Team B - Fall Validation Demo

The Fall Validation Demonstration (FVD) is to demonstrate the drone's capability of performing in a real life simulated version of the DARPA Triage Challenge, with all subsystems integrated. Compared to SVD, FVD focuses on system robustness and capabilities including pose estimation with both IR and EO, localization with visual odometry, and coordinated operations with the Spots from the internal team and collision avoidance from other UAVs of external teams. MRSD team integrated the triaging algorithms instead of developing from scratch, so the triage performance is not under control. However, FVD will also demonstrate onboard triage to show the algorithms integration. FVD will be conducted at **Mill19 or Hockins, and** follow 8-sequence of events below:

1. At the test site, we set up a non-enclosed environment (course) with 1 spot robot running in the course, 1 UAV hovering, and 3 test dummies/actors scattered in the field.
2. Launch all ground systems, and commence autonomous takeoff of the drone.
3. Drone will begin in mapping mode, surveying the entire area within the designated geofence.
4. The approximate GPS locations on first-pass will be streamed back to the ground operator. Drone will begin to return.
5. Upon drone return, perform a battery swap. Reboot systems quickly, and prepare the drone for flight.
6. Redeploy drone in waypoint mode. Go to the first patient, and localize them. Display published GPS coordinates.
7. Perform an orbital pass around the patient. Begin onboard algorithms. Camera locks on the patient with gimbal control algorithms. Perform patient detection, reID detection and pose estimation with both EO and IR.
8. Stream algorithm data back to the viewing gallery.
9. Repeat procedure for the other two test dummies/actors. Autonomously return to land at completion.

Same as SVD, the drone should successfully execute the full behavior tree stack during FVD. All three While following the survey course, the GPS waypoint deviation shall be less than **5%**, and patient location estimation should be decreased to **1 meter** of the ground truth with visual odometry. The drone should still maintain **6 ~ 10 meters** from patients, and achieve patient reidentification and pose estimation at **20% accuracy with IR** due to bounding box limitation. Responding to the Foxglove commands within **1.5 seconds** remain the same, and will still be tested including arm, disarm, takeoff, cancel, Estop, land, autoland, and geofence mapping, and record onboard EO and IR videos shall be at **30 FPS**, and the drone should maintain active transmission with **less than 3000 ms** latency, alongside with bounding box information transmitted to Foxglove with a packet loss rate of less than **1%**. The onboard PX4 log should be

retrievable after every flight. When E-stop hits, the drone should start hovering within **0.5 seconds**, hover when communication is lost, and return to home base when battery level hits to **10%**.