JAIN UNIVERSITY

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Autonomous Self Driving Vehicle using Machine Learning and Artificial Intelligence

ABSTRACT

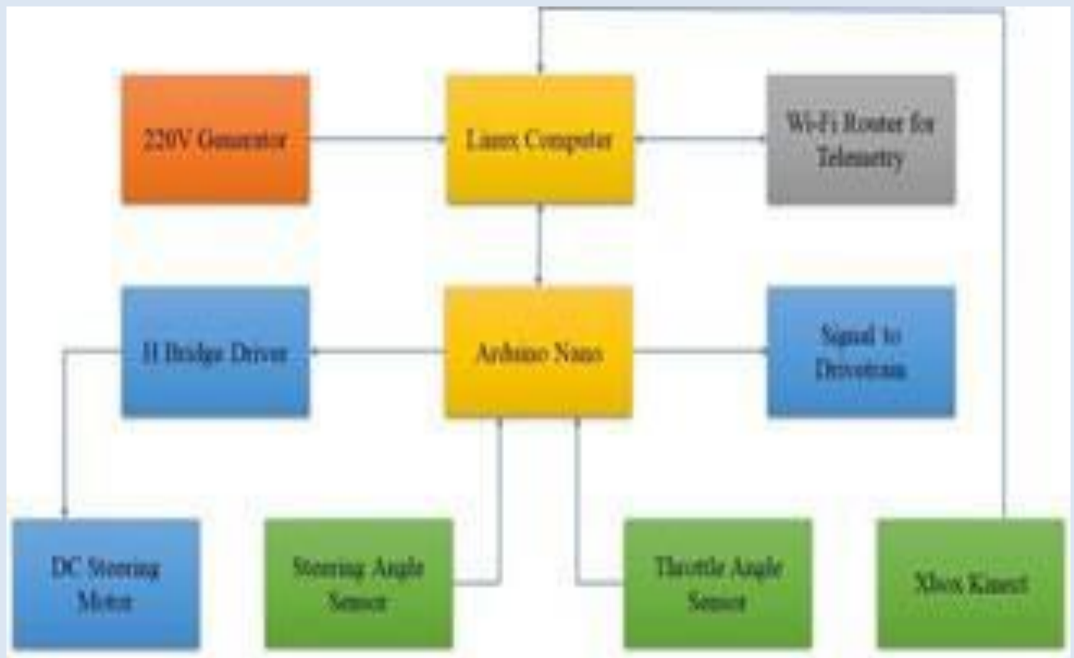
- **The goal of our project to build Fully Autonomous Self Driving Car is to implement autonomous driving ability to an electric kids All-Terrain Vehicle (ATV)**
- **The main parts of our implementation are detection model and control module.**
- **Nvidia's semantic segmentation model returns every 10th frame array with classes per pixel. Using this, road edges are extracted from the arrays and road center line is calculated.**
- **Xbox Kinect Depth Camera helps if objects have been detected a speed reduce command is initiated. Steering and speed commands are sent over the serial to Arduino as well and Arduino executes those commands.**

