

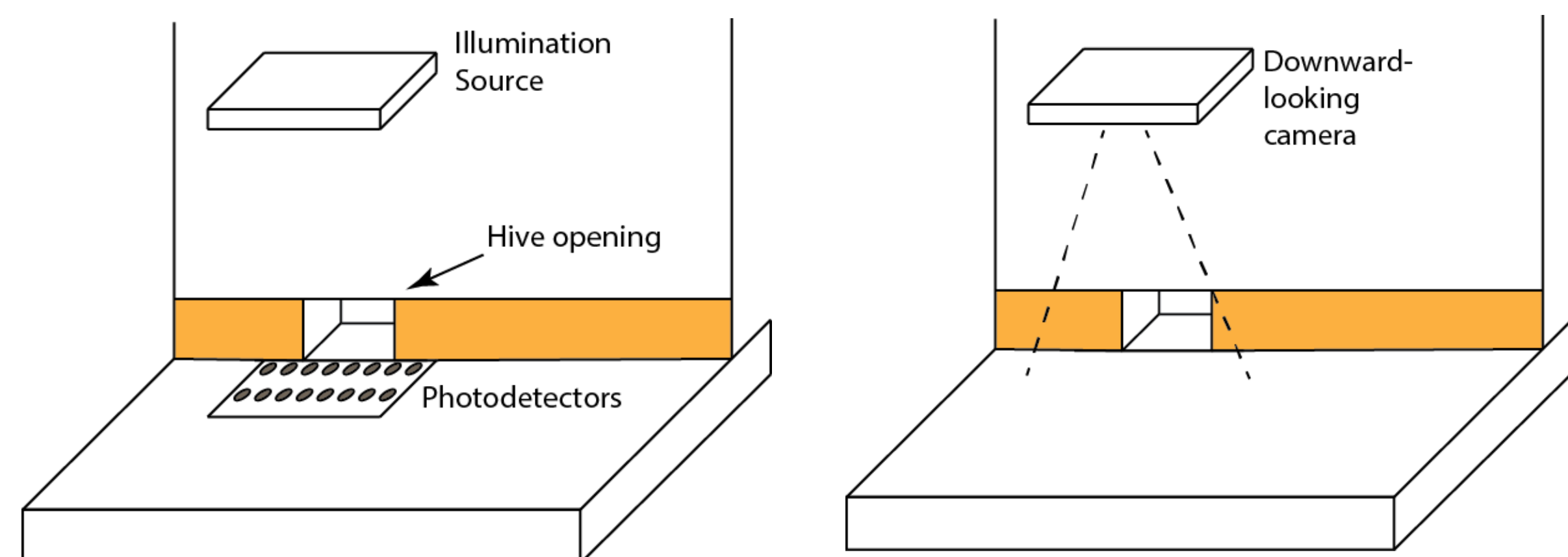
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## Motivation

- Colony collapse disorder is one of several phenomena that require close hive monitoring
- Beekeepers need better tools to estimate hive population
- Goal was to evaluate two alternate methods for counting bees and maintaining real-time population estimates

## Alternate approaches



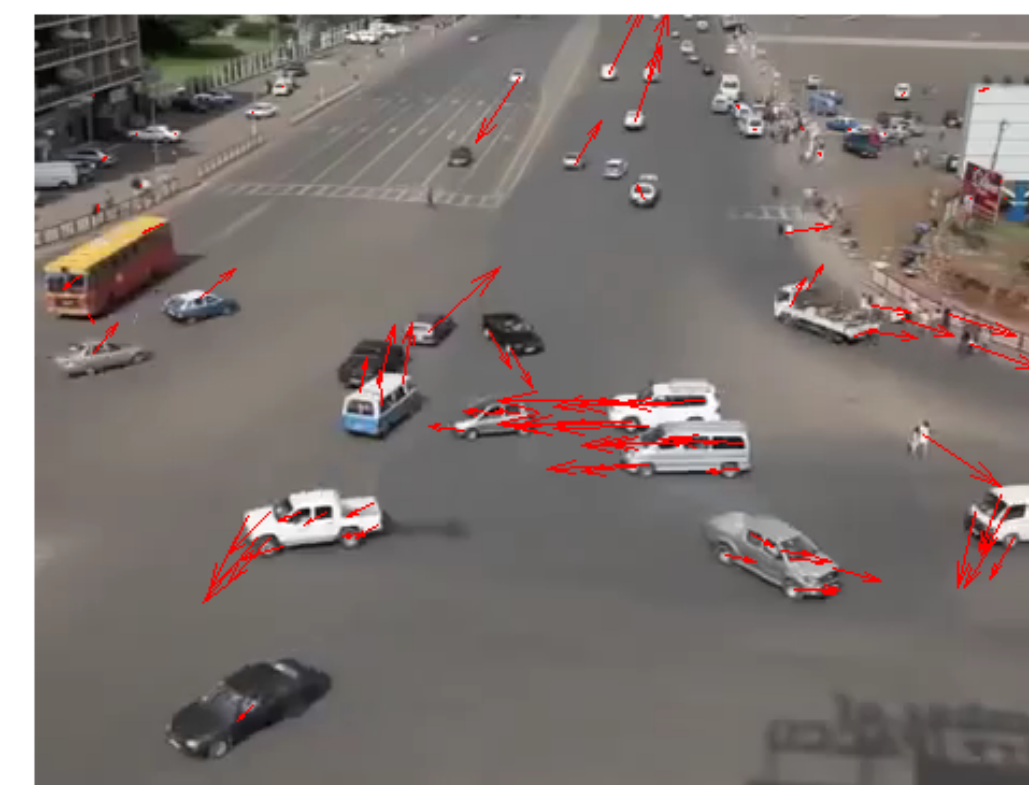
- One method is to use an array of photodetectors to detect bees entering or leaving the hive
- Another method is to use a higher resolution camera

## Pros and cons

- Photodetectors are less expensive and lower resolution
- Photodetectors are likely to be less accurate
- Many cameras have excellent resolution
- The processing requirements of video image processing are a challenge

## Solution

- Camera using optical flow algorithm can produce excellent results
- FPGA (Field Programmable Gate Array) can solve the processing issue



## Optical flow applied to a traffic application

Image credit: Mathworks (<https://www.mathworks.com/matlabcentral/fileexchange/48745-lucas-kanade-tutorial-example-2/content/LucasKanadeExample2/html/LKExample2.html>)



## Anticipated results from actual hive video



## Future research

- Can the same video be used to automatically monitor individual bees?
  - Parasites or disease detection
  - Measure effectiveness of foraging