Collaborative Research: NRI: StickBug – an Effective Co-Robot for Precision Pollination

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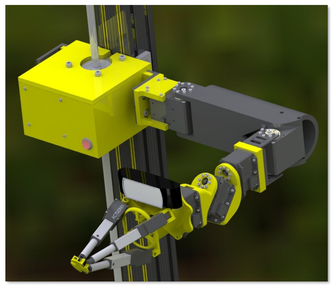
https://yugu.site/2021/10/30/why-are-we-building-precision-pollination-robots/

Long-Term Goal: develop robots that can efficiently care for individual plants

Objectives: 1) significantly improve the effectiveness and 2) lower the entry barrier of precision robotic pollination technology

Challenges:

1. Spatial-temporal development of flowers
2. Manipulating clusters of similar looking flowers
3. Reaching flowers in difficult locations
4. Managing variations of flowers and different crops
5. Working alongside and being accepted by the growers
6. Improving effectiveness and reliability, reducing costs



Technical Approach:

- Crop selection: bramble and tomato
- System design: multi-agent system with a holonomic base and six manipulators
- Robot perception: semantic mapping, active perception of flower pose
- Decision-making: multi-arm cooperative task planning, imitation learning
- HRI: grower and outreach agent acceptance towards co-bot applications
- Validation: pollination quality and effectiveness studies in greenhouses

Scientific Impact:

- Finding multidisciplinary solutions of a highly complex field robotics challenge
- Advancing the fundamental knowledge in robot systems design, autonomy, and human-robot interaction
- Closing the gap between academic robotics research and the needs in real-world applications.
- Making technology more acceptable to growers with no specialized training

Broader Impact:

- Overcome the shortage of natural pollinators; allow selective pollination and flexible pollination schedules
- The precision manipulation ability can benefit other agriculture applications
- Research and learning opportunities for students
- Open sharing of developed designs and software
- Improving diversity, workforce training, and outreach

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