Variables Used to generate data for each ball:
- bgr_color = 29,2,128
- color_threshold = 50
- cv2.erode(mask, None, iterations=1)
- cv2.dilate(mask, None, iterations=1)
- radius > 10
- *bgr for analog = 129,119,195

Description:
- The color was chosen using a screenshot, then using online color detectors to get that RGB combination.
- The rest of the measurements were chosen by trial and error.
- For the Kalman filter, noise = 1, measured variance = 1, and sensor variance = 1 for non-noisy videos and 4 for noisy videos.
- The initial variance is assumed to be 1 (I assume to be accurate).
- The position at every frame calculated by Kalman filter is a combination of measured position (by sensor in the video) and the predicted position based on the velocity of the ball.
- The velocity is the length of the window divided by the total number of frames.
- The variance at every position is also updated using noise and Kalman gain (see equation on Kalman Filter)
- True Variance for every sensor is calculated this way:
  - *[numpy.std(deltaX)]^2*, where *deltaX is a list containing ($x_{sensor} - x_{ball1}$)* at every time-frame.
- The graphs in blue are respectively the Kalman Filter and Variance over time recomputed with the true variance.

About the data for every video (next pages):
- Note some balls were moving left to right and others right to left making the data point in different directions.
- The bolded red line graph represents the position of the ball vs time graph.
- The graph with the Kalman filter (non-true variance) has a black line (Kalman Filter) and a red line (sensor result)
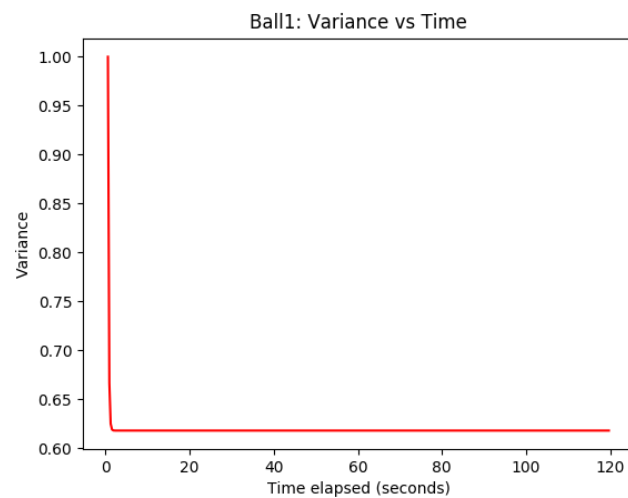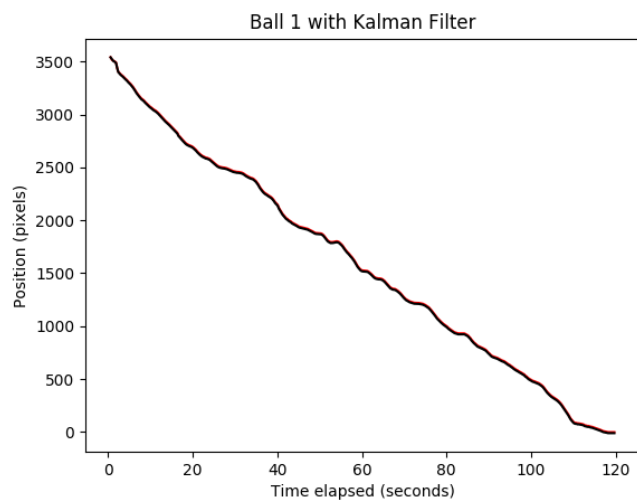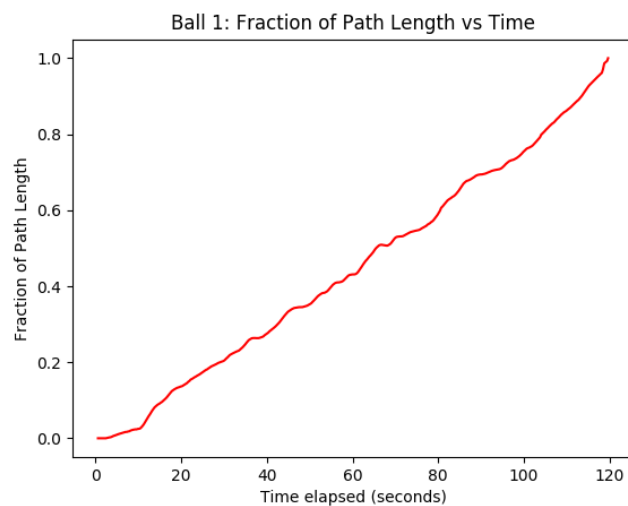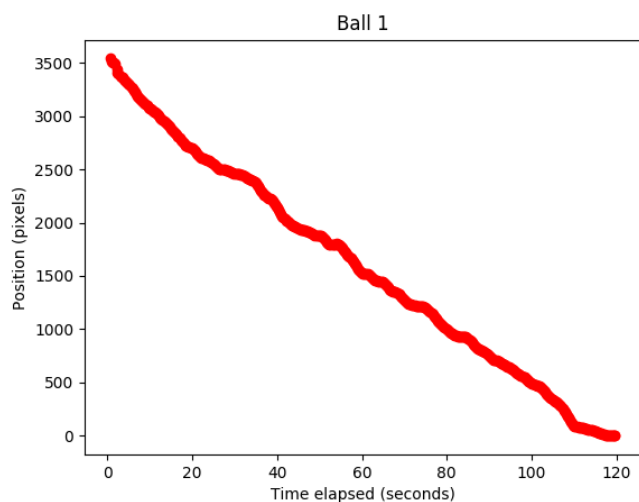
