HOW BUMBLEBEES VISIT FLOWERS

Assignment

Bumblebees can perform more than 1000 landing maneuvers on a flower per hour. Observed under conventional camera, tracking and describing such small scale and fast motion is a challenging task, especially if one aims for bumblebee's trajectory predictions without time delay. Tracking and integrating long flight trajectories, may give an insight on the flight dynamics and landing strategy of individual bumblebee on a flower, which in turn may have an impact on the development of algorithms for autonomously flying robots*. Instead, learning the collective dynamics of bumblebees, such as the overall frequency and duration of the flower visits, will help growers to facilitate pollination strategy of tomatoes in a greenhouse, leading to a higher harvest.

*https://doi.org/10.1016/j.isci.2021.102407

Activities

The student will learn the basics of digital video processing and relevant computer vision approaches, such as optical flow, motion detection, object tracking, and will develop a novel framework for tracking bumblebees in space-time. Next steps are statistical analysis and modelling of bumblebee collective flower visits.

Internship overview

- Master Student
- Internship / Graduation
- Physics/Mathematics
- Location: Eindhoven

Technologies

- Computer vision
- Object tracking
- Statistical analysis
- Physical modelling
- Machine learning

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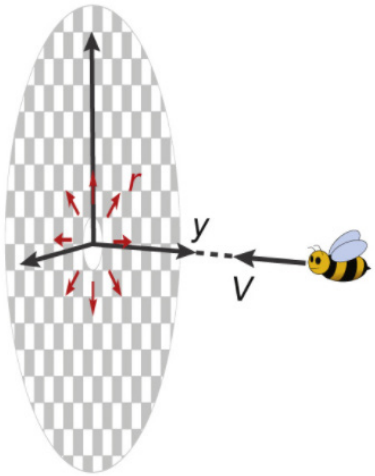
Context

Object tracking is usually approached as a multi-step process, including object detection, assignment of objects to existing/new tracks, and updating all tracks with new information. Most of (human) detection and tracking tasks are currently done by neural networks (YOLO, RetinaNet, Mask-RCNNs, LSTM etc.), yet for many small scale and fast-moving objects, like bumblebees, such approach is unfeasible and will result in dramatic time delays of algorithm. An alternative, feature selection (SIFT, HOG, Shi-Tomasi etc.) and tracking algorithms have limitations by their own, such as sensitivity to details of illumination, occlusions, phenotype differences of bumblebee species**. Therefore, motion tracking becomes a natural method of choice here, as long as sampling frequency is high enough to consider motion small and background is relatively static, such that motion of flowers due to a wind can be separated. Jointly combining detection and tracking will form a solid basis for a generic framework beyond the study of bumblebee dynamics, interesting by itself.

**https://doi.org/10.1038/s41598-021-87210-1



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Would you like to know more about this student assignment?

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