

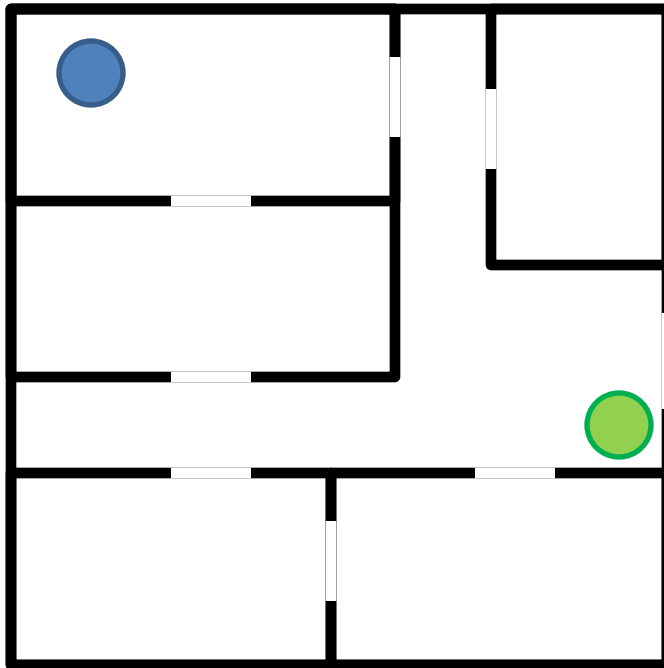


FlyNet Overview

Austin Anderson
Steve McGuire



Project Requirements





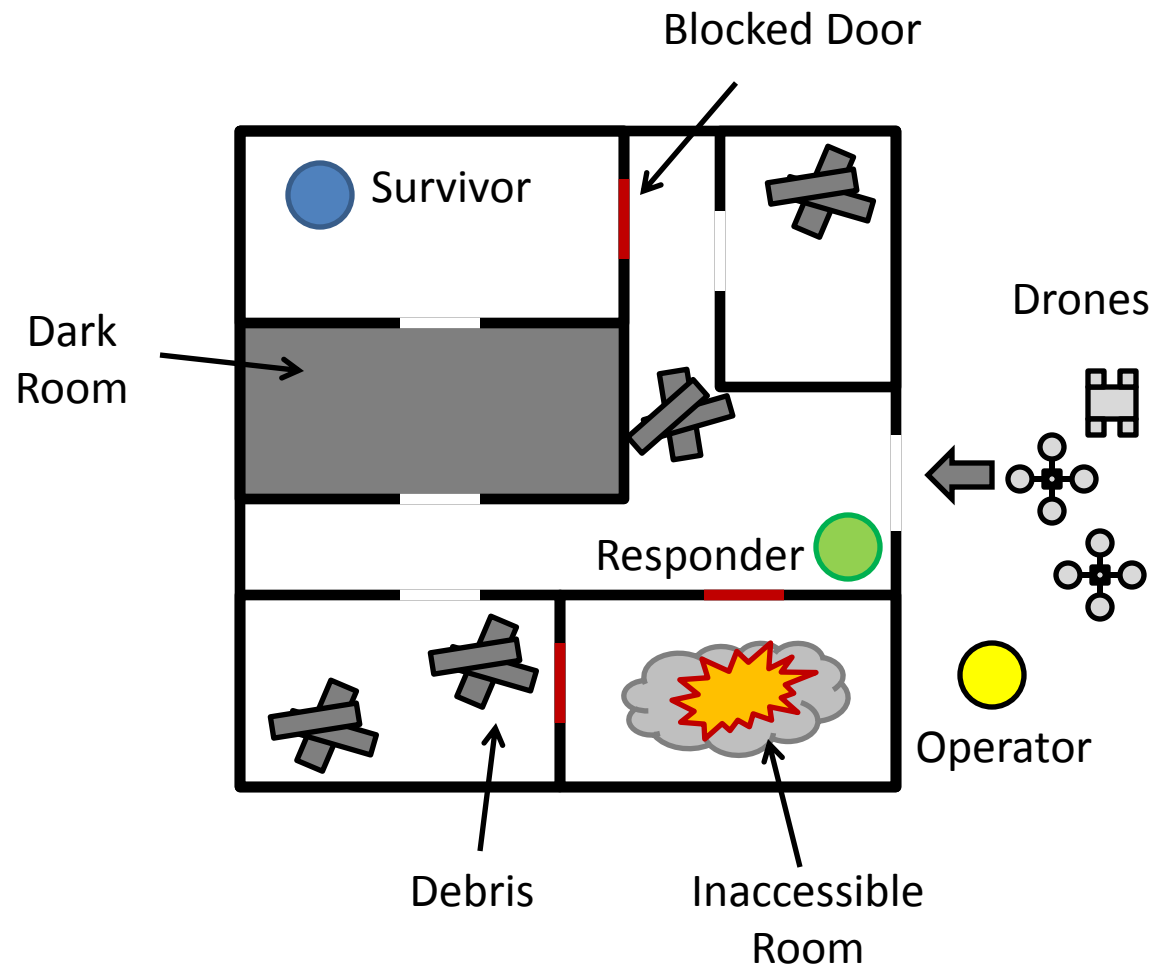
Project Requirements





Project Requirements

**Goal:
Find the Survivor!**



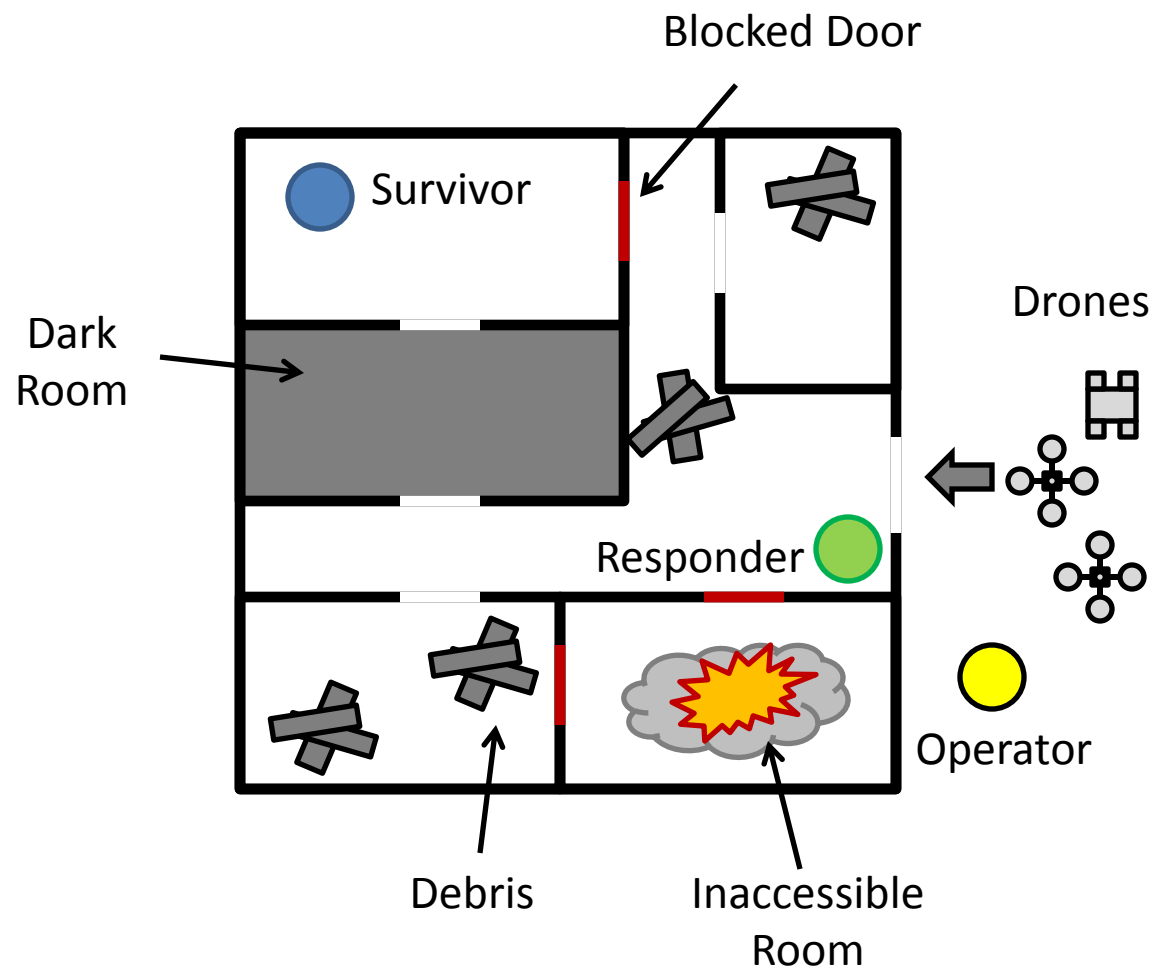


Project Requirements

Goal: Find the Survivor!

Requirements

- Operate in GPS denied environment
- Operate in low/no light
- Identify and track survivors
- Identify and track responders
- Navigate 3D environment
- Plan with prior map
- Update plan based on findings
- Update prior map
- Explore the space in one flight
- Work in a team to explore
- Include ground and air vehicles
- Carry/deploy aide package
- Communicate findings to operator



