Ball Speed Calculation Using Image Analysis

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Experiment Setup

- Ping-Pong ball speed is calculated using image analysis.
- Ball speed is analyzed by distance travelled by the ball in captured frames

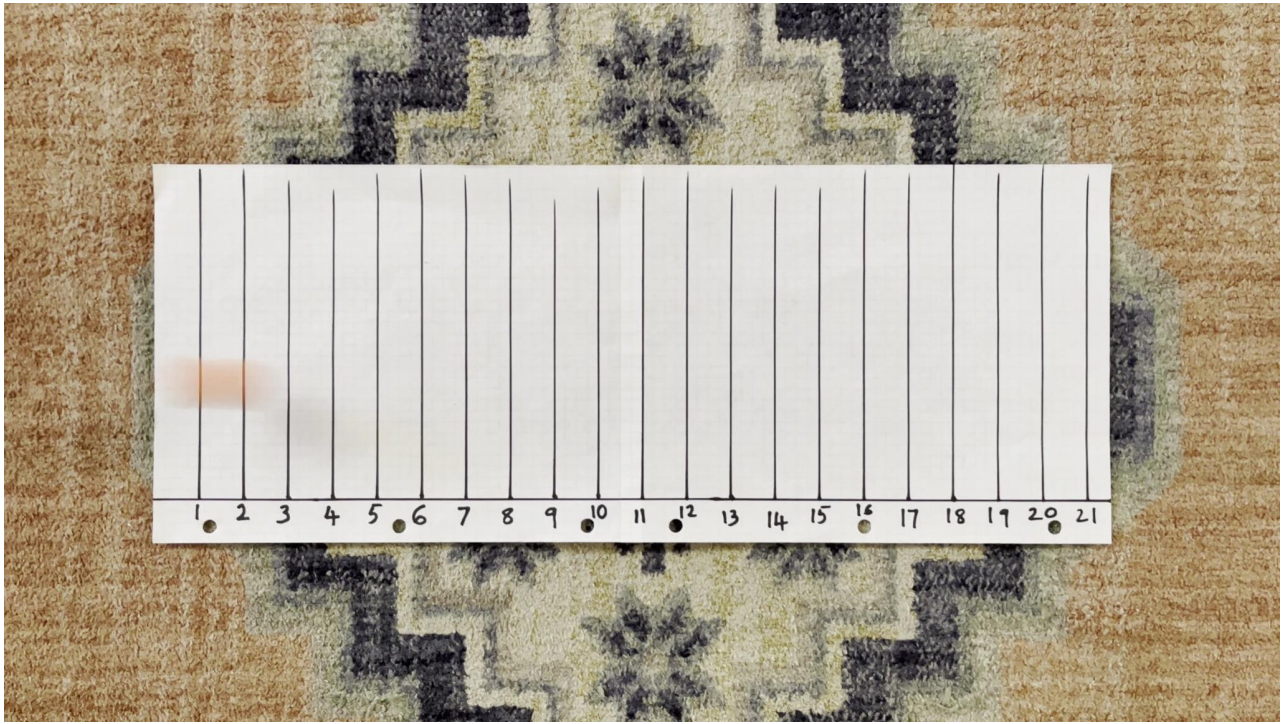
- Paper scale with one inch incremental lines is prepared
- Ping-Pong ball is hit and the video of the moving ball is captured at 60fps
- Video is transferred to computer and is analyzed using python opencv
- The experiment is repeated 20 times

