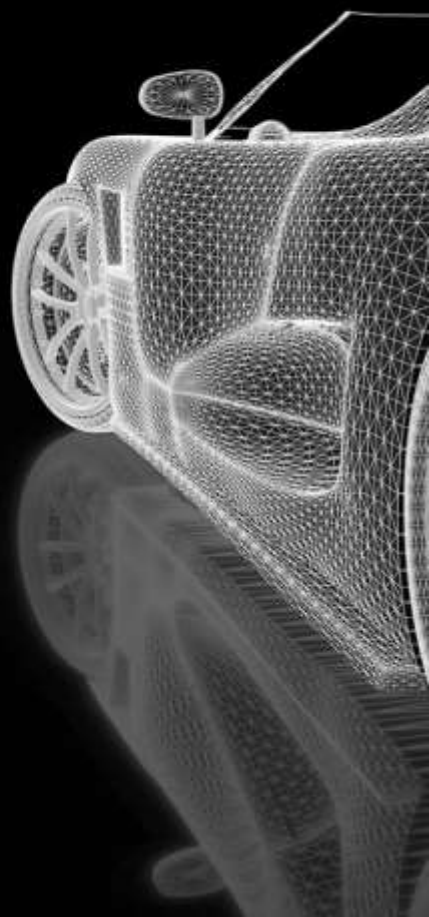
Functional Requirements 1/2



Self Driving Car	• Measure Front Distance Function • Slow Down Function • Stop Function
Android Application	• Start Self Driving Mode Function • Retrieve Function • View Function
Road Anomalies	• Anomalies Classification Function • Road Lane Classification Function
Decision	• Change Lane To Left Function • Change Lane To Right Function • Move Car Forward Function
Save Location	• Upload Current Location Coordinates Function • Road Lane Image Enhancement Function • Filter Sensors Reading Function

Functional Requirements 2/2

Title	Anomalies Classification Function
Description	A function that classify and detect road anomalies
Type	Functional Requirement
Input	Array Of Filtered Readings
Action	Using SVM, the classifier return a result from the data set templets then the function will return this result.
Output	Detects road anomalies that the car will behave and take a decision based on them
Precondition	Filter all sensor readings (FilterSensorsData) and store the filtered reading in a temporary array.
Post Condition	Upload the detected anomalies position on Firebase
Dependencies	StartSelfDriving, FilterSensorsData



