SELF-DRIVING CAR CHALLENGE 2021

ABOUT THIS EVENT

The Self driving car challenge is a national level event in the area of Autonomous vehicle which was conducted by SAEISS. The competition have three phases which consists of 13 different projects in Phase I, II and hardware integration in Phase III . Students from Automobile Engineering department from Dr. Mahalingam College of Engineering and Technology took part in this event and successfully completed the phase I event which is held at SRM university Chennai during 10th June to 12th June, Team MERU from MCET secured third place in National level with a cash award of INR 50, 000, in SAEINDIA SELF DRIVING CAR CHALLENGE 2021.

OBJECTIVE OF THIS PROJECT.

- Detect highway lane lines on a video stream.
- Use OpenCV image analysis techniques to identify lines, including Hough Transforms and Canny edge detection.
- Build and train a deep neural network to classify traffic signs, using TensorFlow.
- Experiment with different network architectures.
- Perform image pre-processing and validation to guard against overfitting.
- Build and train a convolutional neural network for end-to-end driving in a simulator, using TensorFlow and Keras.
- Build an advanced lane-finding algorithm using distortion correction, image rectification, color transforms, and gradient

thresholding.

- Identify lane curvature and vehicle displacement.
- Overcome environmental challenges such as shadows and pavement changes.
- Create a vehicle detection and tracking pipeline with OpenCV, histogram of oriented gradients (HOG), and support vector machines (SVM).

Challenge Elements (Projects)

The following 13 Steps & Projects have to be completed for Self-Driving Car Challenge.

Project Id	Project Name
1	Lane Finding Basic
2	Traffic Sign Classifier
3	Behavioral Cloning
4	Advanced Lane Finding
5	Vehicle Detection
6	Extended Kalman Filter
7	Unscented Kalman Filter
8	Kidnapped Vehicle
9	PID Control
10	MPC Control
11	Path Planning
12	Road Segmentation
13	Traffic Light Classifier

COMPLETED PROJECTS.

This challenge consists of 6 Projects and we have successfully completed all the projects.

Project Id	Project Name
1	Lane Finding Basic
2	Traffic Sign Classifier
3	Behavioral Cloning
4	Advanced Lane Finding
5	Vehicle Detection
6	Extended Kalman Filter

1. **Lane Finding Basic:** The goal of this first project was to create a simple pipeline to detect road lines in a frame taken from a roof-mounted camera.

2. **Traffic Sign Classifier:** The goal of this project was to bui ld a CNN in TensorFlow to classify traffic sign images from the Traffic Sign Dataset.

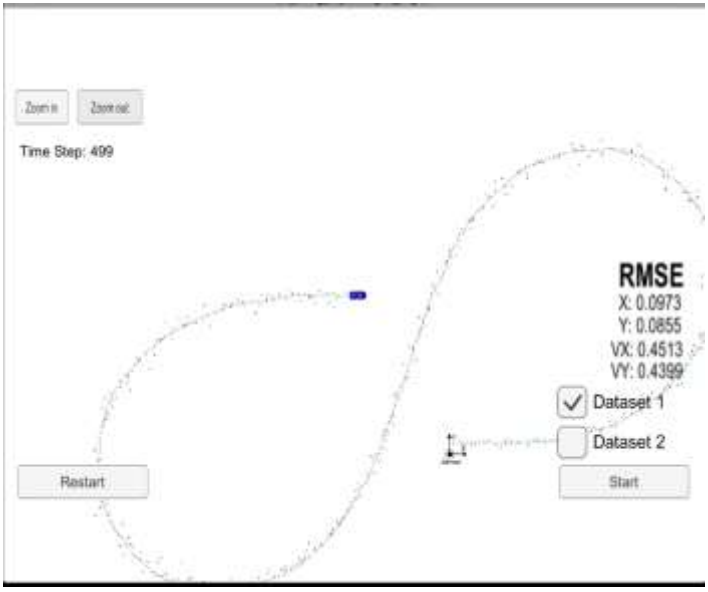
3. **Behavioral Cloning:** The goal of the project was to train a Deep Network to replicate the human steering behavior while driving, thus being able to drive autonomously on a simulator provided by SAEISS. To this purpose, the network takes as input the frame of the frontal camera (say, a roof-mounted camera) and predicts the steering direction at each instant.

4 **Advanced Lane Finding:** The goals / steps of this project are the following:

a. Compute the camera calibration matrix and distortion coefficients given a set of chessboard images.
b. Apply a distortion correction to raw images.
c. Use color transforms, gradients, etc., to create a thresholded binary image.
d. Apply a perspective transform to rectify binary image ("birds-eye view").
e. Detect lane pixels and fit to find the lane boundary. Determine the curvature of the lane and vehicle position with respect to center.
f. Warp the detected lane boundaries back onto the original image.
g. Output visual display of the lane boundaries and numerical estimation of lane curvature and vehicle position.

5. **Vehicle Detection:** The goal of the project was to develop a pipeline to reliably detect cars given a video from a roof-mounted c

6. Extended Kalman Filter: This goal is to implement the extended Kalman filter in C++. We are providing simulated lidar and radar measurements detecting a bicycle that travels around your vehicle. You will use a Kalman filter, lidar measurements and radar measurements to track the bicycle's position and velocity



AWARDS RECEIVED

Secured Third place with a Cash award of INR 50,000

SNAPSHOTS OF MCET TEAM in Final Event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SAEINDIA


AUTOMOBILE ENGINEERING

TEAM 1: TEAM-MERU – WINNERS WITH CASH PRIZE OF Rs. 50000

CAPTAIN: SUSHRUTHAN U (18BAU015)

S.NO	NAME	ROLL NO	Year of Study	Department
1	SUSHRUTHAN U	18BAU015	Final year	Automobile Engineering
2	GURU PRASATH N	19BAU338	Final year	
3	DHINESH KUMAR S	18BAU033	Final year	
4	JEFFRY RUFUS R	19BAU036	Third year	
5	SANJITH KARTHI R	19BAU056		
6	YESHWANTH N	19BAU028		
7	THULASIRAM R	19BAU053		
8	VARUNVISVANATH P S	20BAU316		
9	NALLASENATHIPATHI K	20BAU301		
10	SRIDARAN T	20BAU304		

TEAM 2: The Electro Phenix

CAPTAIN: HARISH G (18BAU056)

S.NO	NAME	ROLL NO	Year of study	Department
1	HARISH G	18BAU056	Final year	Automobile Engineering
2	MUTHU KUMAR G	19BAU003	Third year	
3	AJAY S	19BAU027		
4	SANJAY R	19BAU021		
5	VISHNU AADITHYAN M	19BAU004		
6	KAMALESH S	20BAU312		
7	SABARINATH S	20BAU315		
8	RUBANESHWARAN A	20BAU338		
9	THANESHWAR A S	19BAU044		
10	SABARESAN K S	19BAU042		

TEAM 3: Electric Volant

CAPTAIN: T. PRABU (19BME302)

S.NO	NAME	ROLL NO	Year of Study	Department
1	T.PRABU	19BME302	Final Year	Mechanical Engineering
2	KISHOR K S	19BME084	Third Year	
3	VISHWANATHA S	19BME085		
5	S P DARSHAN	19BME009		
4	V M NISCHITH	19BEE083		Electrical and Electronics Engineering
6	KABILESH.S	19BMC008		Mechatronics Engineering
7	SHAJIN J	21BME329	Second Year	Mechanical Engineering
8	P VINOTH KUMAR	20BME030		
9	JAGADEESWARAN M	21BME314		
10	GOKUL N	21BEE310		Electrical and Electronics Engineering