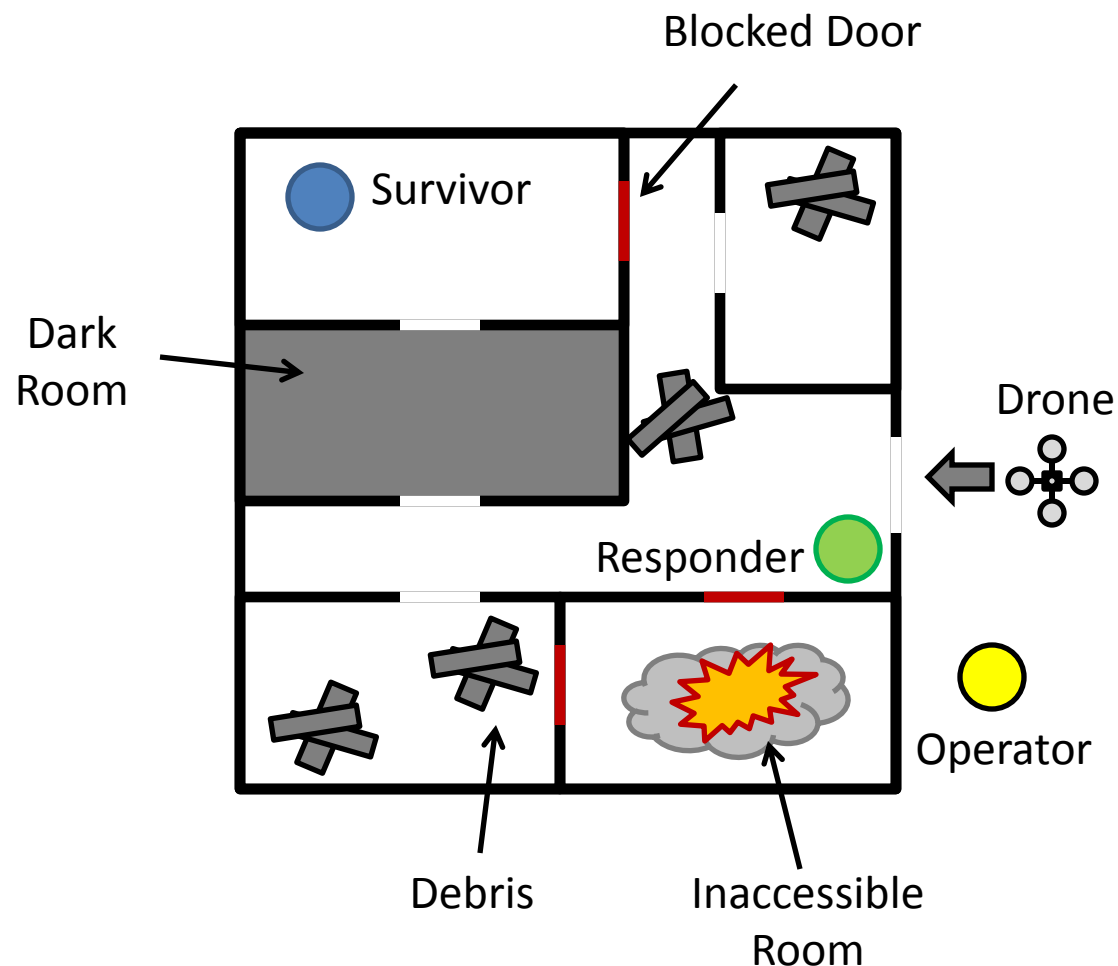


Project Requirements

Goal: Find the Survivor!

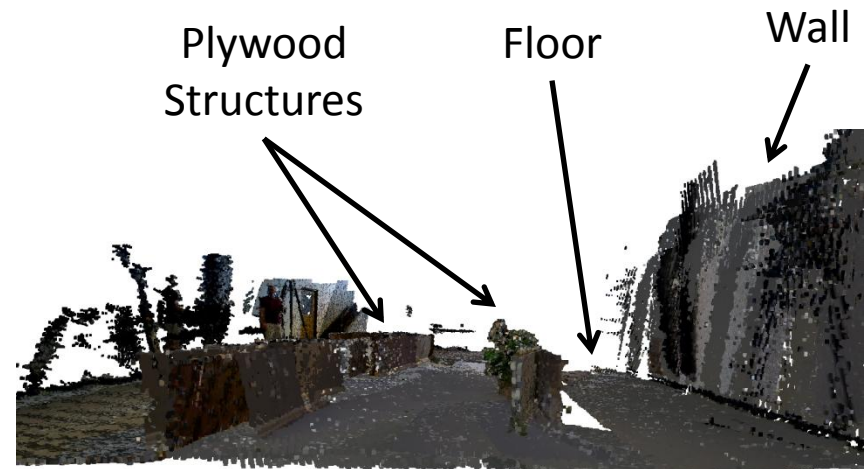
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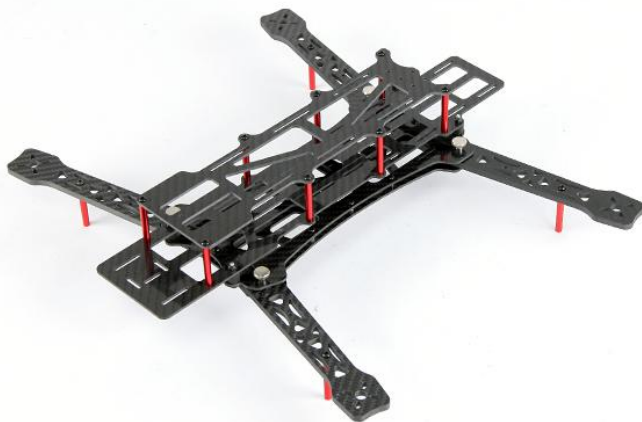
- SLAM = Simultaneous Localization and Mapping
- Family of algorithms used for robotic exploration
- Localizes a robot using sensor odometry and map landmarks
- Updates map landmarks as it goes
- Uses estimation filters



Occupancy map of Fleming Flight Space
Generated with RGBD sensor



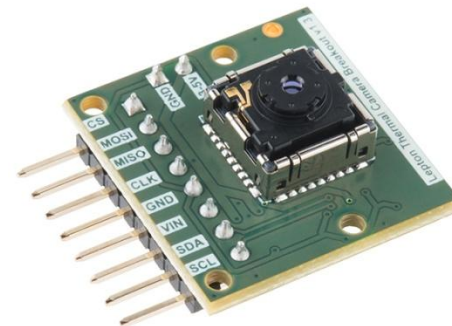
Common Platform Components



Quadcopter Frame*



Pixhawk Autopilot



FLiR Sensor



Laser Altimeter*



Embedded Processor*



WiFi Radio Link

* Indicates design options being evaluated

Laser Altimeter image from: sparkfun.com
Embedded Proc. image from: hardkernel.com
WiFi Radio Link image from: sparkfun.com

