Claremont Graduate University

Artificially Intelligent SLAM Robot

**Abstract for ESRI User Conference**

Our goal is to implement a small vehicle capable of autonomous navigation to and from a location (indoor and outdoor) while capturing and returning 3D sensor (LIDAR) and imaging data at predefined locations, times, or events. Upon arrival at its destination the vehicle takes a set of images for import into our ESRI pipeline which includes an ArcGIS Server and custom apps, and concludes with export from CityEngine in .3vr format for viewing in VR on the Oculus Go through ESRI My Content and ESRI ARC360.

CGU AI Bot 🡪 ESRI Pipeline 🡪 ESRI CityEngine 🡪 Oculus Go

A flying drone version could be used to assist first responders in C&C with a near real-time VR environment, layered with relevant GIS information like water pipes, electricity lines, unit designations, etc., as well as SLAM (Simultaneous Localization and Mapping) capabilities. The VR environment provides an immersive and intuitive way for a user to gain a rapid understanding of a given situation. Our terrestrial bot is small enough to go places a human can not fit while mapping and capturing imagery.

Our bot has onboard AI running on the Nvidia Jetson TX2 that is capable of object detection, classification, segmentation, and avoidance using only imagery from the 1080p onboard camera. It also employs a 360-degree 2D LIDAR to help create an accurate map of its environment.

Future improvements to the bot may include upgrades to allow it to complete the challenges outlined in the DARPA Subterranean Challenge, as well as other difficult navigation and GIS challenges.

Throughout this process, we have gained greater understanding of both the technical challenges associated with modifying the hardware, and programming the software, as well as the real-world logistical and design considerations that factor into a research project.

Development is Happening in the GIS Lab at Claremont Graduate University.

**Team Members** (In Alphabetical Order)

Praveen Bob - Student

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