Active AI Driver Assistant

RUTGERS
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Introduction

❑ This project mainly studies Artificial Intellegience for safe driver assistance. The AI will be providing information to the driver which carry out safety driving in roads and not exceed speed limits.

❑ AI-driven techniques will be used to continuously assess the effectiveness of our interventions and make adjustments to maximize driving safety and quality.

❑ Using python as the main programing language comes with various packages:
Numpy, Keras, OpenCV, Pandas
to support face and object recognition that is implemented on ROS & Gazebo simulation.

Methodology

The approach of creating an AI has been separated into three categories:

❑ Road Sign Detection

➔Road signs images are classified in specific ID and implemented to the program using convolutional neural networks

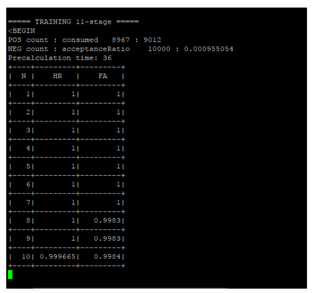
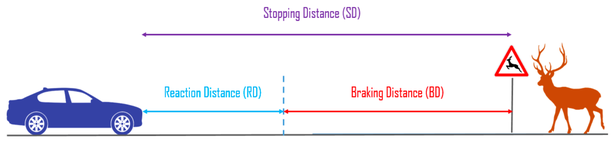


Figure 1. Overview of Road sign Detection



$$Stopping\ Distance = RD + BD$$

$$RD = v.tr$$

$$BD = \frac{v^2}{2\mu g}$$

v	Velocity (speed) of the vehicle in m/s
t_r	Reaction time in seconds (s)
μ	Friction coefficient
g	Gravity (9.81 m/s²)

❖ a derived formula was used to calculate the distance of an upcoming vehicle towards a road sign

❑ Face Emotion Detection

➔A program was then developed that can monitor emotion of the driver which can be used to advise and assist the drive on how they can improve their driving.

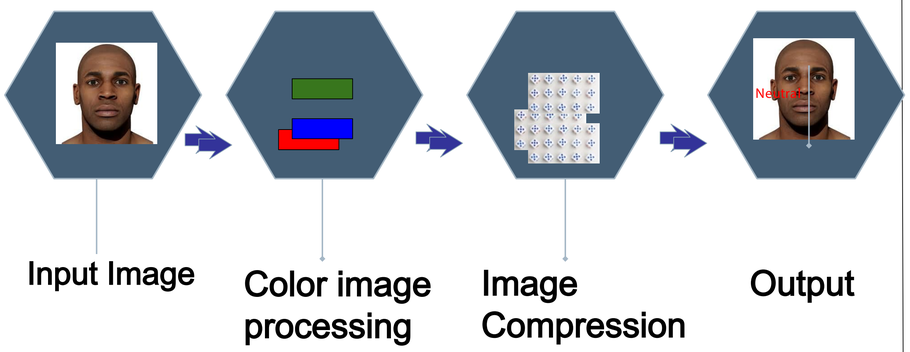


Figure 1. Overview of Face Detection

➔In conjunction with a camera directed towards the driver the program can detect anger, excitement, and tiredness, and using this information advise the driver so their mood does not lead to wreckless or dangerous driving.

❑ ROS & Gazebo Simulation

➔ROS & Gazebo simulation was tested and used for the AI and will be compared to real-life data analysis

➔By implementing the program of road sign and face detection, the gazebo simulation can portray data of the driver's point of view and face detection

Figure 2. Gazebo Simulation

Results

❑ The face emotion detection was run in multiple tests based on train data. The most high accuracy according to the test is neutral while the rest of the emotions are unstable due to the camera's low framerate per second.

❑ According to the results of the calculations of derived formula, the difference of the experimental and theory value is about less than 10% error.

❑ Given face detection, ROS, Gazebo, and the stop sign detection code we combine these systems to deliver a product that can read facial emotion to give the user an alert on stopping earlier or later from a stop sign.

Future Work

❑ Build an AI and learn machine learning
❑ Simulate cameras and accumulate programs in one source of data
❑ Run test in real situations

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