

Client/Company/Organization: Iowa State University

Submitter Name: Liang Dong

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Project Contact: Liang Dong

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Project Title:

A robotic sensing system for gas emission measurement

Project Abstract:

The project is to design and test a robotic sensing system for greenhouse gas emissions measurement. Soil contributes about 20% of the total emission of carbon dioxide to the atmosphere through soil respiration. Emission of carbon dioxide from the soil results in reduction of soil organic carbon pool, soil fertility and productivity. Methane is also considered to be a significant greenhouse gas. Wetland methane emissions are the largest natural source in the global methane budget, contributing to about one third of total natural and anthropogenic emissions. The project involves the design, manufacturing and integration of four components, including a robot, a sensing unit, a navigation unit, and a communication unit, to realize a robotic sensing tool. The team will test the components and final system on ISU research farm to validate the ability of the tools for field measurement of carbon dioxide and methane.

Expected Deliverables:

1. One robot (modified from a commercial one) able to sample from soil, and the other (modified from a commercial one) able to swim on water. 2. Integrated commercial sensors to detect methane and carbon dioxide and transmit data. 3. A navigation unit to guide movement of robots. 4. A tool that can conduct on-farm field measurements of carbon dioxide and methane.

Specialized Resources Provided by Client:

(1) Commercial robots and electronic parts. (2) Testbed at ISU research farm.

Anticipated Cost: _____

Financial Resources Provided by Client: NA

Preferred Students for the Project:

- Electrical Engineering
- Computer Engineering
- Software Engineering
- Cyber Security Engineering
- Other:

Other Special Skills:

Anticipated Client Interaction (estimate):

- 1 meeting per week
 - In person, Over the phone, Web / video conferencing
- 1 meeting per month
 - In person, Over the phone, Web / video conferencing
- 2 or more meetings per month
 - In person, Over the phone, Web / video conferencing

- 1 meeting per semester
 In person, Over the phone, Web / video conferencing

Meeting ABET Criteria

Please rate the following statements as they relate to your proposed project:

0 – Not at all *1 – A Little* *2 – Somewhat* *3 – A Lot* *4 – Completely*

On this project, students will need to apply knowledge of mathematics, science, and engineering 0 1 2 3 4

This project gives students an opportunity to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability 0 1 2 3 4

This project involves students from a variety of programs, i.e., CprE, EE, and SE 0 1 2 3 4

This project requires students to identify, formulate, and solve engineering problems 0 1 2 3 4

This project gives students an opportunity to use the techniques, skills, and modern engineering tools necessary for engineering practice 0 1 2 3 4

Project Approval – for use by ECpE Senior Design Committee

- Approved: _____
- Project Assigned: sdmay22-42
- Advisor(s) Assigned: Liang Dong (ldong@iastate.edu)
- _____