Personalized Instruction of Physical Skills with a Social Robot

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Alexandru Litoiu
- 3rd year PhD Candidate
- Social Robotics Lab, Yale University
- Interested in building robots that can coach physical tasks
- Started project a couple of months ago
- Canadian!
A Novice Tennis Serve
An Expert Tennis Serve
An Expert Tennis Serve – Slow Motion
Socially Assistive Robots for Coaching Physical Tasks

How do we deliver advice to effectively induce a transformation from incorrect human movements into correct human movements?

- Help children to become more physically proficient
- Children that are more physically proficient are more likely to be more physically active [1] [2]

- Assist rehabilitation patients to perform complex motor tasks

Application Domain: Teaching Children to Shoot a Basketball

- **Reliable supervisory signal**
  - Clear score/no score

- **Simplified perception**
  - Free throw from same spot – perception system stationary

- **Automated Coachability**
  - Repetitive motion enables system to learn and give recommendations
  - Ball in hand – do not need to change motion based on a pitch, i.e. baseball
Experimental Setup

Nao Robot

ShotTracker Net Sensor

Kinect Sensor

10 feet

15 feet
Perception of Joint Angle Time Series Using Kinect
Right Knee Time Series

KneeRight

degrees

frame number
A First Pass Approach For Physical Skills with Supervisory Signals

- Converge your shot to a reference trajectory
- Understand the participant and be useful, as quickly as possible
Communicating Advice – Demonstrations
How do we deliver advice to effectively induce a transformation from incorrect human movements into correct human movements?

- Help children to become more active
- Help rehabilitate recovering stroke and spinal cord injury patients

Started creating a system to coach supervised motions such as basketball

- Created a PROBLEM module
- Collected data for and investigating machine learning approaches for PRIORITIZE
- In advanced stages of creating demonstration COMMUNICATION module