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Design Of Service Taekwondo Robot For Simulation "Kwon" Movement

Md Razak Daud[1] , Firdaus B. Mohamed Sahid[1], Wan Nor Shela Ezwane Bt. Wan Jusoh[1], Fatim Fauziani Hussin[1] , Mohd Zamri B. Hamid[1]*

[1]Politeknik Tuanku Sultanah Bahiyah, *razakat@gmail.com

Abstract: "Kwon" means "hand", or "to strike with the hand". This study to design a taekwondo service (Spectre) robot for simulation in "Kwon" movement with a smart panel system specialized in attacking and defending hand movement. This service robot will act as a trainer assistant to teach Taekwondo sports movements on "Kwon". Spectre robot constructed using RERO components. At early stages, users or trainers able to learn and teach simple moves with this robot. The wireless function is added to the Spectre Taekwondo robot to operate it with a certain distance. An android app is created with MIT app inventor for Bluetooth connection and can be used with the aid of smartphones. This study will help to identify the technology of service robot applications.

Key words: Taekwondo, Kwon, RERO

1.0 INTRODUCTION

There are some moves of the Taekwondo that will cause injuries during training or physical movement in taekwondo activities. Data were collected with simple check-off forms that describe the athlete, nature, site, environments, and severity of the injury at three major taekwondo tournaments involving a total of 3,341 boys and 917 girls. Burke (2003) reported that the head and the neck injuries are occasionally very serious during taekwondo games. Out of a total 22 responses, 13 respondents reported experiencing their first injury during training, while nine respondents experienced their first injury in competition. Preparation was most frequently reported as the time of injury, with eight out of thirteen respondents reporting second injuries occurring during training, versus five out of thirteen during competition (Kazemi, 2005).

By 2021, the specialized service robotic market is projected to reach more 30 Billion. Industries need to systematize certain processes for safety protection, efficiency and product output. Safety is a main attention because robots able to face hazardous tasks while humans' attention on intellectual tasks in dangerous situations. Specialized service robots can go where human workers would be in danger.

In the word of Taekwondo activities. The word Tae shows foot or to attack with the feet. In other Kwon means "hand", or "to strike with the hand". "Do" means art, style, method or way. Hence Taekwondo (foot-hand-way) means factually "the art of the feet and the hands" or "the art of kicking and punching" Top, 2018 explored the effects of the taekwondo training given to the children on their strength-agility and body coordination levels. However injuries on the head or other organs during movement tea kwon do practice or participating in taekwondo competition (McPherson 2010, Dury 2017). Taekwondo is not just leg kick use, there will be many situations where users are too close for an effective kick and need to use fists or elbows. Moreover, kicks will be more effective if used in combination with punches and strikes.

According to the study background stated above, the need of taekwondo service robot with specialize simulation of 'Kwon' Movements with Bluetooth System were designed. Namely as Spectre Taekwondo Robot is more mainly in simulation of 'Kwon' movements. This robot design will help to

solve for the problems which are injury during Taekwondo training. Also this service give of knowledge about designing robotic program and Bluetooth system in service robot (Spectre Taekwondo Robot).

2.0 METHODOLOGY

This paper showed design of service taekwondo robot. The service taekwondo robot will be used to demonstrate the punching of taekwondo and also can be used for sumo, running or picking movement or service. Therefore, it is an entertainment or service typed robot. This robot is built using Rero components. Rero stands for reconfigurable robot. A Rero robot does not need screws and nuts to build up. Everything is clip on, clip off and quite durable also. The Rero assemble robot parts can be to assemble and disassemble parts of the robot based on their own imagination and also programme for desired movements.

