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| **Modeling the Kinematics and Dynamics of Continuum robot using Machine Learning Techniques**  In this project I modelled complex Kinematics of continuum robots by machine learning techniques.  The continuum robots are made up of highly complicated and non linear materials. Duiring a robotic surgery this robot has to quickly and precisely move through confined space. traditional approaches to navigate through takes lots of time and computational power. To make this process fast and precise I implemented Deep neural networks and LWPR to model these complex non linear functions and was able to achieve less than 0.2 degrees error in measurement and significantly faster computation.  **Work**  I did my final internship of my bachelors at IPR   |  |  | | --- | --- | | **Real-time monocular vision-based SLAM with NVIDIA Jetson, CNN, and ROS**  Main goal is to study different architecture of CNN for depth reconstruction using single image.  We are going to use custom layers in our CNN architecture.  Then these architecture will be used as part of RTAB-MAP vision based SLAM, Exploration path planning and perception.  One of the reason that this project is important is tries to eliminate the requirement of sophisticated and expensive sensors like LiDAR, Radar, RGBD cameras. The cost of these sensors ranges from 10-60k depending upon level of complexity. Instead this uses pretrained model to trained by these expensive sensors only to perceive its environment. Currently the accuracy of this implementation is low as compared to Lidars and radars but by using custom CNNs and different DL algorithms we can improve accuracy of this implementations.   * depth reconstruction using single image. * CNNs * RTABMAP ROS pipeline. * Low cost as compared to expensive sensors. * Accuracy right now is not comparable with Lidars  |  | | --- | | **Self-driving car simulation in CARLA simulator**  Main goal of this project is to understand the architecture of Autonomous vehicles.  We implemented various **components** of the autonomous vehicles like Perception, motion planning and control.  CARLA simulator was Unreal engine based physics simulator. CARLA provides simulation of the real world city  In this project we created an autonomous vehicle which can be car truck, van etc. We implemented complete see-think-act cycle of an autonomous system.  We implemented basic control schemes to the ego vehicle like throttling, steering, and braking. and incorporated complete sensor suite of radar, Lidar and a camera and a GNSS sensor. This sensors collects information regarding vehicle’s position and environment. environment informations about depths, obstacles and different object around the ego vehicle. We then fused all the information collected by sensors to perceive the environment. After perceiving the environment the vehicles plans the path globally and locally. The vehicle is capable to avoid obstacles, perform turning manuvers and overtaking manuvers.  We also tried to personalized the driving experience by collecting the data of the driver’s driving style.   * Implemented an autonomous vehicle in CARLA simulator. * Implemented basic control scheme for throttling, steering, braking. * Implemented complete sensor suit consisting of Lidar, Radar, GNSS, camera. * Implemented motion planning algorithms to plan path locally and globally. * Personalized the driving experience. | |  |  | | --- | | **Unscented Kalman Filter Highway Project** |   In this project we estimated the position of other vehicles on the highway using Noisy Lidar and Radar data unscented Kalman filter.   |  | | --- | | **Motion Forecasting for Autonomous Vehicles (Deep Learning)**  Better understanding of the dynamic environment and actors are required in order to safely navigate through the environment.  In this project we used LSTM and GAN models to forecast the motion of the actors in the environment.  We were given past position velocities and acclerations of the actors in the environment.  GANs have 3 components 1 generator 2 discriminator 3 pooling module. Generators generates the path given the initial position of the actor. Discriminator determines weather the trajectory is generated by generator or it’s from training data.  **Tell us about yourself.**  I am a first-year graduate student at WPI majoring in RBE. I did my Bachelor’s in Mechanical engineering from India. From the beginning of my master’s, I was interested in autonomous vehicles. I did several projects related to autonomous vehicle ranging from implement a single Lidar sensor to an autonomous vehicle to implement full see-think-act cycle to an autonomous vehicle. Specifically, I am interested in Perception and Machine learning Deep learning for autonomous vehicles. I am deeply interested in this domain. I am proficient in C++ and Python which are the core programming languages for autonomous vehicle industry. I am also proficient in tools and libraries like Tensorflow, ROS, Gazebo, OpenCV, CARLA simulator, Git etc. Besides that I am very good at debugging the code, creating library, Automating tasks by programming etc. I am planning to kickstart my professional career by doing an internship and learning how all these theories that I learned in my college is applied in real life. I think Torc is perfect company for my interest. My interest perfectly aligns with torc’s interests. I am really fascinated how torc has achieved great milestones in 16 years.   * Bachelors and masters * Projects * Interests * Skills * Future plans * About Torc   Strengths,   * Debugging skills * Innovative thinking * I can handle pressure * Taking initiative * Intutive thinking * Team work   Weakness   * Looses creativity when I work under lots of pressure and deadlines * Too detail oriented which can thwart my progress sometimes. * Doing highly ambitious tasks which I end giving it up. * Sometimes I overthink a problem which results in complicated solution to a rather simple problem. | |