透視羽球 - 控球力評估系統

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在運動科技發展方興未艾之際，易志偉教授研究團隊自2019年即投入精準運動科技領域研究。近期易志偉教授研究團隊利用先進的立體攝影技術和電腦視覺技術來追蹤羽球軌跡，創造出以提供科學化的表現數據，提升場館使用者的體驗並增加運動學習效率和娛樂性的「拍拍表現紀錄系統」。易志偉教授研究團隊「拍拍表現紀錄系統」榮獲2023 未來科技獎，肯定研究團隊卓越貢獻。

在羽球運動中，評估球員表現的重要指標之一是每拍擊球表現指標，包括出球 速、出球角和球種使用等。基於這個理念，易志偉團隊的研究目標是開發一套適用於智慧球館的個別羽球表現紀錄系統。

「拍拍表現紀錄系統」涉及了專業運動場地的建設和運作，能夠利用先進的立體攝影技術和電腦視覺技術來追蹤羽球軌跡，以提供科學化的表現數據，提升場館使用者的體驗，增加運動學習效率和娛樂性。該系統主要由四個部分組成，首先是立體攝影系統，它由多台同步高速攝影機組成，能夠以多視角同步錄製比分對打的畫面。這種立體攝影技術不僅能夠捕捉球員的擊球姿態，還能夠提供更全面和詳細的羽球軌跡資訊。

此外，「拍拍表現紀錄系統」還具備相機內外部參數計算等功能，以確保錄製到的影像資料的準確性和可靠性。其次是羽球的 2D/3D 軌跡計算部分。該部分使用深度學習技術來追蹤 2D 羽球軌跡，然後利用攝影幾何原理計算出 3D 軌跡。使得系統能夠以更高的精確度來重建球的運動軌跡，並且在不同角度和距離下都能夠準確地測量出球的位置和運動軌跡。

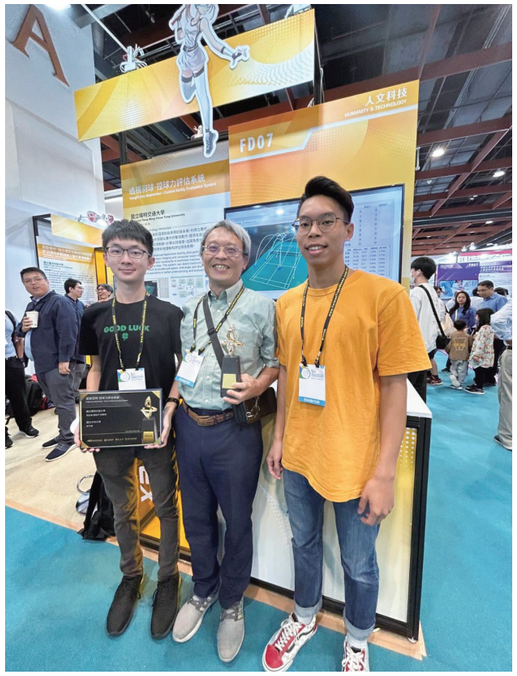
而羽球軌跡的語意解析部分則利用 3D 軌跡來檢測擊球事件，並對軌跡進行分段和平滑化處理。通過對球的運動軌跡進行詳細分析，系統便能夠自動標記出球的起始點、軌跡變化以及終點等關鍵事件，同時還能夠消除由於偵測錯誤計算所引起的軌跡偏差，提供更精確和可靠的球的運動軌跡資訊。

最後是對於球員最重要的擊球表現數據計算，該部分根據 3D 軌跡提取拍拍表現數據，以列表的形式呈現。收集的數據包括出球速度、出球角度和使用的球種等關鍵指標，能夠提供球員和教練在分析和評估球技表現時所需的重要參考資料。同時，「拍拍表現紀錄系統」還提供了 3D 軌跡的視覺化功能，以直觀和生動的方式展示球的運動軌跡，幫助球員更好地理解和分析自己的擊球技術。