Quadrotor frame image from: hobbyking.com
Pixhawk image from: pixhawk.org
FLiR Sensor image from: sparkfun.com



- LiDAR and monocular camera
- LiDAR provides 2-D scans
- Camera supplements scans
- LiDAR is robust to lighting conditions
- Platform can fly fast
- Relatively light processing requirement
- LiDAR is heavy/expensive





- RGBD Camera
 - Red, green, blue, depth
- Depth map constructed from structured light projection
- Depth robust to lighting conditions
- Heavy
- Medium computational complexity
- Suffers from image blurring





- DJI Guidance
 - Stereo vision with ultrasonic ranging
 - Five simultaneous modules
 - IMU fused
- FPGA accelerated to reduce computation costs
- Provides visual odometry and collision avoidance out of the box
- Sensitive to lighting conditions
- Expensive and heavy

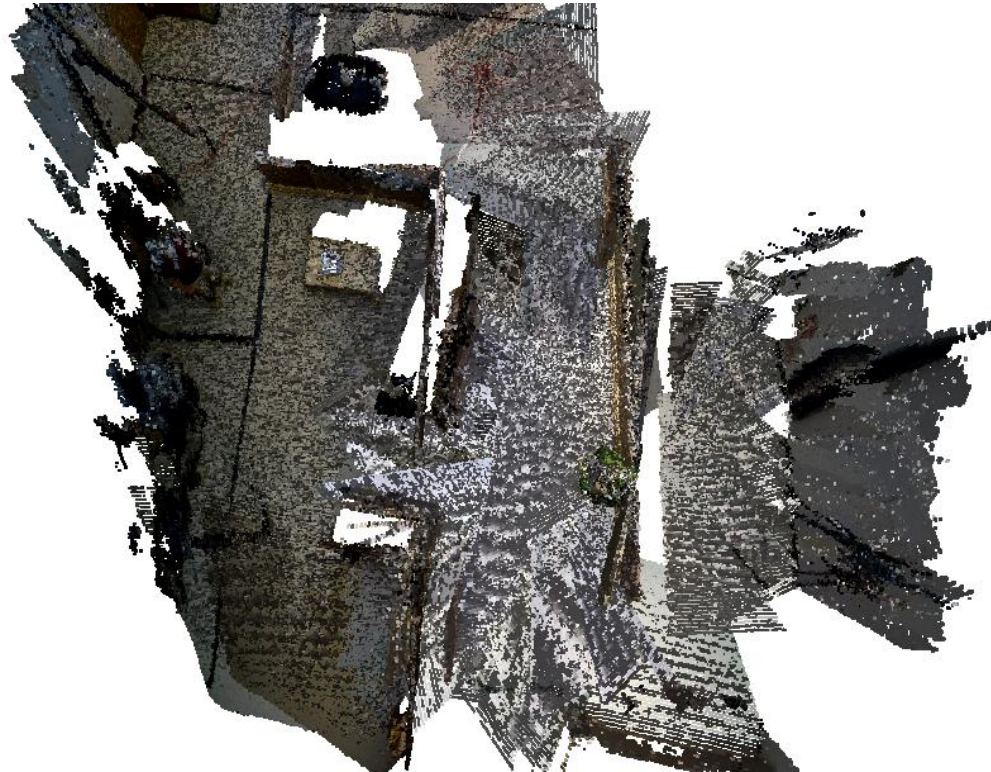




- Robust indoor flight
- GPS denied navigation
- Embedded processing of SLAM algorithms
- Robust planning for efficient search
- Planning with known prior map
- Planning for obstacle avoidance in 3-D
- Multi-platform search
- Multi-platform information fusion
- Robust target identification
- Target discrimination
- SLAM with moving targets



- Robust indoor flight ←
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Research and Engineering Center
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UNIVERSITY OF COLORADO **BOULDER**

Backups



FlyNet Overview

or: How I Learned to Stop Worrying and Love the Drones

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