Number of Frames (used to compute the velocity):
- Ball1:   416
- Ball1-noise: 351
- Ball1-quake: 351
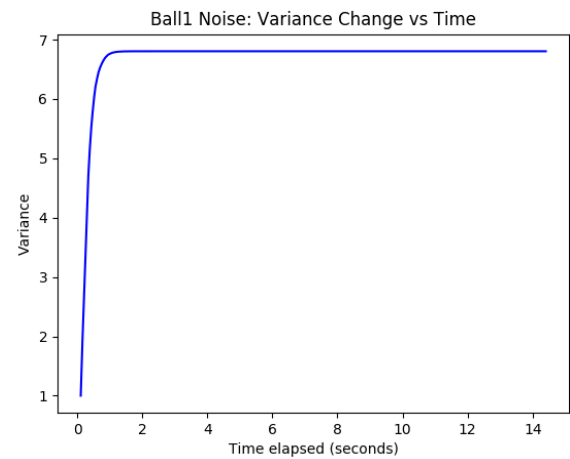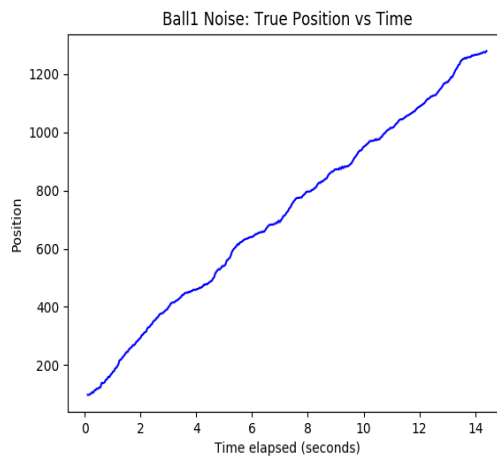- Ball1-analog: 351
- Ball2-verywatery: 524
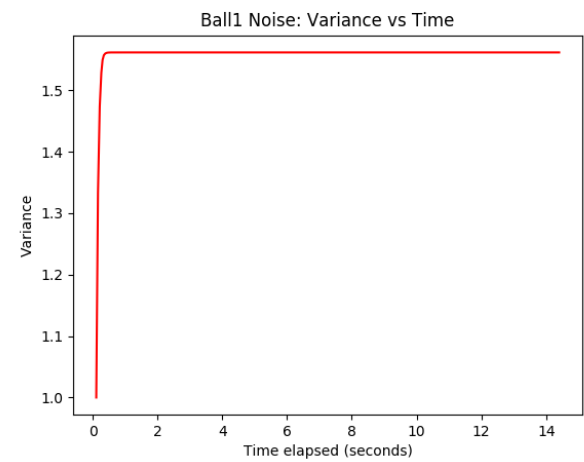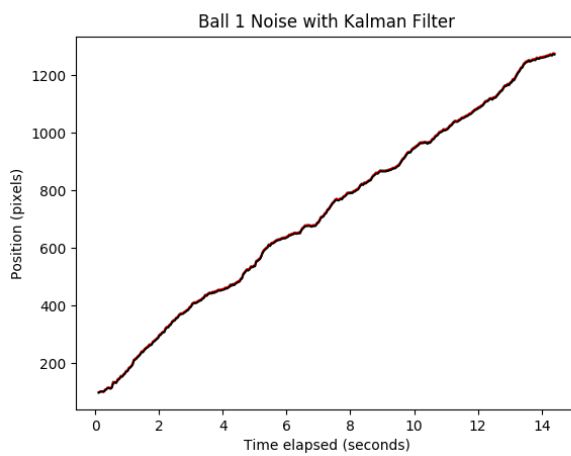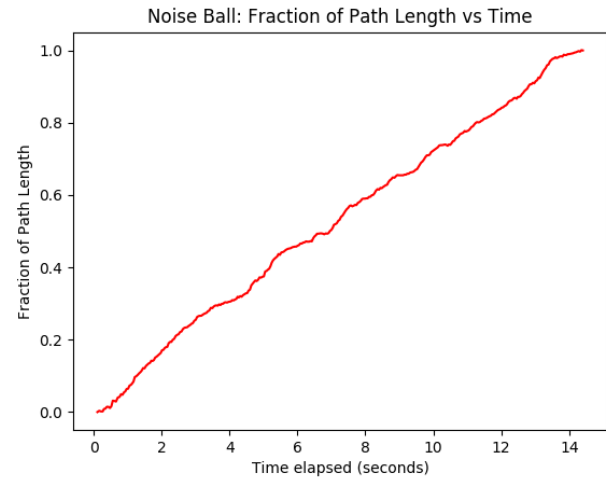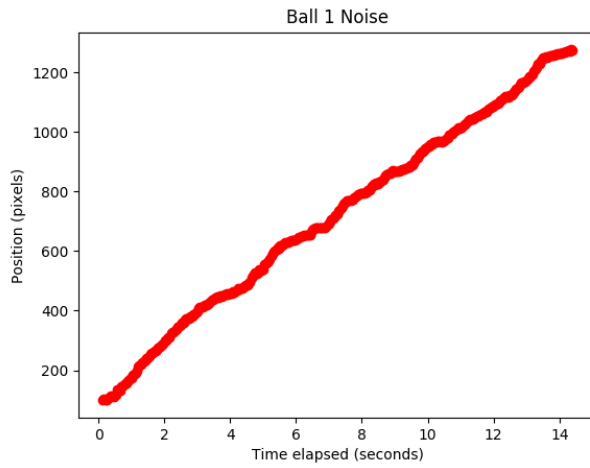
True Variances:
- Ball1:   -   (used as base case)
- Ball1-noise: 53.11016639776367
- Ball1-quake: 125.01505453958961
- Ball1-analog: 50.22677280756053