Non-Functional Requirements 1/1

Safety

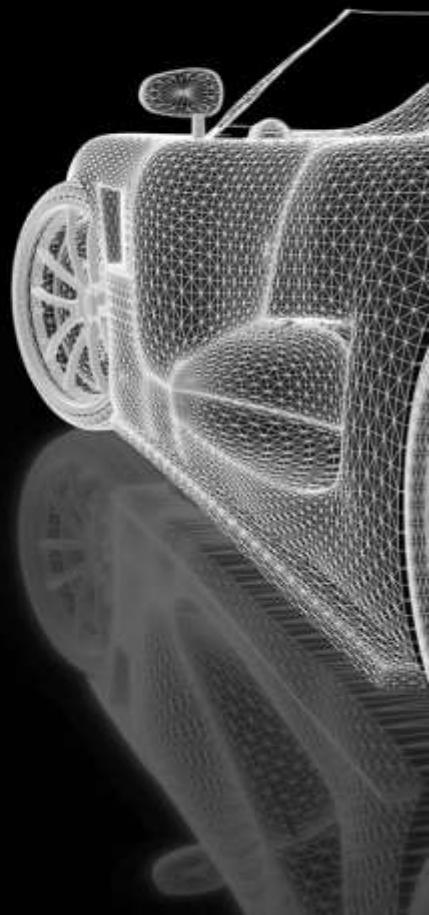
Safe Driving

Performance

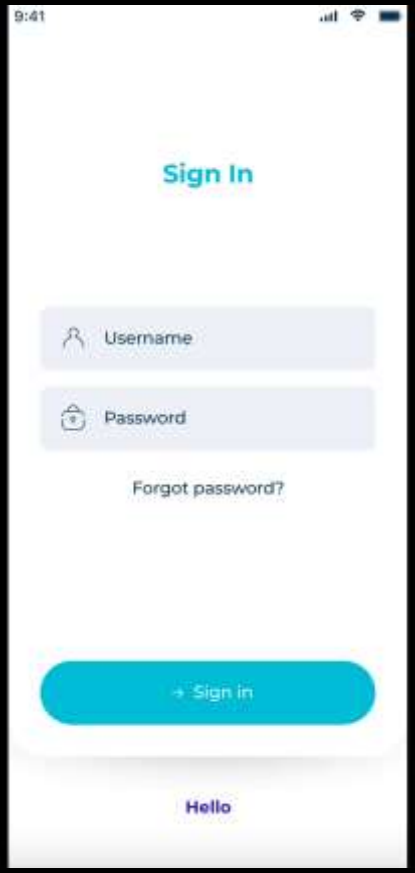
Fast, no delays and Real Time

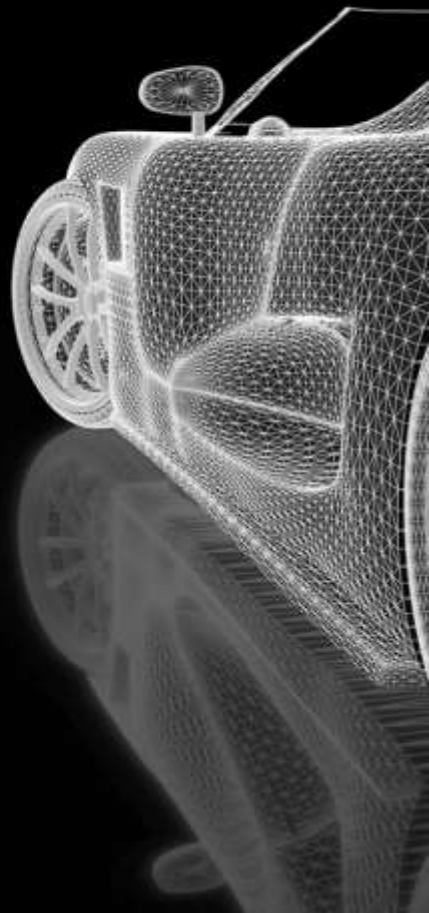
Reliability

High accuracy

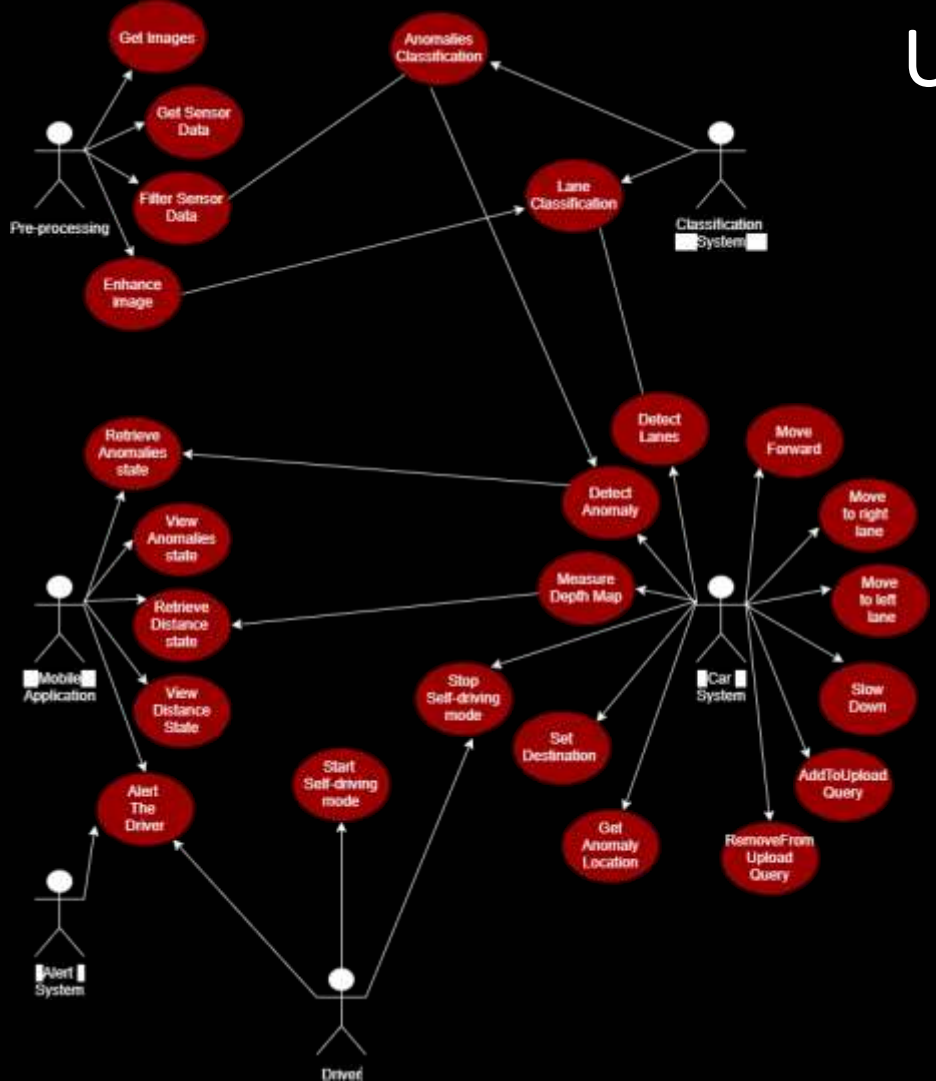


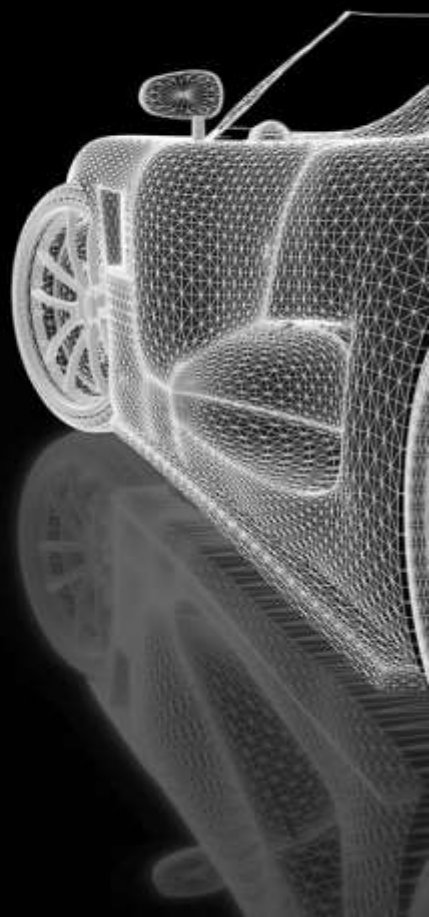
Wireframes

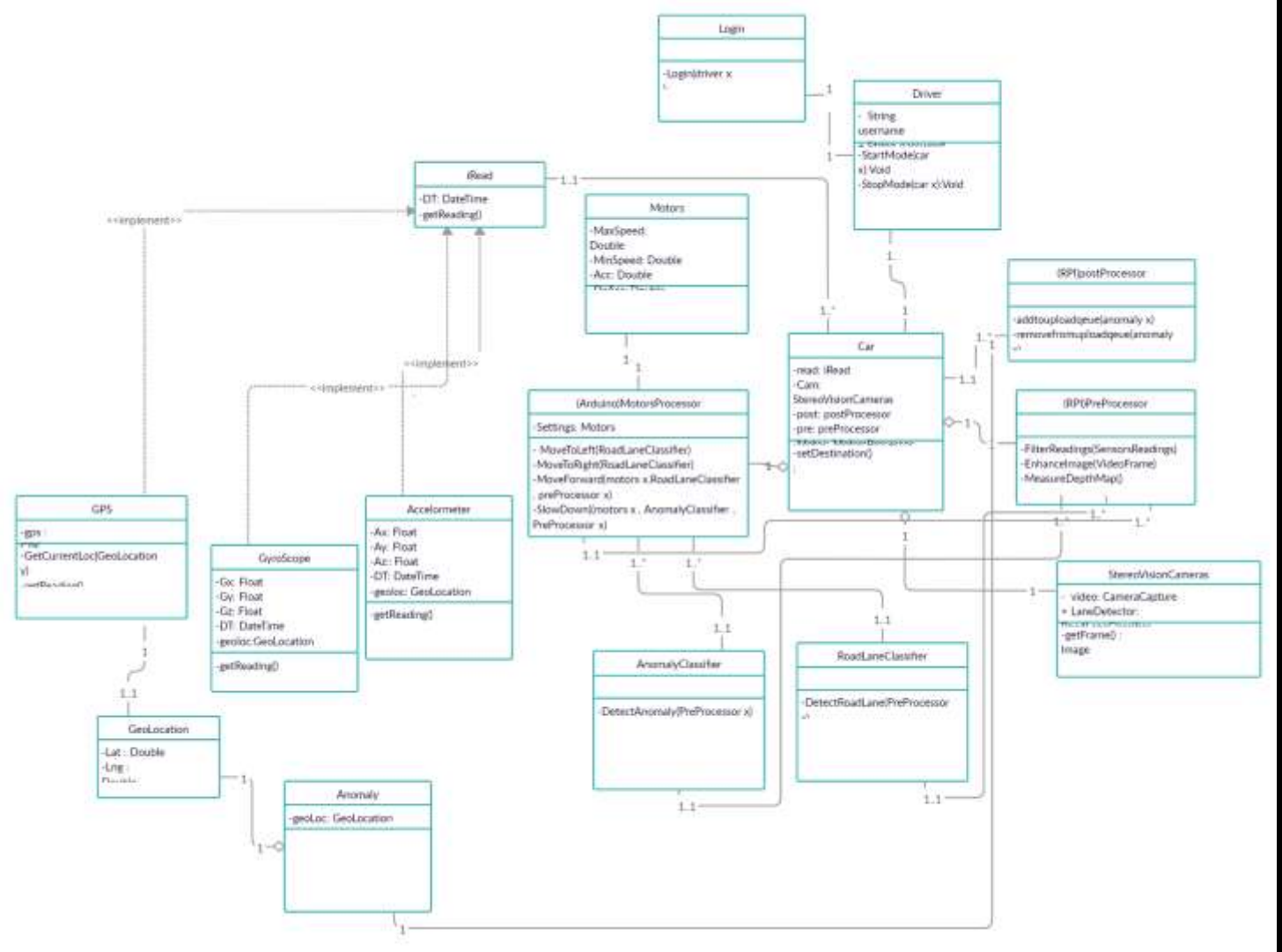

9:41
Sign In
Username
Password
Forgot password?
Sign in
Hello



Use-case

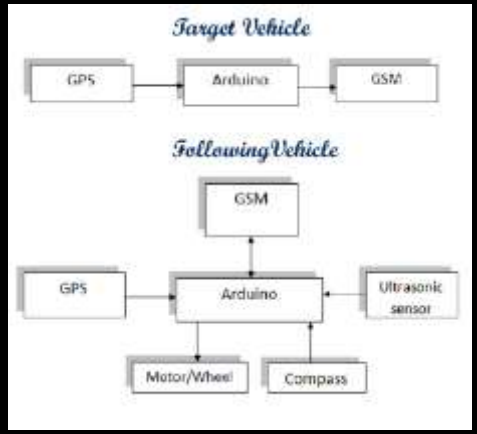

Get Images
Anomalies Classification
Get Sensor Data
Filter Sensor Data
Pre-processing
Lane Classification
Classification System
Enhance image
Retrieve Anomalies state
Detect Lanes
Move Forward
Detect Anomaly
Move to right lane
View Anomalies state
