Bird detection and tracking from stationery camera videos

S M Towhidul Islam

Abstract

Realtime bird detection is important in several important applications such as aviation safety, wildlife surveillance, agricultural bird control and so on. In this project, I aim to detect birds from stationery camera videos and track the movement. To achieve this goal, First, I have extracted foreground from input video frame. Then, I filtered shapes which can potentially represent birds. Then, I have estimated motion using Kalman filter and visualized the tracking results on original video frames.

Problem Statement

The goal of this project is to detect birds from a stationery camera video and track the detected regions.

Approach

- First, I have applied gaussian mixture model-based foreground extraction

- Then, I find out group of connected pixel regions which represent different moving objects. Also, I computed different properties of each region such as area, bounding box etc.

- Then I filtered out the shapes which are not a potentially a bird shape. The filtering is based on criteria such as area of a detected region, height to width ration, shape of the connected region etc.

- Then, I estimated the motion of each region using Kalman filter and saved different information for each tracked region.

- Finally, I visualized detection and tracking results on original video frame.

Results

I tested the system with different input videos containing moving birds. The videos contain different types of birds moving/flying in different outdoor environments. A few of the detection and tracking results is shown in the figure below –
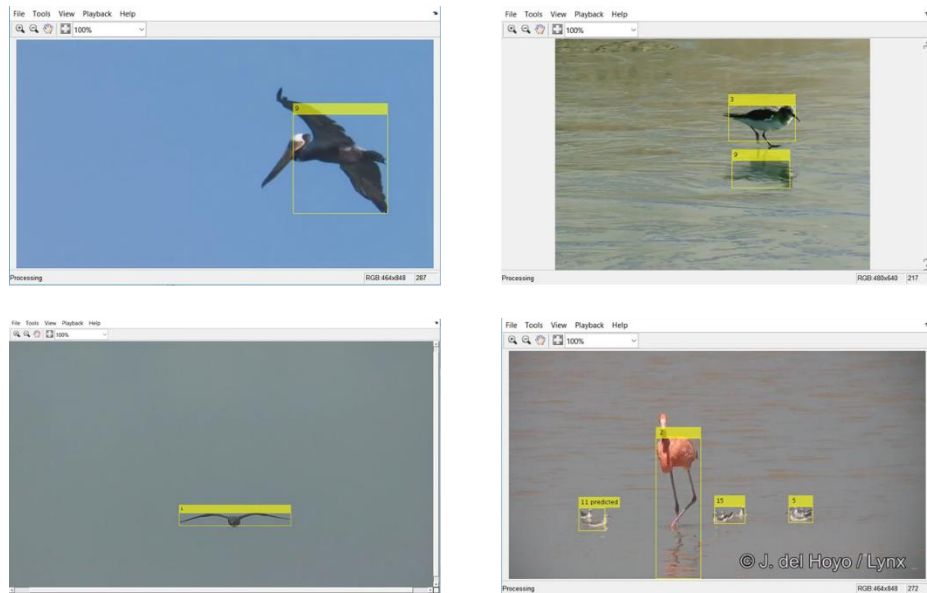
Results based on different input videos

References

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4. Shakeri, M. and Zhang, H. (2012). Real-time bird detection based on background subtraction. Proceedings of the 10th World Congress on Intelligent Control and Automation.

5. Motion-Based Multiple Object Tracking, https://www.mathworks.com/help/vision/examples/motion-based-multiple-object-tracking.html

6. VB100 Video Bird Dataset, http://arma.sourceforge.net/vb100/