

1. **Research Title:** “Biologically Inspired Cooperative Autonomous Navigators for Intelligent Sensing.”

2. **Individual Sponsor:**

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3. **Academic Area/Field and Education Level:** Electrical Engineering and Computer Science / Cooperative Autonomous Vehicle Guidance, Navigation, and Control (MS or Ph.D. level)

4. **Description:** The proposed project will develop a heterogeneous multi-robot system for autonomously mapping, localization, and performing target tracking for an indoor and urban environment over an extended period of time. The vehicles should be biologically inspired to best handle a diverse environment while remaining nondescript. Additionally, in keeping with the heterogeneous idea, the vehicle group should be composed of several structurally and sensor device differences. A base station will be established and will consist of a positioning device, a radio transceiver, a human interface, and a computer equipped with software to support sensor data collection, storage, image processing and map generation, path projection, data transmission, and human input.

The system will consist of a group of autonomous robots. The robots will collectively survey an area autonomously, transmitting and fusing sensor data via wireless LAN. Also, the platform attached to the robot will maintain its global position using some sort of sensor localization. Each robot platform will include the positioning device, radio transceiver, power supply, a mixed set of sensors per platform, and possibly an external, high-resolution video camera. The base station will perform the following functions: (1) track and analyze position information, sensor data, and camera images from each robot, (2) render a map based upon the images and data from the lead robot, (3) recognize a target and handle track continuity during target occlusion, and (4) project the shortest path from the each robots' positions to the optimal target tracking position, using the generated map.

5. **Objectives:** (1) Complete a working group prototype of biologically inspired vehicles with global navigation capability and including a radio modem for data transfer and its own power supply. (2) Integrate the navigational information, and sensor data into a software system capable of generating a map of the urban environment and capable of communicating the shortest path from the base station to the robot. (3) Develop software for autonomous target recognition, and multi-target tracking using the mobile platforms to best position the vehicles for optimal tracking capability.

6. **Research Classification/Restrictions:** None at this time.

7. **Eligible Institutions:** DAGSI