Frame Analysis for one trial

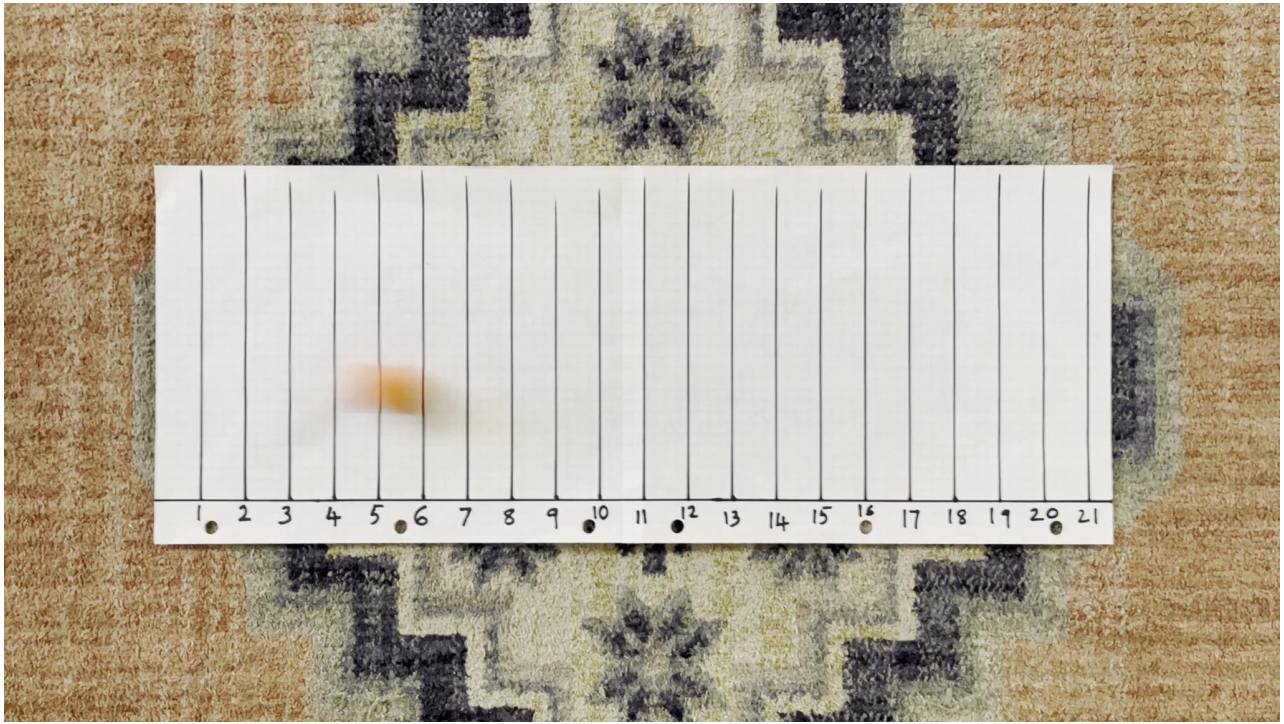
- After transferring the video (60 fps) to the opencv program, video is analyzed frame by frame
- The first frame when the ball enters till the last frame when the ball leaves are visually analyzed (following 8 slides)
- Based on the number of inches passed and the frame count taken, the speed is calculated for that trial
- In the following images, ball moves 19 inches(21 - 2) in 7 frames (frames 53 - 60)
- The speed in this example is 19/7 ≈ 2.714 in/frame