OBJECTIVES

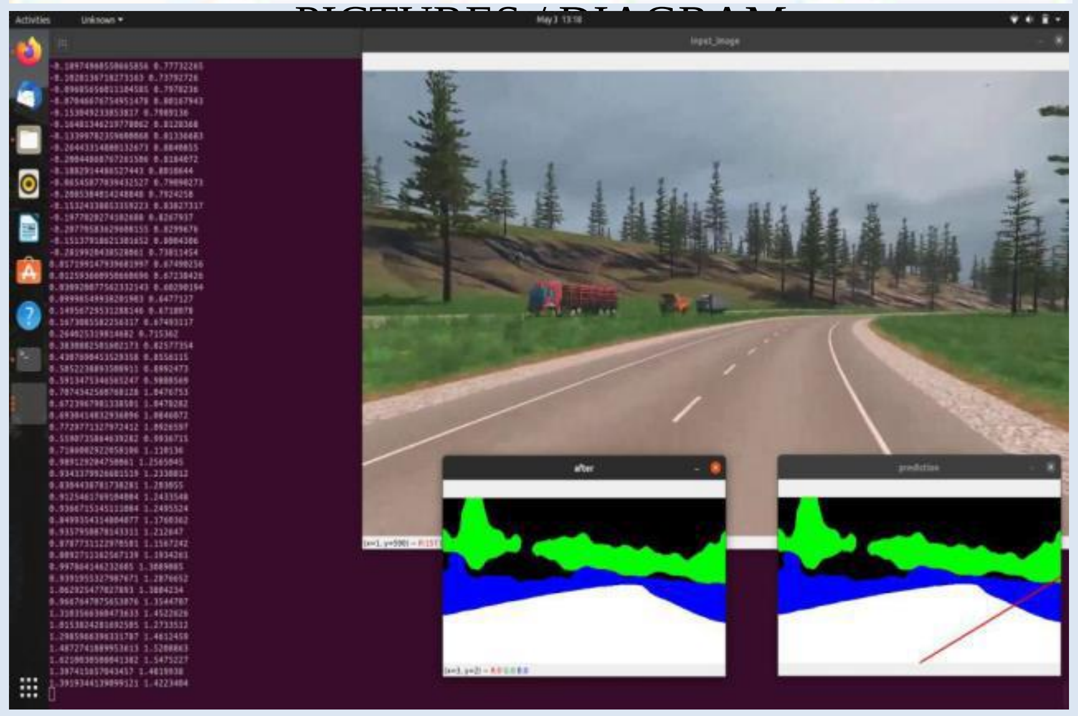
- **Our Goal: To build Fully Autonomous Self-Driving Vehicle at a cheaper price compared to the other ones out there.**
- **The reason for this approach to achieve self- driving is because driving is a complicated task in which we may need to support the machine in a much better manner than just formulas and sometimes human intuition is the only way to tackle such complications, hence we train the neural network with direct human experience dataset.**

METHODOLOGY

- **NVIDIA'S semantic-segmentation model returns every 10th frame an array with classes per pixel**
- **Road edges are extracted from the array with connected component filter Road center line is calculated from road edges with moving average filter**
- **Center of the frame is used as center of the vehicle to calculate Delta between vehicle center and road center.**
- **PID controller is used to generate steering commands from Delta**
- **Any obstacles which are on the vehicle path are detected with Kinect depth Camera.**
- **If obstacles are detected a speed reduce command is made**
- **Steering and speed commands are send over Serial to Arduino**
- **Arduino performs commands**



PICTURES / DIAGRAM



ADVANTAGES

- **Our model is cost effective; As we are using comparatively cheap and yet effective hardwares.**
- **Prevention of car crashes: Computers based on sophisticated systems and algorithms will essentially eliminate costly human error.**
- **Environmentally friendly: Autonomous cars will likely be electric rather than utilizing internal-combustion engines.**
- **Faster commutes: AV's can communicate with other vehicles on the road.**

CONCLUSION

- **Without manual breakdown into road or lane marker recognition, semantic abstraction, path planning, and control, we have empirically proved that CNNs can learn the whole job of lane and road following.**
- **To some extent, a tiny quantity of training data from a few hours of driving was enough to train the automobile to operate in a variety of settings.**
- **From a limited training input, the CNN is able to acquire relevant road characteristics (steering alone).**
- **During training, the system learns to recognize the shape of a road, for example, without the use of explicit labelling.**
- **More work is needed to increase the network's resilience, establish techniques to validate the network's robustness, and improve network-internal processing step visualization.**

REFERENCE

- **A brief introduction to OpenCV (2016 proceedings of the 35th international convention MIPRO)**
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- **OpenCV for computer vision applications**
- ✓ Authors: M Naveen Kumar, A Vadivel

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