Interdisciplinary Summer Research – Collaborative Robotics:

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Sahar Abulaimoun, Erik Aleksanyan, Kyle Cowing, Adam Czyrsznic, Karina Dsouza, Jacqueline Farkas, Matthew Frazier, Kalib Guthrie, Kyle Lapolice, David Monroe, Brittany Morales, Aashka Patel, Benjamin Ruoff, James Smith

Mentors: *Dr. John Federici, Martina Decker, Sam Gatley, Lou Rizzo*

The exploration of GPS-denied, all-terrain environments such as caves or tunnels can be dangerous and difficult for humans. In situations when a human is unable to physically enter the environment, robotic intervention can be of aid. During the summer internship, a collaborative robotic fleet was created. The fleet will be used to navigate caves and tunnels. The mothership will carry the mini bots under its top frame. When the mothership cannot access an area, the operator will deploy one of the mini bots to continue exploring the environment. Each robot has various sensing capabilities. The robots can communicate with each other and send sensor data back to the operator through the established mesh network.

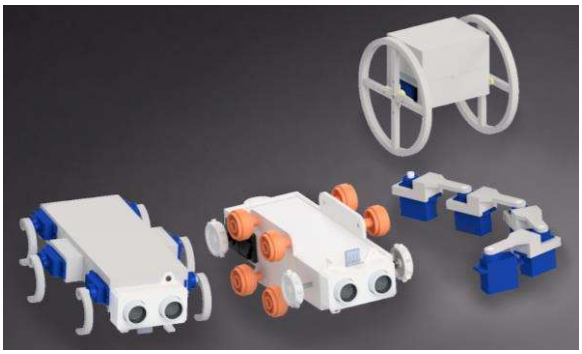

Figure 1. System of Mini-Bots. Image Credit, Matthew Frazier; AddLab

The team for the summer internship was assembled with the goal of interdisciplinary collaboration. Students have backgrounds in applied physics, biomedical engineering, computer engineering, computer science, industrial design, and mechanical engineering. With the various knowledge available among the team, the students were able to work in interdisciplinary groups to develop a collaborative robotic fleet that can explore all-terrain, GPS denied environments. In order to allow the overall project to succeed, the team learned to communicate effectively and work iteratively. Using the iterative design thinking process, the team defined the problem, empathized with the users, prototyped the elements of the project, conducted testing on the said prototypes, and refined the products. The team worked in subgroups to complete the various aspects that the overall project required such as designing the mothership,

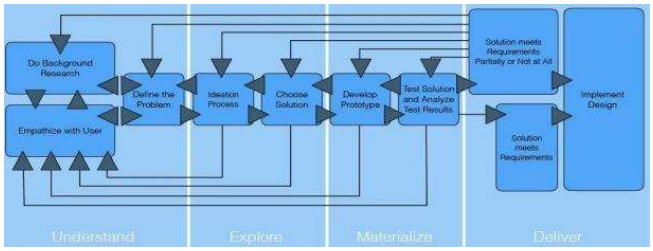

Figure 2. Design Thinking Iterative Process. Image Credit, Material Dynamics Lab

Building the mini-bots, programming the robotic fleet, creating sensor packages, and enabling the mesh network.