# Project Capabilities Progress

System capabilities:

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| Capability | Systems involved | Current method of demonstration | Proposed final demonstration solution |
| Demonstrate route finding and navigation | * Control centre * Laser guidance system * Kinect sensor | * A LabVIEW program is able to calculate where to go and which route to take * Laser guidance system frame has been designed and electronic parts have been tested * Kinect is able to detect key points on a person and locate them as they move around | * The Kinect will be able to detect key points in its surrounding e.g walls, obstacles and mission objectives * The control centre will process this information to calculate the route for the DaNI bot to take * The laser guidance system will lead the DaNI bot around by moving across the route and the Kinect following it |
| Demonstrate moving around complex terrain | * DaNI bot * Kinect sensor * Tri-track | * DaNI and Tri-track are able to navigate up a sloped ramp * The Kinect sensor is able to detect objects and highlight similar objects within its view | * The DaNI and Tri-track will be able to move over ramps * The Kinect will be able to detect obstacles such as ramps and walls * The tri-track will keep the black box stable |
| Demonstrate identifying, placing and retrieving various instruments | * Tri-track * Camera * IMU * Kinect sensor | * The camera, webcam provided in the base kit, is able to detect key features in a picture to locate the black box | * The camera will be able to locate the black box as well as the distance to it * The IMU will be able to copy the movements of the operates arm * The Tri-track will keep the black box steady to avoid loss of data * The Kinect sensor will be able to locate the black box using the on-board microphones |
| Providing mission control centre with mission and technical updates | * Tri-track, * DaNI * Voice operated system * Control centre | * The voice operated system is able to pick up speech and search the internet | * The voice operated system will respond to key phrases from the user and move the robots accordingly * The DaNI and Tri-track will provide the control centre with key information such as their current location, if the valve and black box has been completed and updates on obstacle locations |
| Demonstrate ability to operate autonomously | * DaNI * Tri-track * Laser guidance system | * The LabVIEW program used for route finding is able to calculate the key locations and paths using data hypothetically provided only by the Kinect sensor | * The DaNI will be able to move around the map autonomously by following the laser guidance system which will also calculate the quickest route by itself * The tri-track task will complete the black box task by itself |
| Demonstrate collaborative platform integration | * DaNI * Kinect * Tri-track * Voice operated system * Laser guidance system * IMU * Control centre | * The Tri-track has been operated from a computer over a wireless signal | * All systems will be able to communicate with the control centre over a wireless system and the control centre will distribute the required data to each system |
| Demonstrate communication management failure management | * DaNI * Kinect * Tri-track * Voice operated system | * N/A | * N/A |

Mission capabilities:

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| Capability | Systems involved | Current method of demonstration | Proposed final demonstration solution |
| Demonstrate localisation of navigation using optical beacons | * Kinect sensor | * N/A | * The Kinect will be able to detect the optical beacons using its RGB sensor and correct its route using the information gathered |
| Demonstrate the identification and manipulation of fuel valve control | * IMU * Camera | * N/A | * The IMU will control the motion of the arm to manipulate the valve * The camera mounted on the Tri-track will be used to identify key information on the valve control panel to aid with the manipulation |
| Demonstrate localisation of black box using acoustic methods | * Kinect sensor | * N/A | * The Kinect sensor will identify the black box’s potential location using its microphones |
| Demonstrate ability to avoid identified hazardous areas | * Kinect sensor | * The Kinect is able to identify key areas similar to a preloaded image | * The Kinect sensor will identify the hazardous areas by the image provided and locating it using it’s identification algorithms |