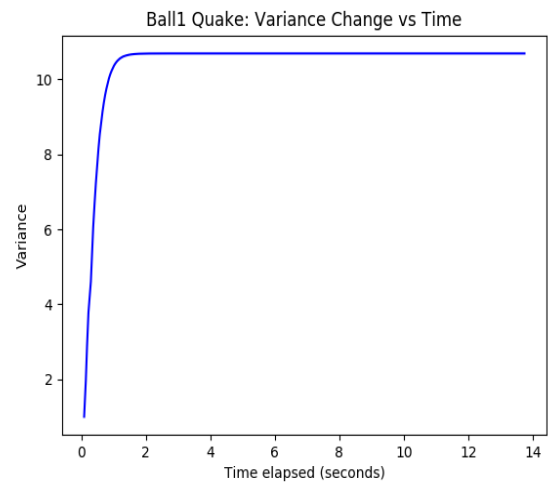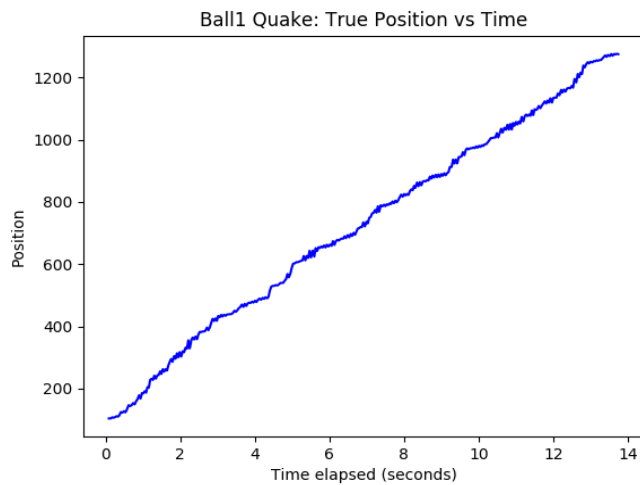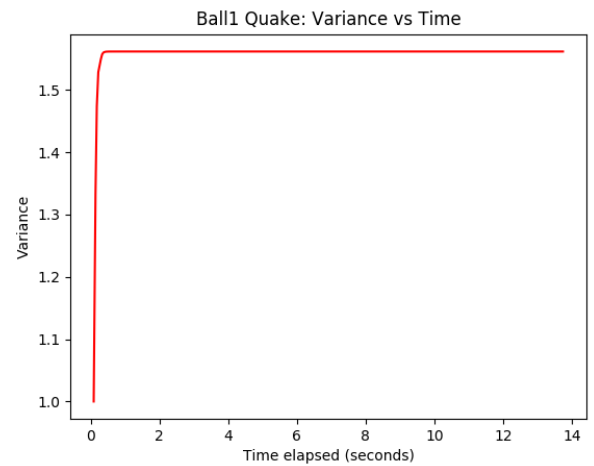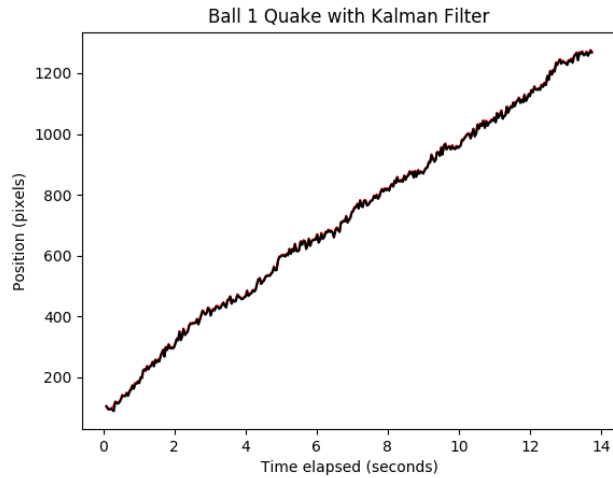- Ball2-verywatery: 83 791.65209996712

Ball1 (no noise):
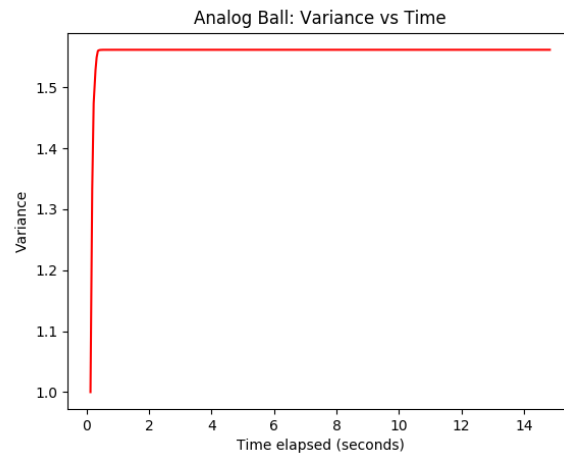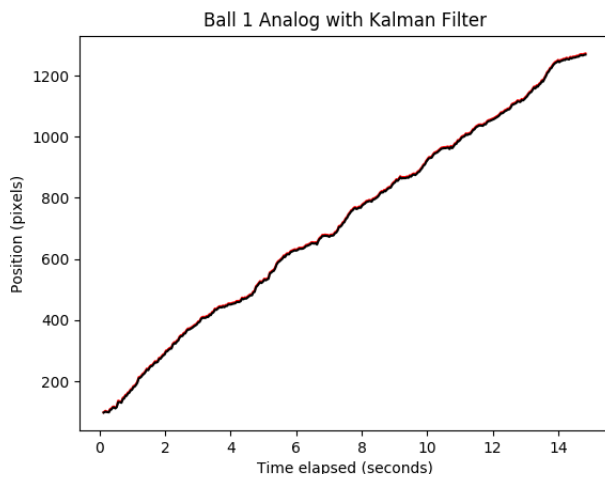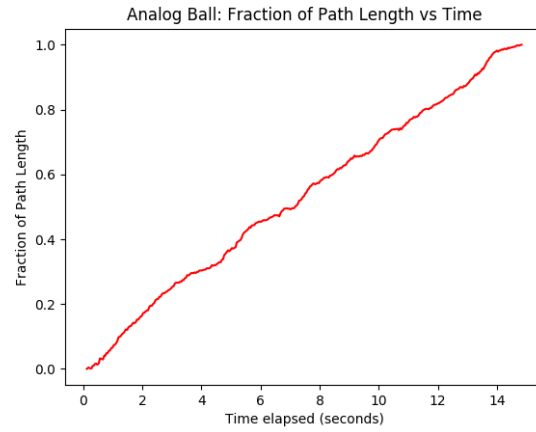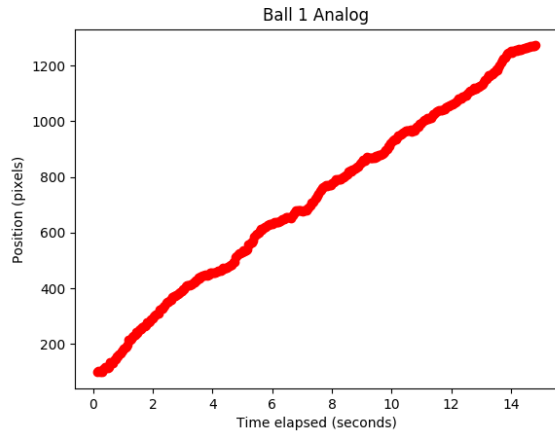
Ball1 with noise:

Ball1 with quake:
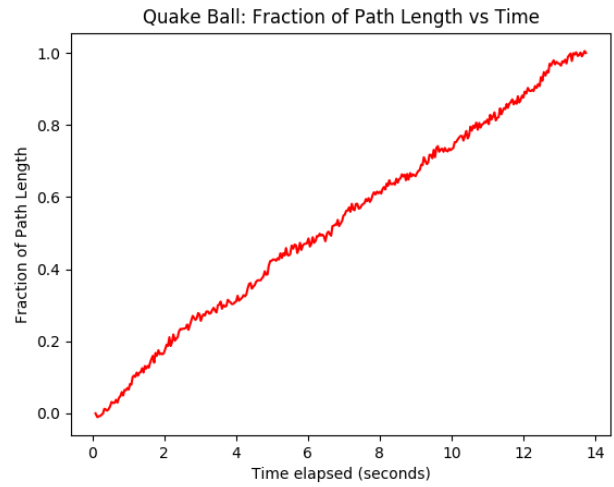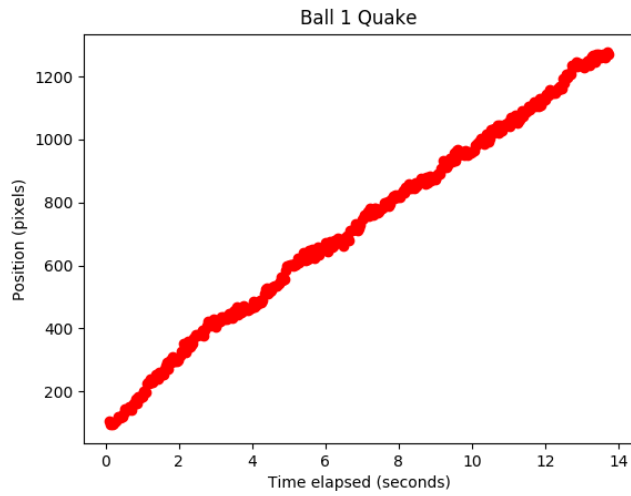
Ball1 with analog:

Ball2 Very Watery:

Ball2 Watery: True Position vs Time

Ball2 Watery Variance Change vs Time