

DL-Shuttle: Badminton Coaching Training Assistance System Using Deep Learning Approach

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Abstract — Coaching in sports is a process that focuses on improving the performance of players by providing them guidance and training. Players that are usually involve in the coaching are those professional players or players that target to be involved in competitive environment. One of the sports that have the most coaches to train players in Malaysia is badminton. Since Datuk Lee Chong Wei announced his retirement from the Malaysia badminton national team, more and more players start to look forward to becoming the next hero for Malaysia. Therefore, there is a sudden growth of demand for badminton coaches in Malaysia, leading to a rise in the cost of hiring a coach. A lot of beginners do not afford to hire a coach as it is expensive. Furthermore, in this period of pandemic, it is better to avoid meeting with one another to reduce the risk of getting Covid-19. Therefore, this project was intended to design and develop a badminton coaching assistance system using deep learning which allowed users to train on their own without physically meeting with coaches. This system become a personal coach for players to undergo their training. It can be used in any place with badminton court and without the need to schedule for human coach. The deep learning approach and the system produced is able to produce above 80% accuracy in detection selected training pose.

Keywords — *Deep Learning, Badminton, Coaching Assistance, Pose Estimation*

I. INTRODUCTION

Badminton is a type of sport as one of the main entertainments around the globe since our ancestor times. Nowadays sport clubs are willing to invest millions of dollars to train and identify unique and talented players using technology. There are about 7.7 billion of human population on earth according to a recent research in 2019 by [1] and close to 220 million (approximately 2.9% of human population) estimated badminton players based on survey by PledgeSports in 2018 [2].

Coming back to Malaysia, after 2008 Olympic whereby Datuk Lee Chong Wei won a silver medal for Malaysia in men's single, badminton has become one of the most popular game in Malaysia. New players or novice in badminton may face difficulties in playing badminton due to lack of skills and proper training. For example, majority of beginners does not hit the shuttle accurately that can lead to loss in points. In times, when they hit the shuttle with the frame of the racquet, it may spoil their racquet as a result of incorrect technique. In this scenario machine learning can be used as a training tool for nonprofessional players to analyse each mistake and give proper advice or adjustment for them to improve.

As badminton is one of the popular sports in Malaysia, a lot of parents are willing to pay for their children to go for training to improve their skills. In sport such as badminton,

training from early age does provide an advantage to develop the skills necessary in order to progress to higher level of competition [3]–[5]. Therefore, there is always a demand for paid coaching especially by parents to provide the necessary training for their children. Depending on the type of coaching, duration and quality of the coach, the average cost per hour for badminton training in Kuala Lumpur starts from RM21.20 for 1 hour session to RM2,669.00 for a 1-week intensive training session. However, this cost be a prohibitive reason for someone interested to get proper training. And there are people that are talented and passionate in badminton do not have the financial means to hire a coach to teach them even some basic technique and skill. Therefore, there is a need to provide a way to help these group of people to have an opportunity to train and to improve their techniques in playing badminton with minimal or no cost.

Furthermore, every sport has their own technique in playing. For example, badminton requires more wrist strength to hit the ball fast. If a player swings too much, they may injure their arm. But beginners in badminton without a coach does not know these techniques. This could cause a serious injury to their arm. The badminton coaching assistance system is able to analyse the players posture and give guidance or advice in correcting their posture to avoid these injuries from happening.

In addition, since March 2020, Covid-19 becomes pandemic and spread around the world [6], [7]. Many countries including Malaysia implements movement restriction to curb the spread of Covid-19, which includes restriction on physical sport activities [8]. It is not suitable to carry out any coaching class in this season to reduce physical contact with each other. A study by Saydd et. al. [9] indicates that the movement restrictions during the pandemic does affect the performance and the health (physical and mental) of athletes, part of it for not being able to train and participate in competitions.

Finally, as the existing coaching style require the presence of the coach, players will have to set their training time base on the availability of the coach. This may bring about inconvenience to the players and the coach. With this badminton coaching assistance system, self-learning is being carried out. Player can do their training anytime and anywhere without needing to worry about the availability of the coach.

The objective of this project is to design and develop a deep learning-based system that is able to provide coaching and guidance for badminton beginners.