Body Kinetics Using High-Speed Imagery

Department of Mathematics and Computer Science

Logan Hoepfner, Ashley Maurer, Laura Salas, Emily Sheetz, and Dr. Michael Sostarecz

Phantom v9.1 High Speed Camera

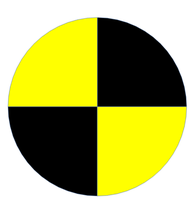
3 GB of RAM

Full Resolution:
1632 x 1200 Pixels
1000 FPS
1.5 Seconds

Introduction

Body movements can be tracked in high speed videos using TEMA tracking software. Tracking body positions and movements could help athletes improve their form and technique. Quadrant markers were used to track the joints and other positions on the body, making the data more accurate.

Logan Hoepfner ’19 and Professor Sean Schumm performed various exercises including an arm chop, a jumping jack, and a squat.



Applications

This project served as an exploration to potential future research. This research can be used in different fields of study, including sports, exercise science, and kinesiology. The programs provide quantitative data allowing for more descriptive analysis of body movements.

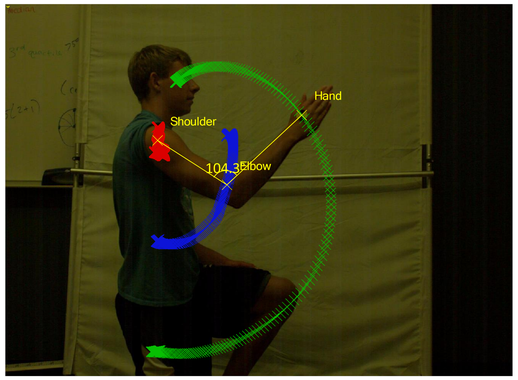
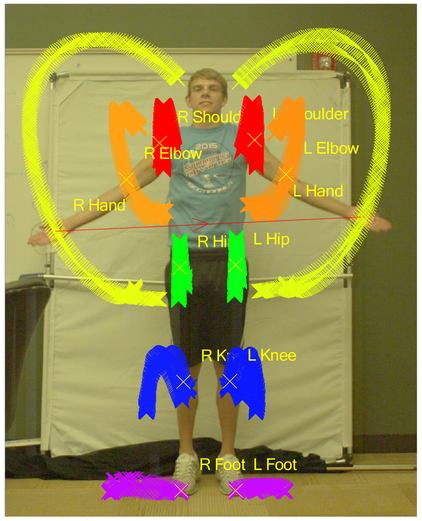


Image Analysis

FIGURE 1

The TEMA tracking software tracked the position of the shoulder, elbow, and hand during the arm chop. Because the markers used to assist tracking are placed at the joints, the angle in the elbow could be found as a function of time (Figure 1).

The position of the jumper’s feet, knees, hips, shoulders, elbows, and hands during the jumping jack were tracked. Figure 2 shows the distance between the hands measured as a function of time.



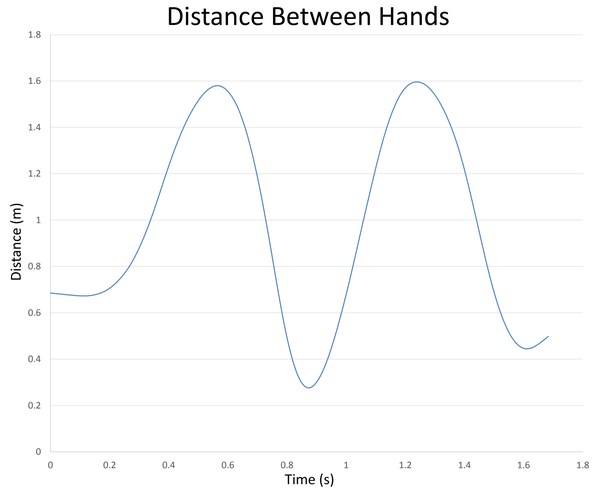


FIGURE 2

Improper

For the squat, the weight lifter’s ankle, mid-calf, knee, mid-thigh, hip, and the end of the bar were tracked. Shown are two trials, demonstrating the difference between improper and proper lifting form. This data could be applied to weightlifting because technique and body position are of utmost importance to make a heavy weight easier and safer to lift.

Proper