Application Note

BEECAM®

Collect video footage for
open-air flying insects counting

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1 INTRODUCTION

This application note describes how to set-up the BEECAM to collect appropriate video footage for aerial open-air insect counting using the AGATHE software.

2   OUTDOOR SETUP

2.1   Hardware installation

The BEECAM device must be placed at a minimum of 40 to 50 centimeters of the area you want to characterize. Because the image processing of the AGATHE software is mainly based on movement analysis, you should primarily care of parasitic effects caused by the wind (moving herbs, leaves, flowers) at the background of the area of interest. It is therefore strongly recommended to introduce a uniformly painted background between the scene and the foreground.
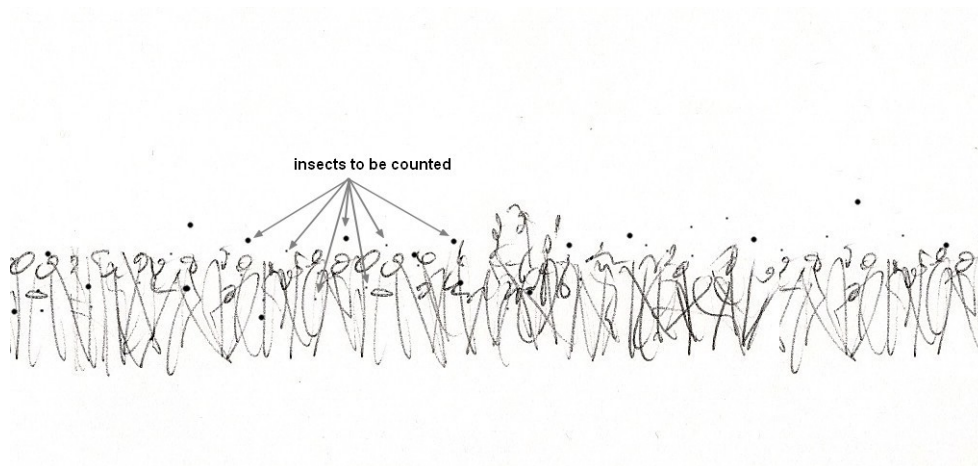
2.2   Example 1 – Open field counting

Figure 1: Possible outdoor scene

Fig.1 describes an area of flowers or vegetation where insects are flying in and out with no physical restriction. The objective of the study is to enumerate the quantity (density) of the insect population in this area as well as their movements. Therefore, we're gonna organize a bit the "scene".

Let's have a look at the Fig.2. The whole area has been separated into three different zones. The B zone would be the one of interest... we'd like to know how many insects are going in, out and whether they could stay in this particular site.
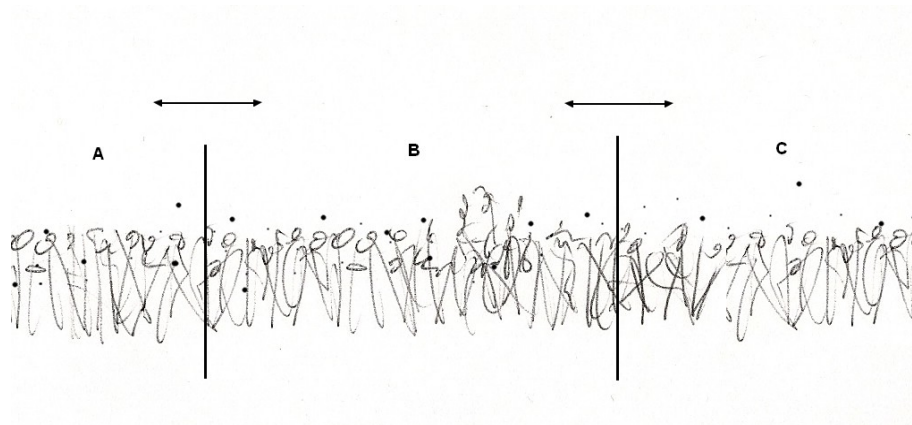
Figure 2: The place is organized into three different zones A, B and C.

As indicated in chapter 2.1, you should install your site to get minimum of interference.

However, as per Fig.2, it is very likely that the bunch of vegetation that you want to characterize will be highly affected by passing wind, even a little breeze, causing the leaves moving or oscillating.
One possibility, already successfully experimented, is described in Fig.3.
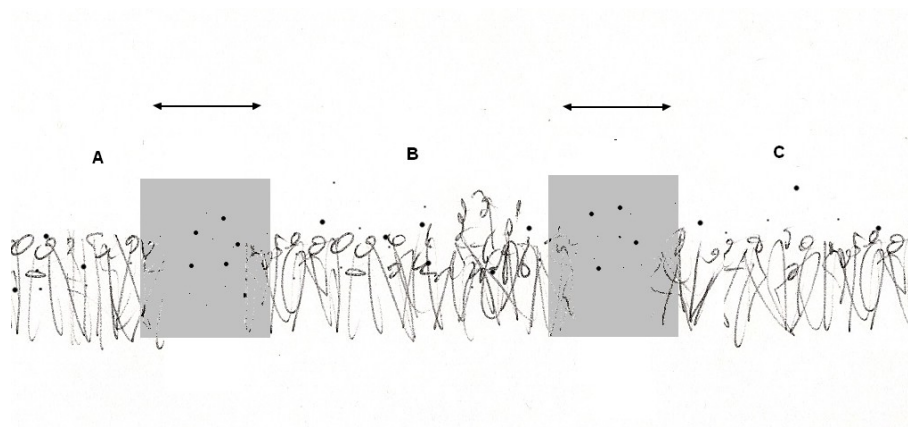

