INDEPENDENT STUDY PROPOSAL

Student's Name: Matthew Fuss

Course Number: EEEE 799

Title of Proposal: Data acquisition and analysis of human motion

Faculty Sponsor: Dr. Dan Phillips

Date of Student's Application: January 10, 2022

Number of Credit Hours: Fall: N/A   Spring: 3

OBJECTIVES

- Develop video and body worn sensor-based analysis necessary to correlate optimal motion with desired result of activity based on the work of Chen et al (Chen 2017) and Guo et al (Guo 2016)

- Create algorithm for providing user feedback to improve performance of activity.

- Development of smart-phone application that performs analysis, data management and reporting.

DESCRIPTION OF PROPOSAL

The development of a "Unified Sports Basketball Shot Trainer" has been proposed that uses video and body worn sensors to acquire and analyze various parameters of a subject's motion while shooting a basketball to determine what can be changed to improve the player's shooting percentage. These motions and parameters include variables such as arm trajectory, direction of shot, angle of shot, and acceleration of body elements.

The objective of this independent study is to research, implement and develop the data acquisition, analysis, and feedback methods necessary to design and test a battery powered prototype system capable of performance assessment and feedback that could be utilized in the Unified Sports program to improve the shot accuracy of basketball players with varying abilities and challenges. Evaluation of progress towards the stated objectives will be carried using a smart phone-based system that is wirelessly connected to body worn motion sensors.
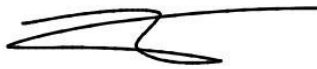
METHODS OF EVALUATION

1. Weekly update meetings (5%)
2. Generation of plan of work including timeline, deliverables and milestones (5%)
3. Generation of system performance requirements and specifications (10%)
4. Development of functioning prototype hardware and software (40%)
5. Generation and execution of assessment protocol of prototype (20%)
6. Complete documentation of prototype system and assessment results (20%)

GRADING: (+/- grading will be considered)

- Greater than or equal to 90% A
- Greater than or equal to 80% but less than 90% B
- Greater than or equal to 65% but less than 80% C
- Greater than or equal to 50% but less than 65% D
- Less than 50% F

Chen, Z., Zhu, Q., Soh, Y. C. & Zhang, L. Robust human activity recognition using smartphone sensors via CT-PCA and online SVM. *IEEE Trans. Ind. Inf.* **13**, 3070–3080. https://doi.org/10.1109/TII.2017.2712746 (2017).

Guo, H., Chen, L., Chen, G. & Lv, M. Smartphone-based activity recognition independent of device orientation and placement. *Int. J. Commun. Syst.* **29**, 2403–2415. https://doi.org/10.1016/j.gaitpost.2010.09.0200 (2016).

_____ Date __1/10/22____

Student's Signature

Daniel B. Phillips (_____) _____ Date _18 Jan 2022_

Approved by Faculty Sponsor

Ferat Sahin (_____ Date _____

Approved by Department Chair