Senior Project-Computer Science-2014

Evaluating Body Posture and Ball Trajectory to Determine Fastpitch Softball Pitch Types

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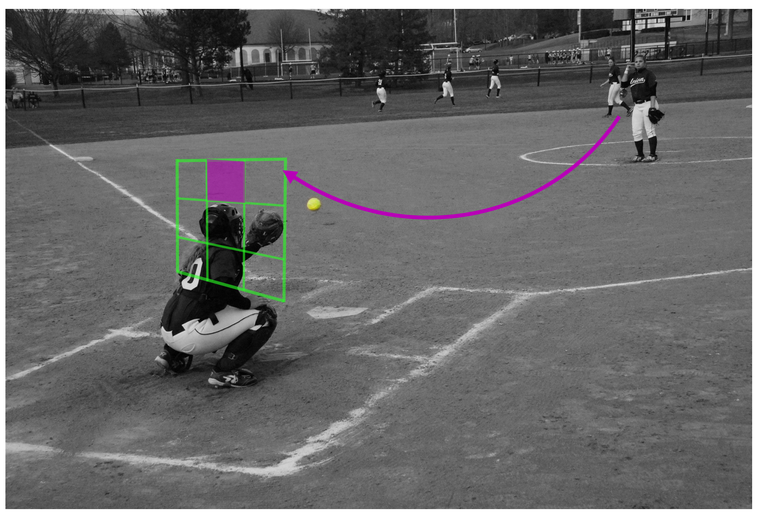
Objective:

Build an instructional system that accurately determines the pitch type of a pitch that was thrown by evaluating the pitcher's body posture.

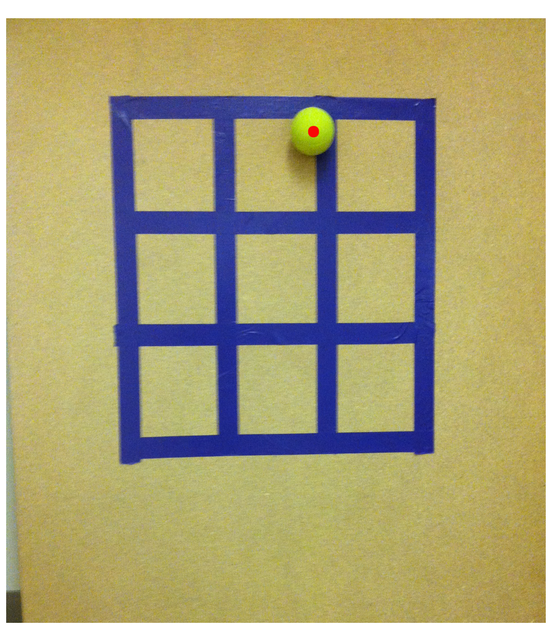
Background:

Elite fastpitch softball pitchers throw between three and seven different types of pitches. A pitcher's body posture varies for each pitch in order to move the ball around the strikezone. It is difficult for an untrained eye to see these subtle changes in body posture.



Above: Riseball location in strikezone

OpenNI Skeletal Tracker and Theta/Phi values



Above: Picture taken by Kinect of a riseball

Process:

Collect data on 15 joints of the body with the Kinect (head, neck, torso, etc...)
- Train multi-instance classifier on 14400 instances of all joints--100% accuracy
- Train multi-instance classifier on one set of 14400 instances using a different set of 14400 instances (recorded from a second pitcher)--100% accuracy

Generate Theta and Phi pair values for four joints
- Relational space accounts for joints in different planes, but have the same angle
- Train with multi-instance classifier--100% accuracy

Decrease the number of instances to 7800
- Train with multi-instance classifier (all joints and Theta/Phi)--100% accuracy
- Train with multi-instance classifier using only Theta and Phi values--100% accuracy
- Train first 7800 instances with classifier--83% accuracy
- Train last 7800 instances with classifier--100% accuracy
  - The end a pitch is more distinguishable

Collect audio data with USB microphone
- Take a picture of the strikezone at the time of the maximum sound (ball hitting plywood board strikezone)

Future Work:

- Compiling a statistics book from the data collected by the system.
- Finding the location of the ball's center point within a grid.
- Tracking the ball into the strikezone and turning the Kinect into a radar gun to evaluate speed.