  = 162.85 in/sec = 13.57 ft/sec

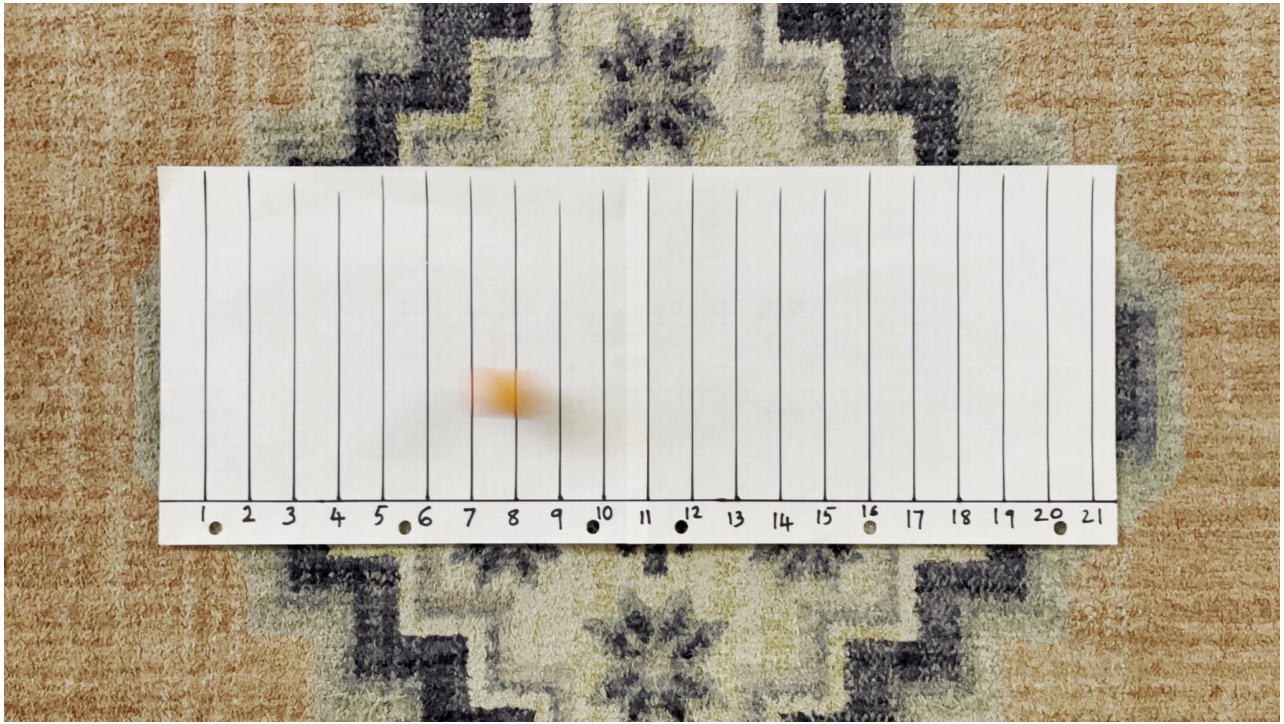
Frame 53



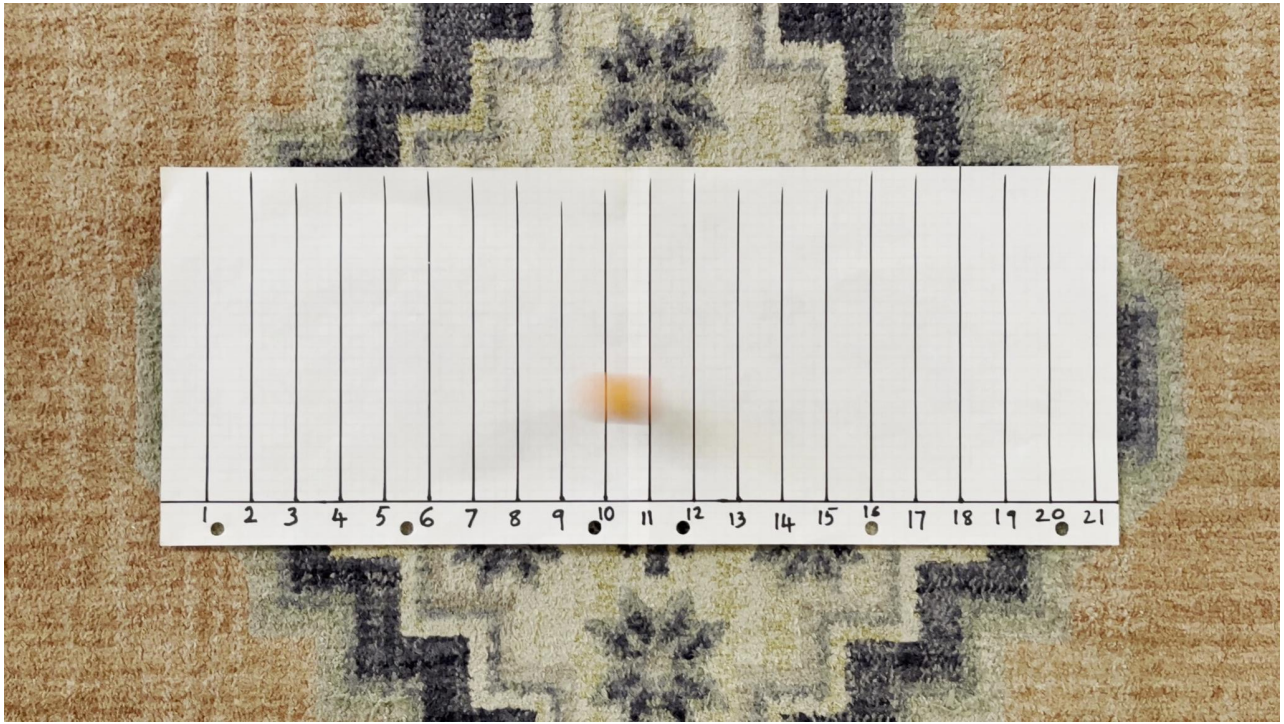
Frame 54



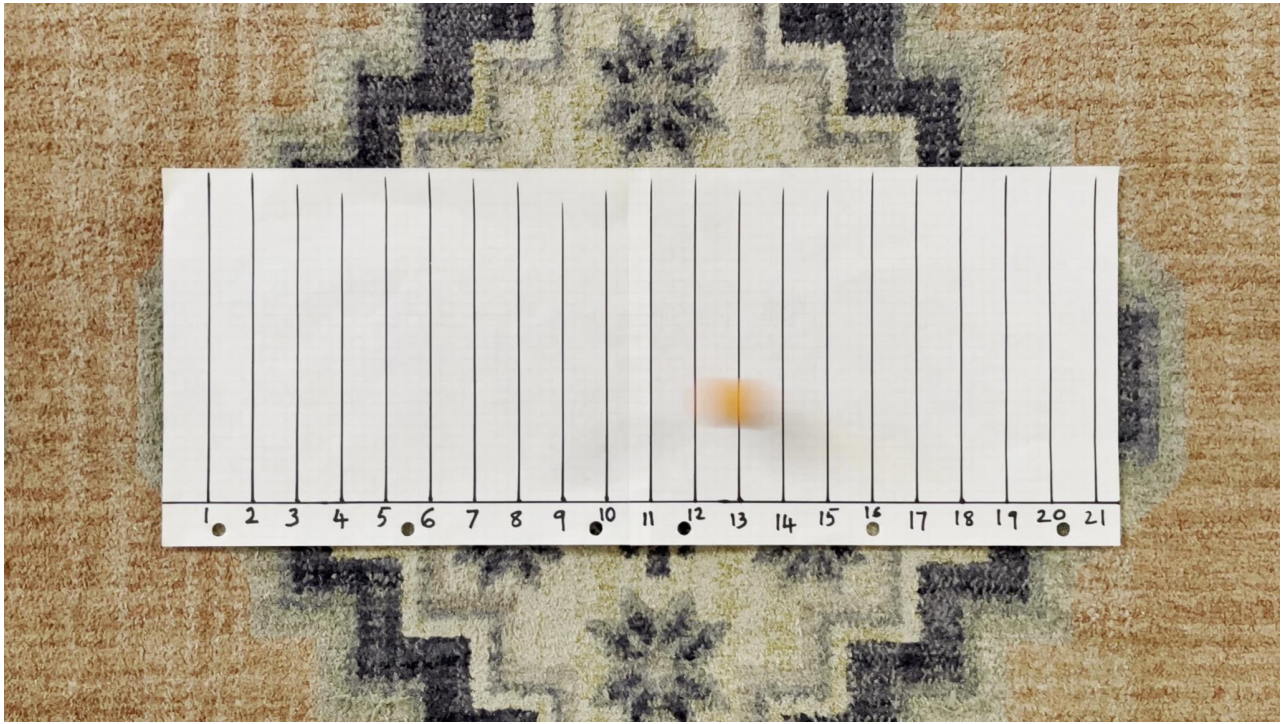
Frame 55



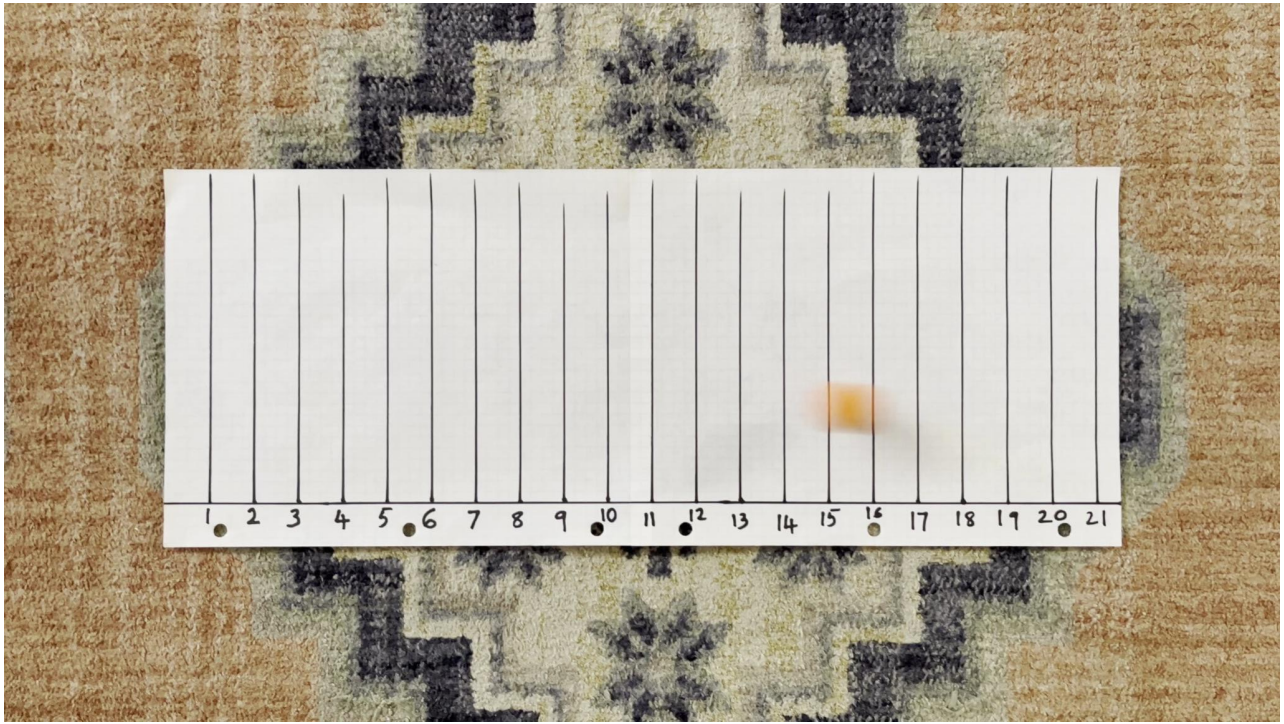
Frame 56



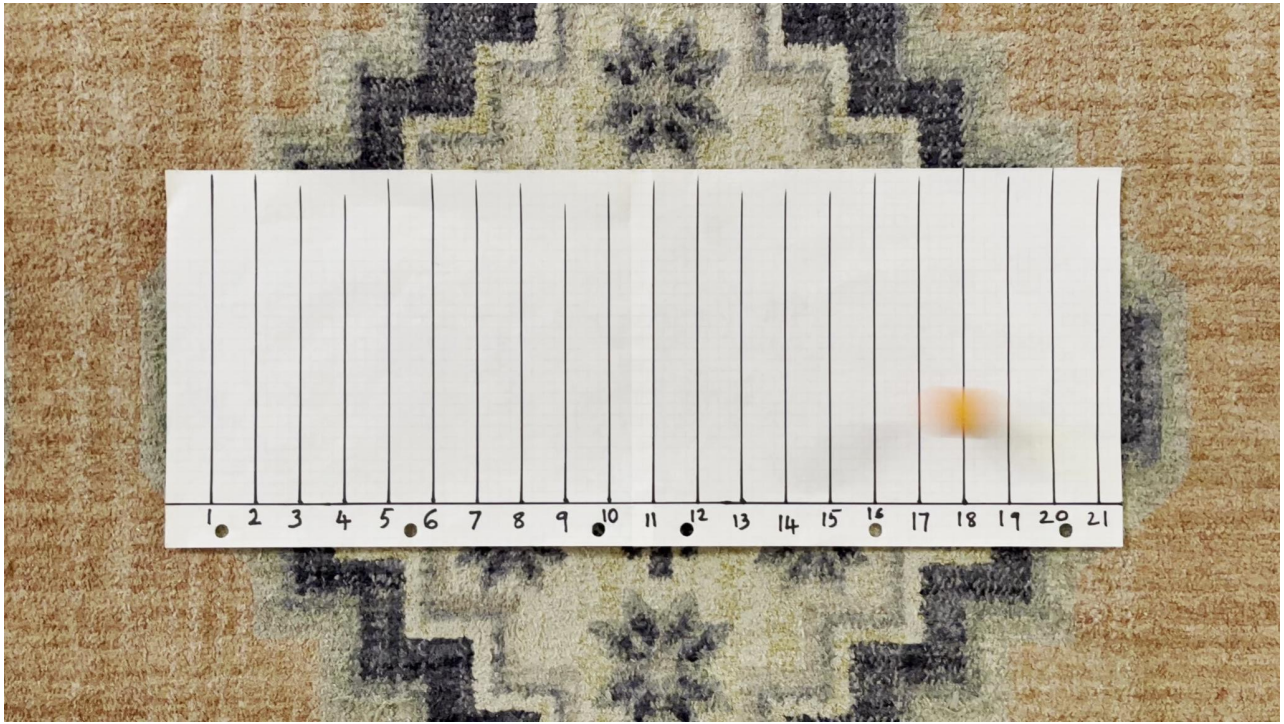
Frame 57



Frame 58



Frame 59



Frame 60

Experiment Summary

- Speed per frame for each trial and average
- The details of the speed calculations are explained in **Slide 5**

Trial	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	**AVG**
Value	2.83”	2.68”	2.92”	2.86”	3.04”	2.63”	3.08”	3.13”	2.68”	2.86”	2.59”	3.00”	3.04”	2.14”	2.79”	3.15”	2.79”	2.68”	2.50”	2.64”	**2.80”**

Speed Calculation

Average speed per frame for each trial = 2.80”

fps = 60

Average speed per sec = 2.80 * 60 / 12 ft/sec = **14.00 ft/sec**

Average speed per hour = 14 * 60* 60 / 5280 = **9.55 miles/hour**