Measure Depth Map
Move to left lane
Retrieve Distance state
Mobile Application
Car System
Stop Self-driving mode
Slow Down
View Distance State
Set Destination
AddToUpload Query
Start Self-driving mode
Alert The Driver
Get Anomaly Location
RemoveFrom Upload Query
Alert System
Driver

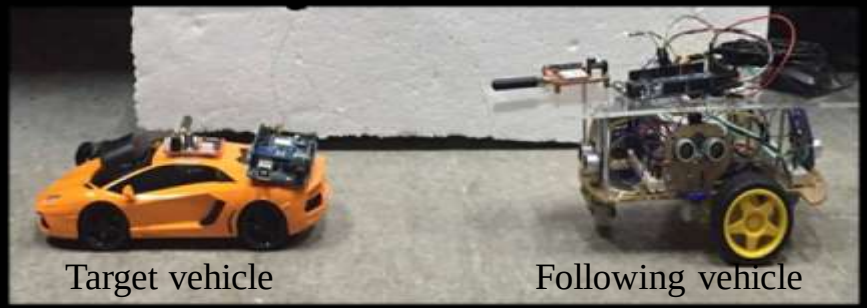



Login
-Login(driver x
Driver
String
username
-StartModelcar
x) Void
-StopModel(car x):Void
IRead
-DT: DateTime
-getReading()
Motors
-MaxSpeed:
Double
-MinSpeed: Double
-Acc: Double
<<implement>>
<<implement>>
<<implement>>
IRP(postProcessor
-addtouploadqeue(anomaly x)
-removefromuploadqeue(anomaly
Car
-read: IRead
-Cam:
StereoVisionCameras
-post: postProcessor
-pre: preProcessor
-setDestination()
IRP(PreProcessor
-FilterReadings(SensorsReadings)
-EnhanceImage(VideoFrame)
-MeasureDepthMap()
IArduino(MotorsProcessor
Settings: Motors
- MoveToLeft(RoadLaneClassifier)
-MoveToRight(RoadLaneClassifier)
-MoveForward(motors x,RoadLaneClassifier
preProcessor x)
-SlowDown()(motors x , AnomalyClassifier ,
PreProcessor x)
GPS
-gps :
-GetCurrentLoc(GeoLocation
x)
Accelerometer
-Ax: Float
-Ay: Float
-Az: Float
-DT: DateTime
-geoloc: GeoLocation
getReading()
GyroScope
-Gx: Float
-Gy: Float
-Gz: Float
-DT: DateTime
-geoloc:GeoLocation
-getReading()
StereoVisionCameras
video: CameraCapture
+ LaneDetector:
-getFrame() :
Image
AnomalyClassifier
-DetectAnomaly(PreProcessor x)
RoadLaneClassifier
-DetectRoadLane(PreProcessor
GeoLocation
-Lat : Double
-Lng :
Anomaly
-geoLoc: GeoLocation

