Ball Speed

```
┌─────────────────┐
│ Video Capture,  │
│ read camera     │
└─────────────────┘
        │
        │  bol, frame
        ▼
     ◇ if bol not false ◇ ──False──> Cam unavailable
        │
        │ True
        ▼
┌─────────────────────┐
│ (multiple frame     │
│ encountered, track  │
│ of frames count -   │
│ average speed)      │
│ set frametime       │
│ counter             │
└─────────────────────┘
        │
        ▼
┌─────────────────────┐
│ Apply colour        │
│ threshold and find  │
│ countors (To take   │
│ only ball circle    │
│ outline)            │
└─────────────────────┘
        │  Binary maskfirst,
        │  ci first
        ▼
┌─────────────────────┐
│ drawing a rectangle │
│ to find ball        │
│ position            │
│ (for horizontal     │
│ movement x, for     │
│ vertical movement y)│
└─────────────────────┘
```

x, y, w, h

◇ [if ball one position found store (x) in current, current will be updated from none to one value; when current is not empty store current to previous] is current not None? ◇ ──False──> store x in current

True

```
┌─────────────────┐
│ store current   │
│ in previous     │
└─────────────────┘
```

calculate distance between current position to previous position by taking diffrence

adding every distance of change in position(x)

find sum of all distance - average speed distance

find distance for only current and previous position - instantaneous speed distance

find time for all position - average speed time
find time for only current and previous position - instantaneous speed time

average speed calculation = average speed distance/ average speed time
instantaneous speed calculation = instantaneous speed distance / instantaneous speed time

display text average speed calculation

display instantaneous speed calculation

1. Start camera, ball circle alone required omit other background by thresholding and finding contours (outline of closed circle).

2. Draw rectangle to get x

3. x for horizontal movement using center(x) of a rectangle

4. for example ball moved a -> b -> c -> d -> e ->f
  distance calculated by subtracting a(previous) with b(current); -> b(previous) with c(current); -> c(previous) with d(current); -> d(previous) with e(current); -> e(previous) with f(current);

thresholded time = 30 frames (or 30 'horizontal x' movements) for 1 second; find time for 6 frames or (6 'horizontal x' movements);

$$\frac{30}{1} = \frac{6}{x} => x = \frac{6}{30} = \frac{1}{5}$$

for average speed add all the computed distance

$$\frac{}{\text{time calculated using thresholded time}} = \frac{(a-b)+(b-c)+(c-d)+(d-e)+(e-f)}{1/5}$$

5. for instantaneous speed
thresholded time = 30 frames (or 30 'horizontal x' movements) for 1 second; find time for individual frames or (individual 'x' movements current and previous);

$$\frac{\text{individual distance of current and previous}}{\text{time calculated using thresholded time}} = \frac{(a-b)}{1/30} \quad \frac{(b-c)}{1/30} \quad \frac{(c-d)}{1/30} \quad \frac{(d-e)}{1/30} \quad \frac{(e-f)}{1/30}$$