# Search and Rescue System Using Omni-Orientation Mapping Robot

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When a building collapses, survivors are trapped in unknown locations. Locating survivors is crucial in a rescue operation and can be extremely difficult due to the terrain and inaccessibility of the rubble. This project is an autonomous robotics system that can locate survivors in a collapsed building. This year's work details the first two of four parts of this project: an omni-orientation reconnaissance robot that can quickly traverse the inside of the collapsed building, a mapping program that can recreate the robot's environment, a probability fields program that references the building's schematics and the mapping program to determine probable locations of survivors, and a swarm of aerial drones to deploy reconnaissance robots. The omni-orientation robot has angled drive trains so that it can move in changing, rough terrain. The robot was able to climb an incline of 30 degrees and move while being flipped. A 3DOF differential joint was created to allow the omni-orientation reconnaissance robots to combine and move in a snakebot configuration. The current mapping program relies on motor encoders and an IMU to recreate the robot's movement and a 2D LiDAR to provide a perpendicular cross-section of the environment. The robot moves through an L-shaped, inclined rectangular prism testing course. It uses an IMU to gather orientation data to account for the inclined testing environment. Last year, the mapping program on a flat surface had a volume percent error of 11.5%. This year, the percent error was -14.53% which successfully integrated an inclined testing environment. This autonomous system will reduce the search and rescue time by directing rescuers to probable areas of survivors' locations.

**Awards Won:**

Fourth Award of $500

U.S. Agency for International Development: USAID Science for Development First Award - Working in Crisis and Conflict