

智慧棒球(AI-Baseball)技術情蒐分析系統

An Information Collection and Analysis System for AI-Baseball

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This project aims to develop an AI-Baseball Data Analytics System, mainly for advanced technical and tactical analysis, which will also cover other sports where necessary. This is a long-term project, and we organized the team to start from basic technology development and integration in 2019-2020, under a very limited funding. The research team includes IC and AI-experts from the College of EECS, sensor/actuator experts from the College of Engineering, and baseball coaches from the College of Education (Dept. Phy. Edu.). We focus on two most important technical domains in baseball, i.e., pitching and batting. In pitching, we have developed a smart baseball by embedding G-sensors and finger-pressure gauge in the ball, together with a low-power Bluetooth module for real-time data communication during live pitching sessions. We have successfully measured the ball speed, spin rate, spin axle, trajectory, pressures of the index and middle fingers, etc. With the collected data, we will try to distinguish the ball types, and together with image-based AI algorithms, we will analyze the data and provide the biomechanical information of the pitcher for performance improvement and injury prevention. In batting, we have employed IMUs with an eye-tracking device to investigate different swing strategies between two levels (trainee and expert) of batters. Eye gaze position, head, shoulder, trunk, and pelvis angular velocity, and ground reaction forces were recorded. Again, together with image-based AI algorithms, we will analyze the data and provide the biomechanical information of the batter for performance improvement and injury prevention. Based on the current technologies, the team will submit a proposal for MOST funding.

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Samples of Results and On-Going Works

智慧棒球開發

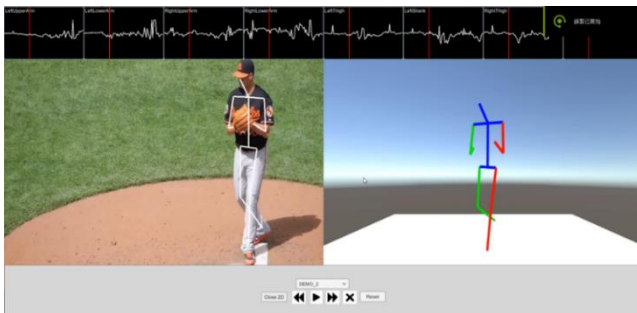
- 投手投球過程數據採集及分析
 - 與國體大龔榮堂教授合作
 - 預期目標
 - 投手動作
 - 球投出後運動軌跡及資訊



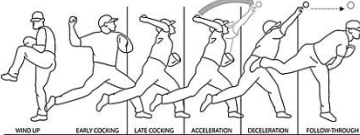
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感電感測器	1k Hz	16 bits
氣壓感測器	10 Hz	16 bits
三軸加速器	1k Hz	12 bits
六軸加速器	1.125k Hz	16 bits
九軸加速器	200 Hz	16 bits
GPS		
快閃記憶體		

Hsi-Pin Ma

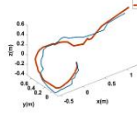
馬席彬教授團隊 4




Smart Baseball with Finger Pressure Gauge (H-P Ma & C Liu)



Cocking Trajectory



- 9-axis G sensor, pressure gauge, wireless comm.
- Key data items: force, rotation, trajectory, velocity, etc.
- Prototype being developed by industry partner





Event Prediction in Boxing by AI (H-K Chu & W-H Chiu)




Taiwan's Neo-Chin Chen and Italy's Angela Carini during the Olympic Games boxing match in Tokyo, 7/27/2021
Source: Taipei Times, 7/28/2021

- What AI is trying to do:
 - Automatic labeling of events and even event sequences
 - Identification of events and tactics
- What we need:
 - Cameras (videos) and private 5G network
 - Cloud/Edge servers and AI accelerators
 - AI software, data, visualization, and information system

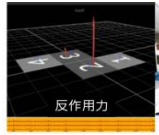


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Foot Pressure & Eye Sensing and Analysis




眼動儀



反作用力



壓力板、影片模擬



凝視位置、視角變化

Hsi-Pin Ma

李昀儒教授團隊 8