

Analyzing Nestbox Images

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Problem: Automated Bird Detection

Saving Scientists Time

- Scientists sit for long hours in the forest recording the bird's nest entrances and exits

The *CENS network cameras* automatically sample bird activity images inside the nestbox, showing ground truth data of when the bird enters and exits the nestbox.

- Image processing techniques such as background subtraction used for bird detection

Frame differencing to detect bird entrances and exits
Edge detection to detect presence and absence of bird

Studying Bird Nesting Cycle Habits

- Bird Occupancy Durations per Visit**
 - Histogram of how often birds spend a certain amount of time inside the nestbox during different nesting periods
 - Nest building, Incubation, Post Hatching
- Testing camera sub-sampling rates for accuracy**
 - Instead of 1 second intervals with the wired camera, test X second intervals for bird detection accuracy of different sampling rates
 - Simulate sampling rates of a cyclops camera (10 – 15 minutes per frame) to determine accuracy of bird detection

Methodology: Bird Detection and Data Gathering

Bird Detection using Frame Differencing

Matlab & OpenCV



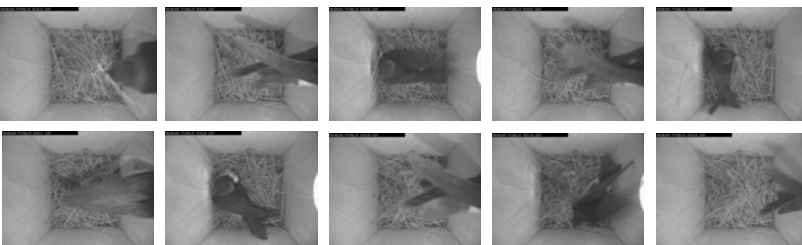
- Label the separate white regions as different objects
- If the number of white pixels exceeds a threshold, there is bird activity



Results: Detection Accuracy and Nesting Trends

Bird Detection Accuracy

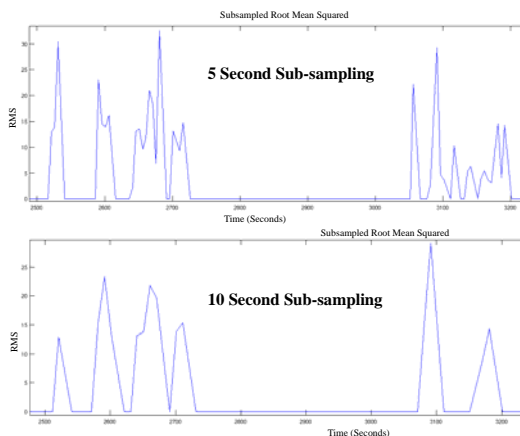
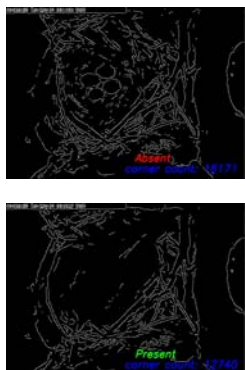
Bird Entrance & Exit Detection



- Bird enters on frame 44. Bird exits on frame 62.
 - Bird enters on frame 66. Bird exits on frame 89.
 - Bird enters on frame 91. Bird exits on frame 132.
 - Bird enters on frame 134. Bird exits on frame 151.
 - Bird enters on frame 159. Bird exits on frame 261.
- Entrance & exit times are recorded into a Matlab array
 - Bird occupancy duration times converts into histogram format and relevant data
 - Simulate sub-sampling rates on the wired cameras to predict cyclops camera behaviors

Sub-sampling of wired monochrome micro-video board camera with 6 LED I/R Illuminators

Edge Detection



Bird Occupancy Duration Histograms

