

# Blackdog UGV System

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## EXTENDED ABSTRACT

### **Purpose**

The purpose of this project is to create a fully autonomous Unmanned Ground Vehicle (UGV) system. This system will be able to operate in conjunction with a previously developed Unmanned Aerial System (UAS) system in order to get a closer look at targets identified by the UAS. The goal is to create a system that reduces the number of lives lost in dangerous endeavors such as military operations, research, law enforcement and natural disasters.

### **Methods**

Our system utilizes the Python programming language and its extensions in the software ground stations. The storage center for the UAS and UGV's data are networked virtual objects that use a PYRO (PYthon Remote Object) connection to communicate with the rest of the software. The UAS can read information about the UGV from its virtual object and either adds waypoints to its queue, or request the UGV follow the UAS's movement. The Graphical User Interface polls the virtual object to update the user's display. The UGV's intelligent navigation is assisted using a D\* algorithm to plot a path around obstacles. The UGV's hardware ground station utilizes a Dragon 12 evaluation board running a Motorola 68HCS12 micro-controller with GPS, a manual-override controller, and power management integrated on-board.

Team selection was completed based on majors and interest. There are eight software engineering, two computer science and two computer engineering majors for a total of twelve members. There are four – three person teams: GUI, Object / Communications, Control and Hardware.

The engineering process used was based on Crystal Clear process. Crystal Clear is an agile process that utilizes frequent delivery of usable code, osmotic communication, reflection workshops and iterative development. For our team, two week iterations and product deliveries were deemed appropriate for a two semester project and have worked extremely well.

### **Results**

The system development spans one academic year, which is nearing its conclusion. Currently the UAS and UGV are working products however the two are still in the process of being integrated. The UAS has been tested and deemed complete while software and hardware are being finalized for the UGV. The team is currently on schedule for a completion date of April 30, 2008.