UNIVERSITI TEKNOLOGI MARA

TECHNICAL REPORT

TRAJECTORY OF SHUTTLECOCK USING NEWTON'S SECOND LAW

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IN THE NAME OF ALLAH, THE MOST GRACIOUS, THE MOST MERCIFUL

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ABSTRACT

Sports like badminton require skilled performance to coordinate dynamic interceptive actions to place the racket in the proper location at the correct moment to intercept the shuttlecock (projectile) and protect or attack court space. The problem statement on this study is the player needs to focus on the service angle before releasing the shuttlecock to maximise the distance the shuttlecock falls on the opposing team's court to obtain the point. The player needs to strengthen their ability to read their opponent's shots and it might be difficult for the player to figure out and predict the angles that need to be produced so that the opponent player has difficulty receiving the shot. Newton's Second Law in Projectile Motion model is applied to find the terminal position of the with various angles which are from $15°$ to $65°$. Hence, the result shows the furthest terminal position is at angle $15°$. Then, Vitruvian Man was used in order to determine the height from waist to feet for average Asian male height which is $1.68\ m$. From that, the shuttlecock can be passed over net when player $2\ m$ away from net can be determined. After that, Theorem Pythagoras was used to determine distance of the shuttlecock with opponent's centre line when player at the centre of the right service court. Therefore, the opportunity for the opponent's players to return the shuttlecock can be analyse at the end of this study. For angle $15°$ to $25°$ are unable to pass the net meanwhile angle $30°$ until $65°$ shown that they were successfully passing the net. By calculating the distance of the shuttlecock lands at the opponent's court with the centre line, $30°$ and $40°$, are successfully lands on the opponent's court, compared to $45°$ and $50°$. Meanwhile, $60°$ is failure to fulfil the rule of service in badminton. From the result of data, the angle released can be analysed and others factors to make the optimum trajectory of the shuttlecock after landing on the opponent's right service court. The player can improve the techniques and skills in short service and develop the capabilities in reading opponent's movements in return the serves. Last but not least, there are certain issues that arise when finishing this study due to the scarcity of references. No method can be used directly to determine the trajectory of the shuttlecock. So, as a suggestion to future researchers, they may utilise the kinematic equation to determine the value of the trajectory in their research.