The goal of this project was to implement a security system using autonomous robots for any given area using Robotic Operating System (ROS).

The project incorporates the use of fiducials known as April Tags and Blob tracking to patrol an area and search for a predetermined intruder.

The security system was specifically made to work in GPS denied locations, so it is ideal for homes and businesses.

**METHODS**

- **April Tags**
  - April Tags are read using the Raspberry Pi Camera V2
  - The tags are preset with global positions. When the robot reads the tag using the mounted Pi camera, the robot will be accurately represented in the global map utilizing transforms in ROS.

- **Blob Detection**
  - Blob detection is done using the Intel D435 RGB-D camera along with OpenCV.
  - With the use of the depth image from the D435 we are able to calculate how far away the blob is from our robot. With the knowledge of where the robot is at in relation to our robot, we are able to follow the blob around the map.

**SYSTEM**

- Pi Camera reads April tags at 7 FPS for a maximum of 2.5 meters distance
- RGBD camera tracks at 30 FPS and reads depth for a maximum of 4 meters
- The voltage regulator steps 12V down to 5V to power UP board off of OpenCR board
- Using ROS packages, data from cameras is handled by host computer to localize the robot and track targets

**DISCUSSION**

- The simulations give us a way to visualize and track our robots moving about the defined environment and ensure that the systems we designed are working correctly.
- The data from the april tags is used to update the position of each robot in the map.
- The system was designed to patrol the first floor of the USU Engineering Laboratory building.