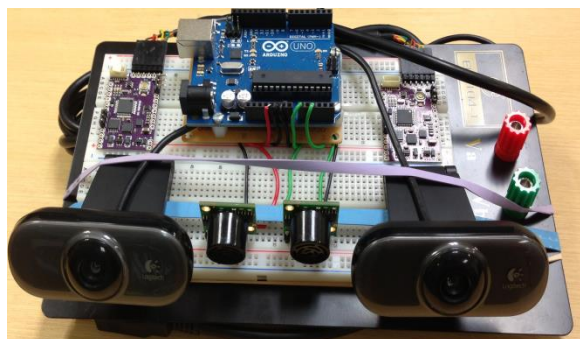# DangerBall

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Introduction

Human lives are quite fragile in hostile and hazardous environments. The evolution in technology that protects and saves human lives in these situations is of the highest importance. In military and emergency response settings, soldiers and emergency personnel put their lives at stake in order to ensure the safety of others. Usually when a building needs to be cleared in a hostile environment, the soldier has little to no information about layout or shape of the rooms. A similar situation arises, when emergency responders enter a potentially hazardous environment to check for survivors. The device will use several sensors and cameras and the data collected by all of the devices will be transmitted wirelessly to a processing station, which would fuse the data to provide a cohesive representation of the state of the room environment. This could potentially save lives when entry into a hazardous building is required.

Motivation

Our motivation for this project was to provide these personnel with instruments that would help them plan out a course of action in a hostile environment, by providing the necessary data that could be fused to represent the interior layout of such buildings, without endangering any personnel.

System Overview

Our sensor package consists of two ultrasonic distance sensors, two Inertial Measurement Units (IMUs), two video sensors (webcams), a microcontroller (Arduino Uno) and minicomputer (Raspberry Pi). The two ultrasonic distance sensors are connected to the Arduino, which then feeds the data collected by these sensors over USB to the Raspberry Pi for processing and packaging purposes. Next, the IMUs are directly connected to the Raspberry Pi over USB using an FTDI cable. Finally, the two webcams connect to the Raspberry Pi through a USB Hub. The data collected from the various sensors are packaged and synchronized, via timestamps, on the Raspberry Pi and sent wirelessly to an external computer for displaying the fused data. For demonstration purposes, the Arduino and the IMUs are connected directly to the external computer.

Conclusion

The main objective of this sensor package was to successfully capture and transmit various sets of data to an off-board processing site. From there, the goal was to fuse the multiple sets of data into an easy-to-understand consolidated view of all the data, thus providing the user a clearly defined understanding of the hostile/harmful environment without ever having to put human beings in harm's way.