這套系統不僅能夠提供精確且全面的羽球擊球表現紀錄，幫助球員和教練更好地了解球技表現、發現長處和改善之處，同時還能夠為觀眾和球迷提供更豐富的觀賞體驗，深入了解羽球運動。該系統的應用潛力廣泛，不僅可以應用於智慧球館，還可以用於訓練場地和比賽場地，提升羽球運動的品質和競爭力。

因此，易志偉教授的研究成果不僅能夠促進智能化技術的應用和發展，更能夠推動運動科學的進步和運動體驗的提升，成為當代科技界的典範。在此，再次祝賀易志偉教授獲得未來科技獎，也期待他的團隊在科研道路上的能為體育項目智能化有更多精彩的研究成果，取得更多重大突破和成就！

Insight into Badminton – Control Ability Evaluation System



At the flourishing development of sports technology, Dr. Chih-Wei Yi and his research team have been dedicated to precision sports technology research since 2019.Recently, Dr. Yi's research team developed a shot-by-shot performance evaluation system for smart courts. They utilized advanced stereoscopic photography and computer vision technology to track badminton trajectories and generate scientific data. With outstanding contributions from this team, Professor Yi's research team was honored with the 2023 Future Technology Award for their Shot-by-Shot Performance Evaluation System.

In badminton, one of the crucial performance indicators is the performance of each racket hitting the shuttlecock, including the speed of the shot, the angle of the shot, and the type of shot used. Therefore, Professor Yi's team aimed to develop an individual badminton performance recording system suitable for smart badminton courts. The “Shot-by-Shot Performance Evaluation System” incorporates the construction and operation of professional sports venues when tracing badminton trajectories with technology. By providing scientific performance data, it can enhance the user experience of venues, increase the efficiency of learning, and improve the overall entertainment experience. The system consists of four main parts. The stereoscopic photography system, composed of multiple synchronized high-speed cameras, is capable of recording rallies from multiple angles simultaneously. This technology not only captures the player's hitting posture but also provides comprehensive and detailed information about the badminton trajectory.

Besides, the system has functions such as calculating internal and external parameters of the cameras to ensure the accuracy and reliability of the recorded image data. The 2D/3D trajectory calculation of the badminton shuttlecock tracks the 2D trajectory first and then calculates the 3D trajectory using deep learning technology and the principles of photographic geometry. This enables the system to reconstruct the shuttlecock's motion trajectory with higher precision and accurately measure its position and movement from various angles and distances. The semantic analysis of the badminton trajectory utilizes the 3D trajectory to detect hitting events. Also, it can segment and smooth the trajectory. By conducting a detailed analysis of the trajectory, the system can automatically identify key events, including the starting point, trajectory changes, and endpoint of the shuttlecock. It also mitigates trajectory deviations caused by detection errors. Fundamentally, this allows the system to furnish more accurate and reliable information about the shuttlecock's motion trajectory. Finally, the calculation of player performance data, which extracts performance data from the 3D trajectory, is presented in tabular form. The collected data include key indicators such as shot speed, shot angle, and the type of shot used, providing reference for players and coaches in analyzing and evaluating their skills. The “Shot-by-Shot Performance Evaluation System” can help players better understand and analyze their hitting techniques, as the shuttlecock's 3D motion trajectory can be vividly and intuitively presented through the visualization feature.

This system provides accurate and comprehensive records of badminton hitting performance to help players and coaches better understand strengths and areas for improvement. Additionally, it enhances the viewing experience for the audience during games. The application of this system also extends to athlete training in venues, improving competitiveness in badminton competitions for players. Therefore, Dr. Yi's research achievements not only promote the application and development of intelligent technology but also drive the advancement of sports science and the enhancement of sports experiences. His significant contributions have made him a role model in the field of computer science. Congratulations to Dr. Chih-Wei Yi once again for receiving the Future Technology Award, and we look forward to more brilliant research results from his team in the field of intelligent sports technology.