Beehive Traffic

3D Vision Project Proposal
Supervised by: Sattler Torsten
March 9, 2018

GROUP MEMBERS

Jonathan Burkhard | Jasmin Fischli | Philipp Göldlin | Julie Veya




I. DESCRIPTION OF THE PROJECT

One problem a beekeeper can encounter during spring, is the sudden swarming of his bees. They do so to find a new location for their colony.

In this project we want to count the number of bees that enter and leave the hive at any particular time, to be able to detect such a bee swarming. Using a GoPro camera, we will take several short videos and apply background subtraction followed by segmentation using OpenCV to recognize the bees. To track the path of the bees in 3D, we will use OpenCV.

For the support of our project we found a paper [**?**]which uses the tracking software 'SwarmSight' in combination with one camera for counting bees.

II. WORK PACKAGES AND TIMELINE

Task	**Group Member**	**Time period**
Literature research, get familiar with Python, OpenCV	Everyone	Weeks 3 to 5
Taking several video recordings (test installation, different camera positions, uniformization of background)	Jonathan	Week 4
Frame to frame association and background subtraction	Julie, Philipp	Weeks 5 to 6
Prepare presentation	Everyone	Week 7
Midterm presentation	Everyone	09.04.
Implement segmentation and ellipse fitting	Jasmin, Philipp	Weeks 8 to 10
Determine trajectories using OpenCV	Jonathan	Weeks 10 to 11
Determine a logic to count incoming and outcoming bees	Julie	Week 12
Reflect on further improvement, possible enhancement of method and/or measurement	Everyone	Weeks 12 to 13
Prepare final presentation	Everyone	Week 14
Final presentation	Everyone	28.05.
Write the final report	Everyone	Weeks 15 to 16
Final written report	Everyone	15.06.

Some problems we will encounter during the project are listed below:

- First of all, the hive has a brownish color, which causes a small difference in color between the bees and the hive. To facilitate the background subtraction we will put a coloured paper on the hive to better recognize the bees.
- Another challenge will be to detect the rapid movement of the bees for which we need a frame rate high enough to map the trajectory of the bees through the consecutive pictures.
- Furthermore we will have overlapping bees. Solving this issue will be complicated using a single camera. But since we are interested only in the number of bees this does not falsify our result if we confuse two bees with each other. Additionally if we are able to track the bees' paths using OpenCV then we could be be able to distinguish the bees from one another.
- We might not be able to distinguish bees from other insects. But we assume that this implies only a negligible error.

III. Outcomes and Demonstration

At the end of this project we want to be able to count the bees entering and leaving the hive. Furthermore we want to track the bees using a single camera. At the end of the semester we will demonstrate the results with recorded videos, on which the bees' path is tracked.

References

[1] Justas Birgiolas & Christopher M. Jernigan & Brian H. Smith & Sharon M. Crook *SwarmSight: Measuring the temporal progression of animal group activity levels from natural-scene and laboratory videos* (Psychonomic Society, USA, 2016).