Building a LUTZ Simulation

The Catapult has a number of LUTZ pods in its **CavLab**. These pods are fitted with a variety of sensors (Lidar, GPS, cameras etc.). The pods typically drive around the streets around the Catapult in Milton Keynes. We have a 3D model of this area and of the Pod.

Being able to simulate these three items, pod, sensors and environment would be invaluable to future pod development.

ROS

The Robot Operating System is a set of software libraries and tools that help build robot applications. Each node within the system takes a single responsibility within that system. ROS is being used within the LUTZ pods to develop control and sensing capability.

The Pod

The pod itself is a simple Ackerman steered vehicle with rear drive. Demand is provided to the vehicle through a CAN bus and state of the pod is returned on the same bus. The communication through that bus is neatly encapsulated in ROS nodes.

A simulation of the pod would appear to the rest of ROS as though it were the pod itself.

The Sensors

The pod is fitted with a Bumblebee XB3 stereo camera, three Ibeo Lux lidars, a Mobileye camera and an OXTS GPS/INS. Given the environment and pod location, it would be possible to simulate the output of each of these cameras. These data would enhance the capability of a pod simulation.

The Environment

The Catapult has a model, within Unity, of an area of Milton Keynes. A trimmed down version of these data will be made available for use in simulation to provide an environment in which the virtual pod can drive.

Gazebo

Gazebo is a toolbox for simulating robots and their environment. It is capable of simulating the physics of motion, providing sensor output and visualising the output. It can easily be integrated with ROS.

Requirements

Attendees who plan on contributing towards any of these simulations should have recent releases of ROS and Gazebo installed under Ubuntu. Instructions for doing are provided in a separate document titled: Virtual Machine Preparation for Hackathon.

Other Ideas

The above ideas are merely opening suggestions. Any other idea that contributes to the simulation of pods and beyond is welcome.

- Could we take Google Maps and Elevation data to create a Gazebo world?
- Could we output the pod pose provided by simulation as an input to a Unity VR?
- Can we develop a method for determining ow accurately our simulation matches recorded pod data?
- …