FS HIVE MRK 12: An Autonomous Swarm Robotics Fire Suppression System

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Commercial fire suppression systems are expensive to install and when in use cause extended water damage to property. These systems are mandatory in all commercial buildings. Through the use of new technology, the same overall goal can be achieved without collateral water damage. To address this, I designed and built a series of 12 prototypes that utilize swarm robotics combined with autonomous features to create a complete commercial fire suppression system. Each simple robot is comprised of five main systems; long-range fire detection which uses a thermal camera mounted to a stepper motor to survey the area and determine if a heat source that passes a threshold exists; short-range fire detection which detects close range flames to determine how close and what position the robot should be in to suppress the fire; locomotion and navigation system which uses line tracking technology and color sense to navigate to the area the other robots are broadcasting from; swarm communication and organization (indirect and direct) using radio signals to inform all the robots in the swarm information about the fire as well determining where to position themselves as a swarm to best suppress the fire; and fire suppression which uses suppression spray to eliminate the fire. The entire system is controlled using an open-source microprocessor, various H bridge controllers, and software written in C++. After completing many tests the data suggests that it is possible to use swarm robotics to suppress a fire without having any human interaction.

Awards Won:

International Council on Systems Engineering - INCOSE: INCOSE Best Use of Systems Engineering Award* of $1,500