A cost effective method for autonomously detecting humans
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Introduction
Following the 9/11 attack at The World Trade Center in 2001 there was a boom in the search and rescue robotic industry (Burion). Many of these locations are too dangerous for people to be able to safely traverse them. While there are already sensor arrays and bots capable of detecting humans they are extremely expensive. The goal of this project was to create a cost effective way to detect humans using the combined abilities of two sensors.

Materials and Methods (continued)
In order to collect data, a person sat at various distances and 3 different angles (60°, 90° & 120°) from the sensor array (see Figure 2 for angles). While the person was sitting the code was run. Test points were considered a success only if the PIR sensor properly detected/did not detect a person at a given point. Any point the thermometer did not detect a person was considered a success as long as there was not a person at that point but if the thermometer failed to detect, it was labeled as a failure.

Results (continued)
The sensor array achieved a total accuracy of 70.5% indoors, however the accuracy of the array beyond 15’ was only 63.0%. There was also testing done outside. It was performed in the courtyard of the school, and the overall accuracy was 51.9%, with a 33.3% accuracy with no person present.

Conclusion
The sensor array worked reasonably well indoors, though beyond 15’ the data was very unreliable due to the low accuracy (63.0%, anything below 70.0% is considered unreliable). There was also a hot spot at 120° created by a window this could be why the sensor array was detecting anything. Unfortunately there was not time for testing to be done in the gym, which was the only room that could realistically be used for this distance. The sensor array performed poorly in the hot testing conditions of the courtyard. This occurred because both sensors are very reliant on heat, in a hot environment, they become oversaturated. The sensor array seemed to be noticeably more accurate at 120° than any other degree. This may be caused by the PIR sensor not pointing at the exact same direction as the thermometer. Future projects could include creating a small drivable bot. The bot would use the created sensor array to detect people on the ground. A Microsoft® Xbox Kinect would be used as camera and method to detect people that are standing.

Reference

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