Related work

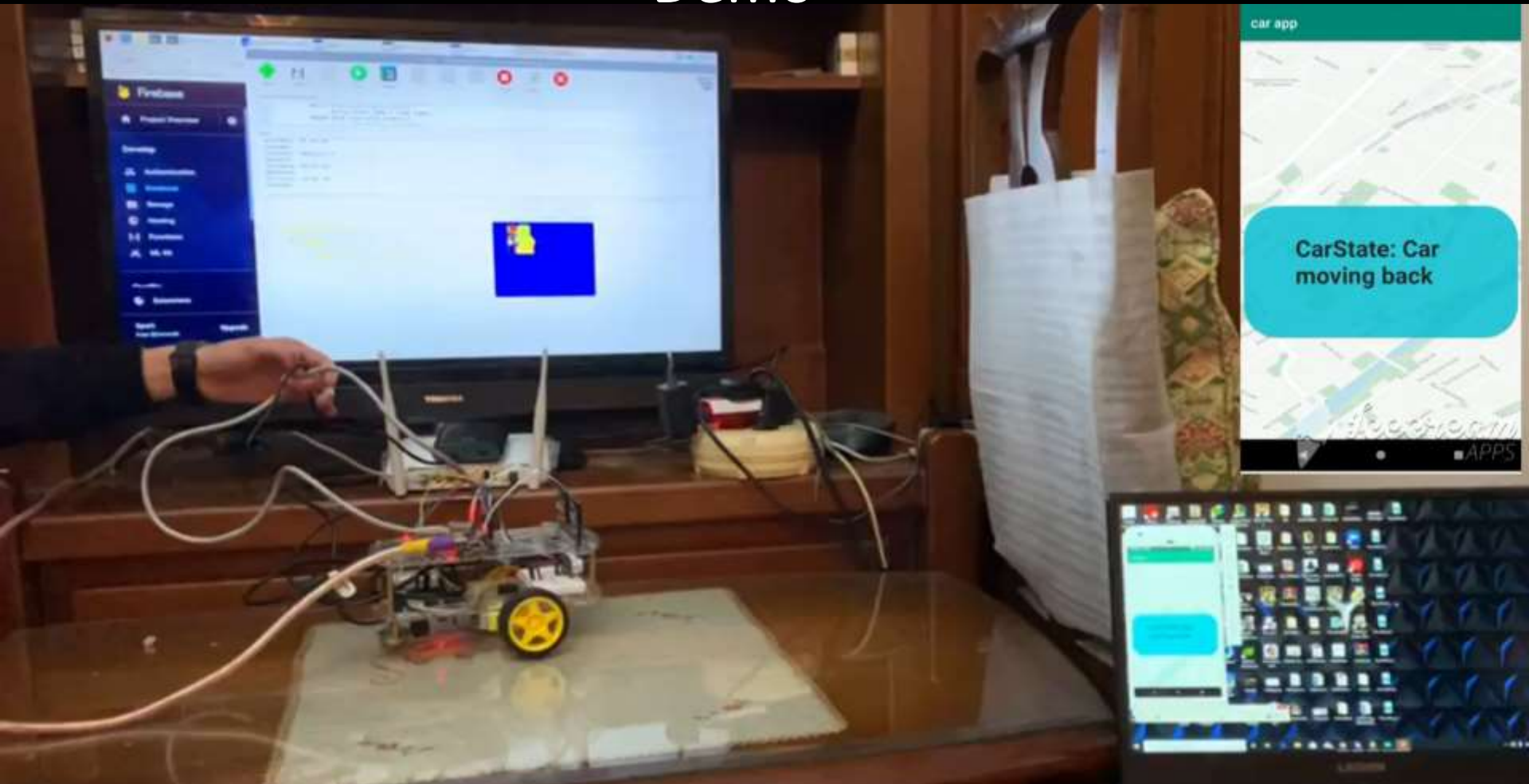
- Sensors used (GPS, GSM, US, Compass).
- Modified the concept of google car.
- Aims of this system
  1) Make driver more relaxed in traffic jam.
  2) Create automated vehicle whose destination is dynamic.





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

Demo



THANK YOU FOR LISTENING

Any Questions ?