An Unmanned Agricultural Robotics System (UARS) was designed, constructed, and operated in both classrooms and fields. The UARS is a precision agriculture vehicle platform for mounting multiple sensors, including crop height sensor, crop canopy analyzer, normalized difference vegetative index (NDVI) sensor, multispectral camera, and hyperspectral radiometer.

Establishment of an Agricultural Robotics Lab at Prairie View A&M University

Who cares and why?

With the advancement of robotics technology, unmanned agricultural robots system (UARS) is becoming widely used in precision agriculture. Modern farming requires making increasingly complex scientific, business, and financial decisions, so advanced education/training in agriculture as well as engineering is important. Thus, it is extremely important for higher education institutions, especially minority serving universities, to offer appropriate education opportunities for students to prepare them adequately for their future careers.

Also, the wide use of agricultural robots in the agricultural industry demands qualified workers equipped with relevant expertise and skillful hands-on experience. Prairie View A&M University (PVAMU) is ready to take this responsibility in providing diversified and qualified workforce for the society. However, due to lack of agricultural robotics facility, agricultural and engineering students enrolled in PVAMU do not have the opportunities gaining hands-on experiences with agricultural robotics technology. This shortage further widen the gap between industry requirement and our students' skills, thus undermines their confidence as well as the local economy.

To tackle all these problems, we have conducted this project to enhance our students' multi-disciplinary experience through training in transferable skills with agricultural robotics technologies.

What has the project done so far?

UARS was designed, constructed, and operated in the classroom and in the field. The UARS is a precision agriculture vehicular platform for mounting multiple sensors, including crop height sensor, crop canopy analyzer, normalized difference vegetative index (NDVI) sensor, multispectral camera, and hyperspectral radiometer.

The UARS has been tested in rice field as well as in fruit field. In these tests, various data were collected with the sensors mounted on the UARS. During the tests, students performed various activities to check the reliabilities of the system and students identified some problems and helped improved the robustness of the whole system. In fruit field testing, the shapes and volumes of the trees were measured and collected

with a 3D scanner mounted on the UARS system. Students gained more experience of using UARS system for precision agriculture.

Several groups of senior design students were involved in the design and construction stages. In the design stage, students helped to conduct the literature review and collect ideas; while in the construction stage, students worked with faculty members for both mechanical and electrical parts. Students gained hands-on experience as well as confidence toward their future careers.

To better prepare students for a successful professional career in diversified technology fields, a special topic class was offered to the Engineering Technology students. The course was featured with general introduction of mobile and agricultural robotics, theory and technology behind mobile robotics, and hands-on experience with mobile robotics. Throughout the semester, the course was divided into two parts: theory introduction and hands-on practice. Also, a female undergraduate engineering technology student was hired for this project. The student actively participated in the project and presented her experience in research symposium. She was a winner of the best presenters.

Impact Statement

Future B.S. level employees of the agricultural industry would benefit from a broad educational background and hands-on experience with agricultural robotics technologies.

An agricultural robotics lab can provide training to our engineering technology students, help them understand the basics of the unit operations in this industry, and equip them with relevant expertise in pursuing a career in agriculture engineering. From the agricultural industry standpoint, this lab not only trains agricultural students, but also helps to attract new blood with diversified technical background.

Such a ground-based automatic crop condition measuring system also will help farmers maximize the economic and environmental benefits of crop pest management through precision agriculture.

What research is needed?

More research is being conducted to upgrade the currently remote- controlled robot system to automatic mobile agricultural robot system. Also, aerial-based robots technology is under investigated by the PIs.

Want to know more?

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