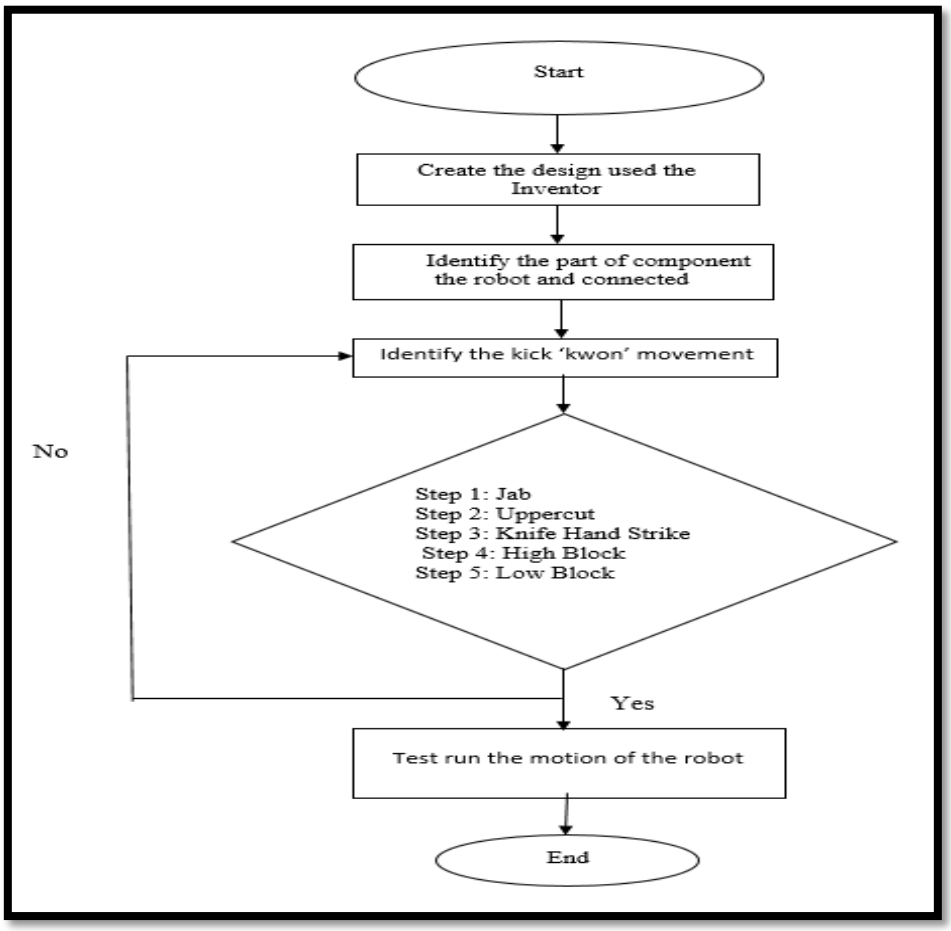

Figure 1: Flow chart for spectre service robot for 'Kwon 'movement

In figure 1 shows the flow chart for this Spectre robot for kwon movement. This design Spectre Taekwondo Robot was used Rero Robot which use bluetooth system. With the aid of Bluetooth system it can connect between the robot and devices like smartphone and laptop. Besides that, some intelligence is added so that the robot can be moved by using the remote devices by using a new application that was developed. In addition, the movements and servo motor of the Spectre Taekwondo Robot can be modified through connection of bluetooth system without USB wiring. Therefore it is very convenience and easy to handle.

Figure 2: Service taekwondo robot 'Spectre Taekwondo Robot'

The design of the robot was created using Inventor (CAD software). Then, the parts of the component of the robot were identified and connected. After that, the basic 'Kwon' movements were selected which are Jab and Knife Hand Strike. The movements were selected based on the capability of the robot. Finally, after the robot is teaching for all the movements, the test run of the motions is carried out. Then, the robot taekwondo was formed. The process of producing the model of service robot 'Spectre Taekwondo Robot' see in fig 2 was determined. The Spectre robot was tested run and data analysis was collected.

3.0 RESULT AND DISCUSSION

The length of the body parts of the Spectre Taekwondo Robot was measured and the average length of the human body parts was taken. The length of both robot (see in Table 1) and human body (see in Table 2) part were compared. There are two types of movement used, jab and knife hand Strike, for taekwondo kwons. It is found that the ratio length of robot to human were almost 3.5 to 5.4 mm, as required for data analyses. Percentage of kwon movement comparison between Spectre robot and human almost similar. As demonstrated in Table 4, the Spectre movement jab and knife hand strike were found to be clearly smooth however the movement speed in slow. Luk (2005) Aung reported that a good sensing technique used in serves robot possibly will solve the speed of robot movement.

Table 1: Distance measurement on Spectre Taekwondo Robot'

Parts of measurement	Length (mm)
The length of the arm	203
The length of the leg	203
The height of the robot	375
The length of the body	110
The length of the head	60

Table 2: Distance measurement of human

Parts of measurement	**Length (mm)**
The length of the arm	705
The length of the leg	900
The height of the human	1700
The length of the body	600
The length of the head	200

Table 3: The ratio of length of robot to human

Parts of measurement	**Ratio of Robot : Human**
The length of the arm	1 : 3.5
The length of the leg	1 : 4.4
The height of the human	1 : 4.5
The length of the body	1 : 5.4
The length of the head	1 : 3.3

Table 4: Sample movement comparison between Robot and Human

Movements	Human	Description	Robot	Description
Jab		A quick flick of the fist on the forward arm. This Taekwondo punch is generally used for defence and keeping the opponent away.		The movement is almost same with human movement but just with slower motion.
Knife Hand Strike		Use the outer side of an open hand to hit soft areas such as the opponent's neck.		The motion of the robot is same as human but in slower speed.

4.0 CONCLUSION

Recently technology of Bluetooth to control service robots has established technology for system control. From this study, the results showed with the aid of the Bluetooth system it can connect between the robot service taekwondo and devices like smartphones and laptops. Besides that, some intelligence is added so that the robot can be moved by using remote devices (MIT App Inventor). This spectre robot will help to understand basic movement in taekwondo 'Kwon' for jab and knife hand strike. This service Kwon robot automates the routine of the Kwon movement with efficiency. The used of a service taekwondo robot also to engage users through structure and programming robots.

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