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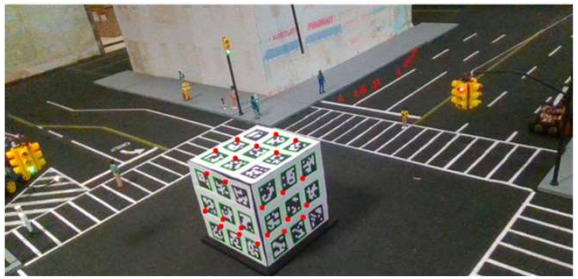
WINLAB | Wireless Information Network Laboratory

Smart Intersection Cameras

Heneil Patel, Eleonore Pichon, Peter Wilmot

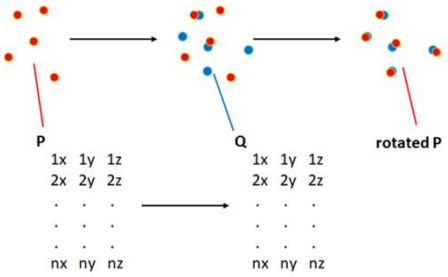
Introduction

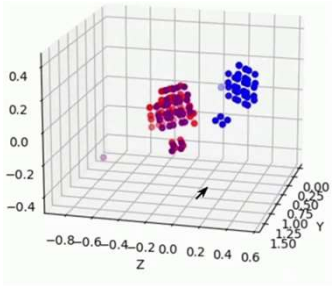
A single traffic camera can only see the front of objects, and not what is behind them. Multiple 3D cameras will remove the blindspots, but they need to be calibrated.



Point Transformations

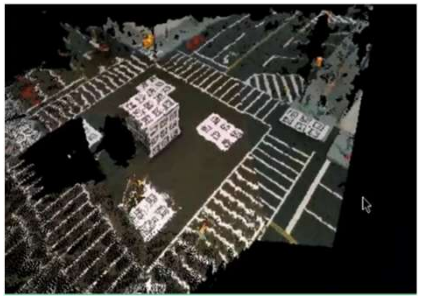
OpenCV and ArUco markers (On the cube) were used to detect points that multiple cameras can see in the Cosmos model intersection. The Kabsch algorithm was utilized to get a translation and rotation to move the points to each other.





Good Calibration

The image below is the best calibration so far, with the crosswalk continuing from one camera to the other.

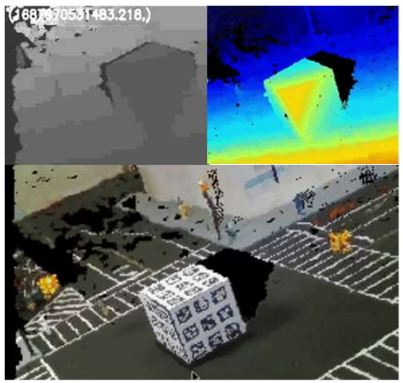


ROS/RVIZ

The Robotic Operating System and its visualizer were used to show transformed point clouds. This was inconsistent and had constant error.

Point Cloud Streaming

Python sockets were used to create a custom streaming service for point clouds.
Open source options were insufficient, a custom solution transferred the points directly.

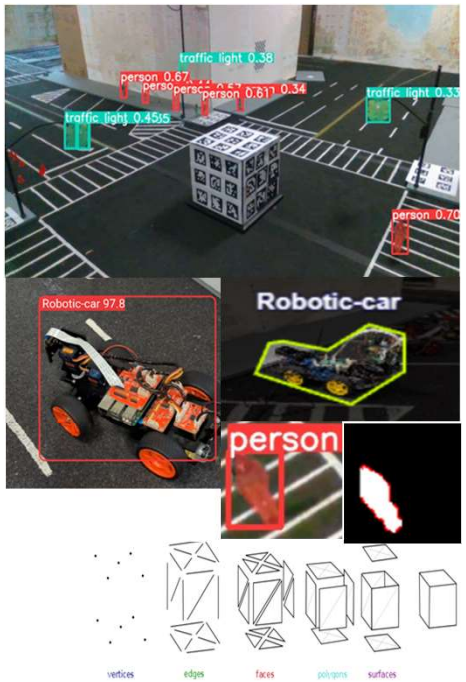


Object Detection

The YOLOv8 deep learning model was used to detect and segment objects in the intersection.
A model to detect DIY robotic cars was created.

Image Masks

The points for objects detected were obtained so that multiple cameras could be used to separate and track objects in 3D.



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