Figure 3: Transitions between A, B and C have been instrumented

When possible, a trench is prepared (vegetation is cut and removed, Fig.3) at the transition between the A, B and C areas. One gray panel is placed at a distance that is realistic with the migration flow of insect. Fig.4 gives a top view of the final set-up.
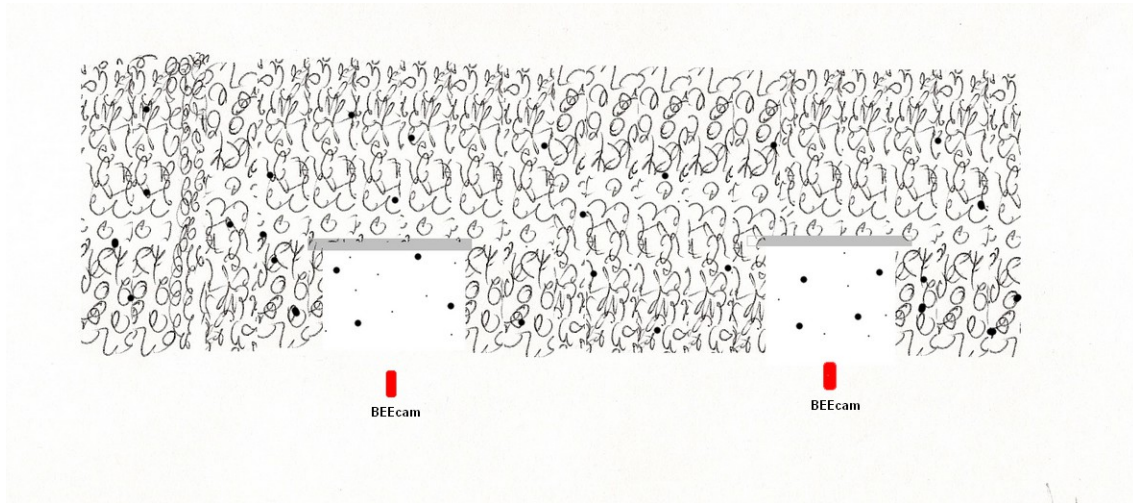
Figure 4: Top view of the area once preparation is finalized
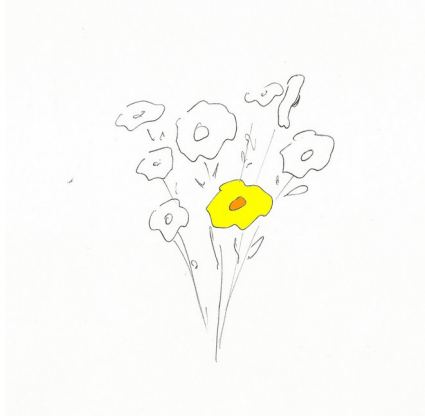
2.3   Example 2 – Flower visits

Figure 5: One flower out of a bench

In the example of Fig.5, we would like to know how many insects are visiting one particular flower (or area) of a bunch. The difficulty comes from the erratic movements caused by the wind. Even the shadow of the neighborhood might corrupt the footage.

Several possibilities can satisfy the objectives of counting[2] entering and exiting insects from the flower of interest.
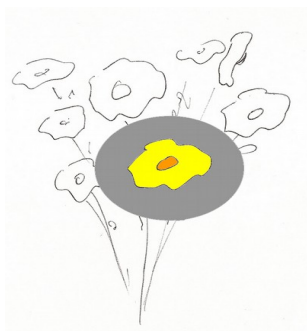

Figure 6: The bunch of flower once instrumented

The Fig.6 illustrates the final scene once instrumented. A little circular piece of gray material has been installed behind the flower of interest. Its size may vary but the larger, the better (cf. recommendations of page 4). It is also good to maintain the flower while shooting the video.

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2   With the AGATHE software, counting will accumulate, with no distinction, passing and/or stopping insects. Further details require data examination by dully experienced operator

3 DISTANCE AND AREA

The regular BEECAM is equipped with a 5Mega-Pixel image sensor. The lens of the sensor is fixed and not accessible. The focal plane is managed to get correct images from 50cm to infinity.

For a full resolution image, the lens gives:

- Horizontal field-of-view: 53°
- Vertical field-of-view: 40°

With these numbers, one can calculate the area that an image will correspond using the following equation (full resolution of 2591 x 1944) :

Width of the image (cm) = distance from the object x 0.906

Height of the image (cm) = distance from the object x 0.684

Example:
a distance of 1m from the camera will result in a shooting area of 90.6cm x 68.4cm. At this distance, one pixel will thus correspond to 0,34mm height and 0.35mm width.

4   SOME OBVIOUS TRICKS

Shooting photos or videos in outdoor condition is not a simple task. There are many various parameters that you will not control. One of them is light, which is probably the most tricky and important parameter that will make your shooting cession successful or definitively a waste of time.

Light does not simply affect the quality and the details of your shootings. It will also have direct impact on the quality of your study since it can literally affect the counting.

4.1   Shadow

For instance, let's imagine that you have installed the camera according to the tips given here-above. Everything seems fine but you have not considered the effect of the sun light.

For instance, have you verified the possibility that an insect could be counted twice because it projects its shadow on the gray panel?

What is true for the insect's shadows is also true for any other material, including the BEECAM.

4.2   Direct sun light

Have you considered that, at dawn, the light of the sun could be in direct view of the image sensor, providing so much light that, even with the optimum controls that the sensor has, the image will be saturated?

4.3   Weight and growth

At the beginning of the shooting, the fruit was perfectly aligned in the center of the image. But, with time, the apple grows and becomes so heavy that eventually, it disappears from the image...