Computer Senior Seminar Research Paper Proposal

By Matthew Clark

Synopsis: In recent years, due to significant improvements to sensor and processing power and capability, major milestones have been made in the field of autonomous vehicles. Much of the automotive industry and consumers alike have been deeply interested in the possibilities autonomous driving holds for safety, productivity, and cost deduction. To realize full autonomous driving, the vehicle must have reliable object detection systems. Lidar, cameras, and other proximity sensors are used to make this possible. Much of the research and development is being poured into improving the performance of detecting lanes, signals, road signs, pedestrians, vehicles, and other unexpected objects. Detecting each object has its own challenges and difficulties. The analysis of the different object detection techniques for each type of road object will provide an effective picture of the state of the field in its current form. Within each technique there is an unwanted biproduct of potential system failure or error, thus it is important to value each system by its reliability, robustness, capability, and moral implications.

Description: My current plan for this paper is to first describe what an autonomous vehicle is, how it generally works, and why many people are interested in the technology. Followed by an outline of the different object detection techniques. That outline consists of a description of the system followed by an analysis of the value (reliability, robustness, capability, and moral implications). I will then assess the which technique is most preferable and whether that system is integrated in the autonomous vehicles today. The paper will end with a reflection on where we are and where we need to go on the road to fully autonomous driving.

Primary Articles:

Hoang, Toan Minh; Baek, Na Rae; Cho, Se Woon; Kim, Ki Wan; Park, Kang Ryoung. 2017. "Road Lane Detection Robust to Shadows Based on a Fuzzy System Using a Visible Light Camera Sensor." Sensors 17, no. 11: 2475.

Meng, Xiaoli; Wang, Heng; Liu, Bingbing. 2017. "A Robust Vehicle Localization Approach Based on GNSS/IMU/DMI/LiDAR Sensor Fusion for Autonomous Vehicles." Sensors 17, no. 9: 2140.

Alternate Articles:

An, Jhonghyun; Choi, Baehoon; Sim, Kwee-Bo; Kim, Euntai. 2016. "Novel Intersection Type Recognition for Autonomous Vehicles Using a Multi-Layer Laser Scanner." Sensors 16, no. 7: 1123.

Bottino, Andrea; Garbo, Alessandro; Loiacono, Carmelo; Quer, Stefano. 2016. "Street Viewer: An Autonomous Vision Based Traffic Tracking System." Sensors 16, no. 6: 813.

Gámez Serna, Citlalli; Ruichek, Yassine. 2017. "Dynamic Speed Adaptation for Path Tracking Based on Curvature Information and Speed Limits." Sensors 17, no. 6: 1383.

Rudolph, Gert, and Uwe Voelzke. "Three Sensor Types Drive Autonomous Vehicles." *Sensors Online*, November 10, 2017. Accessed January 27, 2018. https://www.sensorsmag.com/components/three-sensor-types-drive-autonomous-vehicles.