Next Generation of Cruise Control Using Model Predictive Control

Goal
Apply advances in autonomous vehicles to improve human driver convenience and safety by developing a next-generation cruise control that is aware of its surroundings, using economical sensors such as visible light and thermal infrared cameras.

Solution
Real-time Model Predictive Control (MPC) allows us to utilize complex control objectives and constraints, such as obstacle avoidance and lane-following. Environmental awareness is achieved using visible-light and thermal-infrared cameras.

Heat-producing Obstacle Detection Using Thermal Infrared Imaging

Goal
Detect and estimate the trajectories of heat-producing obstacles, in particular other running vehicles, for use by the next-generation cruise control.

Properties
- Active in all lighting conditions: 55% of all traffic fatalities occur when it is dark [1].
- Heat signatures of active cars stand out on thermal infrared imaging.
- Many luxury cars are already equipped with ‘Night Vision’ technology that features a thermal infrared camera display for the driver; we add intelligence to this sensor.

Moving Obstacle Detection Using Computer Vision

Goal
Detect and estimate the trajectories of moving obstacles, in particular pedestrians and other vehicles, for use by the next-generation cruise control.

Properties
- Finds objects that are moving in scene, not easier problem of finding objects that are moving relative to cameras.
- Detection of obstacles that are both near and far (no planar or non-planar assumption).
- Single parameter trades off between inter- and intra-object similarities.