Ball Trajectory Prediction

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Tracking method:

Tracking was used through by smoothing the frame and then converting to HSV (Hue,Saturation,Value), and thresholding the image to the specific needed color, therefore the result is a binary image containing blobs as foreground, indicating the color needed, and any other color as background. Since there might be unneeded blobs, or the needed blob is somehow deformed, due to the thresholding process, the 2 methods Erode and Dilate are used to fill the deformed blobs and remove the unneeded ones. Then the operation of finding the needed blobs is done through finding the blob with the largest area, which is done through using the method findContours. After the largest blob is found it is passed to the method minEnclosingCircle, which gives back the center and radius of the circle in the blob.

Trajectory Prediction method:

Predicting the ball's path was based on the kinematics equations of the projectile motion. The initial velocity is calculated through getting the difference in displacement between 2 points. Then through using euler's method a polygon illustration of the projectile path can be generated, and then used to display the path of the ball. It is generated through calculating the next position using my current position and the velocity that the ball would be moving with a certain time speed, which is the velocity previously deducted. Then the next velocity value is

calculated through the current acceleration and time, which indicates the velocity the ball would be moving in the next step. Accordingly the projectile path can be estimated with repeating the previously stated method multiple time in each frame.

Limitation

- Tracking only a single ball, since the image is being thresholded from the beginning based on a specific color.
- False matching to different object of the same color.

Solution:

- Kalman filter can be used for tracking more than a single object.
- Background subtraction can also be solver for the tracking of multiple balls.

Team members part:

Baher: Created the tracking and detection of the ball using color thresholding.

Heba: Created the trajectory prediction of the ball using the kinematics equations.