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# 羽毛球撿球與缺陷檢驗智慧訓練系統

**BEST System: Badminton ball-picking and defect Examination Smart Training System**


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臺灣大學電機博士，現為臺灣科技大學電子工程系教授兼應用科技學位學程主任，並擔任國際技能競賽（WorldSkills）電子職類裁判、全國技能競賽電子（工業電子）職類裁判長、教育部全國高級中等學校工業類學生技藝競賽工業電子類召集人。


**研究領域**

嵌入式系統設計、生醫電子工程、穿戴式裝置設計、物聯網應用、基於影像的生理和活動信號偵測技術、健康照護、機器學習、運動科技

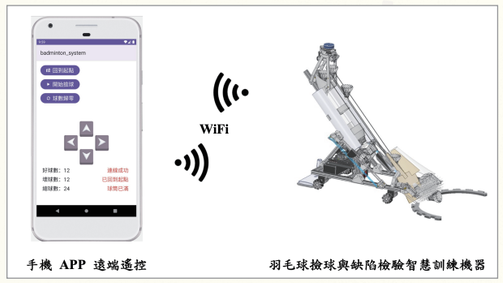
## 作品摘要


近年來，全球對於國際體育賽事的關注度不斷攀升，而羽球作為一項風靡全球的運動也吸引了越來越多人的關注和參與。臺灣的羽球運動員也屢次在國際賽事中獲得佳績，成為了國人驕傲的代表之一。然而，隨著羽球運動的發展和普及，如何提高羽球運動的訓練效率已成為一個非常重要的議題。

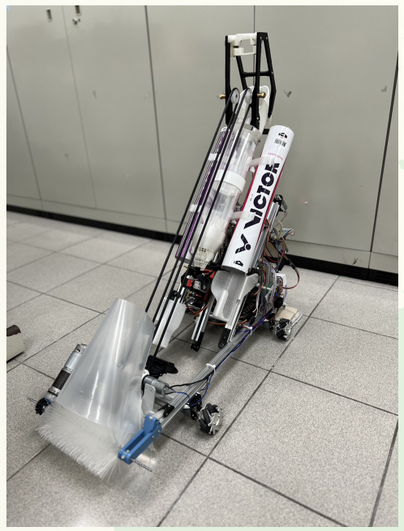
運動科技輔助訓練是一個趨勢，例如使用智慧球拍或羽球發球機協助訓練，但很少有人專門研發羽球撿球機。因此，在訓練中需花費大量人力去撿球。此外，訓練結束後，也會花大量時間在篩選羽球是否可以再次使用，這些都是非常耗時耗力的工作。因此，我們開發了「羽毛球撿球與缺陷檢驗智慧訓練系統」，是一套結合撿球、羽球缺陷檢驗及篩選、手機APP遠端操控以及拖地四大功能於一體的系統，本作品的系統架構圖如圖一所示，作品實體圖如圖二所示。

我們採用了NVIDIA® Jetson™ TX2作為核心，STM32作為馬達控制器，硬體方塊圖如圖三所示。TX2接收來自光達和攝影機的數據，以控制撿球機的移動、辨識球場角落以及羽球的好壞。我們也開發手機APP，讓使用者能夠透過手機遠端操控撿球機的移動方向，開始撿球、停止撿球，手機APP還可以顯示有幾顆好球、壞球以及總球數，可以提高教練和選手的訓練效率和便利性。

透過本系統，訓練過程中原本需要大量人力完成的工作將交由本作品完成，使得教練和選手能夠有更多的時間用來訓練和分析訓練數據。本作品希望能為羽球訓練提供貢獻。


圖一 系統架構圖。



圖二 作品實體圖。

## Abstract


In recent years, there has been a growing global interest in international sports events, and badminton, as a popular sport worldwide, has attracted increasing attention and participation. Taiwanese badminton players have also achieved remarkable results in international tournaments, becoming one of the prideful representatives of the country. However, with the development and popularity of badminton, improving the training efficiency of the sport has become a very important issue.

Using technology to assist in sport training has become a trend, such as using smart rackets or shuttlecock serving machines to aid in badminton training. However, there are few machines specifically developed for picking up shuttlecocks. Therefore, a significant amount of manpower is required for ball picking during training. Additionally, after training sessions, a considerable amount of time is spent on screening shuttlecocks to determine if they can be reused. These tasks are time-consuming and labor-intensive. Therefore, we have developed the “Badminton shuttlecock picking and defect Examination Smart Training System,” which integrates four functions into one system: shuttlecock picking, shuttlecock defect inspection and screening, remote control via a mobile app, and floor-sweeping. The system architecture diagram of this project is shown in Figure 1. The entity diagram of the work is shown in Figure 2.

We adopted the NVIDIA® Jetson™ TX2 as the core and STM32 as the motor controller. The hardware block diagram is shown in Figure 3. The core receives data from LiDAR and cameras to control the movement of the ball picker, recognize the corners of the court, and evaluate the quality of shuttlecocks. We also developed a mobile App that allows users to remotely control the movement direction of the shuttlecock picker, and start or stop the process of picking shuttlecocks. The mobile App can also display the number of good and defective shuttlecocks as well as the total count, thereby improving the training efficiency and convenience for coaches and players.

Through this system, the tasks that used to require a significant amount of manpower during training can now be automatically completed by this project, allowing coaches and players to have more time for training and analyzing training data. This project aims to contribute to badminton training.

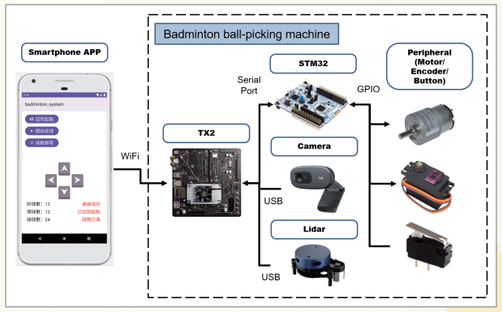




Fig.3 Hardware block diagram.