DESIGNING A SUPPORTING DEVICE FOR BADMINTON FOOTWORK PRACTICES BASED ON A MICROCONTROLLER TECHNOLOGY

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Abstract

This research aims at designing a supporting device for Badminton footwork practices based on Microcontroller Technology. The development method consists of several designing stages starting from product design, design validation, design improvement, design making, product trial, product revision, and practice trial. The result shows that this device may become the supporting device for a coach to guide the athletes during the footwork practices. This device may show the targeted locations to reach by the athletes in one particular time through the display lights. The device may be manually or automatically operated and has the function as a measuring device for an athlete to meet his/her practice targets. This device has a special ability to measure an athlete’s achievement level in performing each set of practices and to be well adjusted with the difficulty levels needed. This device’s practice difficulty level may be integrated and varied based on the time practice parameter, number of footsteps in each set of practices or footstep-distance parameter through the target sensors located in the field. A validity test is conducted by the experts concluding that the design of this device may be utilized to well support the Badminton footwork practices.

Keywords: design, footwork, microcontroller

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INTRODUCTION

In this recent era, sports have become a need for the life of a nation. A nation’s sports achievements also reflect its capacity in the other fields. A nation with a fast developing knowledge and technology tends to have a rapid sports development. In the developed countries, the best achievements made by the athletes who break the world records may not be separated from the touches of knowledge and technological engineering (Franz, 2008). Sports device development and engineering are greatly required to keep up with sports activities which recently coached and organized using technology. To evaluate the influence of sports technology, a concept of
performance index improvement is developed to improve the athletes’ performance since the higher their index, the higher their sports development will be (Steve, 2009). Badminton is the fastest racket game with enormous changes in its patterns and speed. Technological innovation greatly influences the Badminton games. Technology has changed the game standards due to the recent implementation of technology and new materials in the development of devices, such as dealing with the roles of referees, rackets, shoes, and clothes. Badminton game has recently oriented more on skills and technology. Video is one most important technology to improve the skill techniques. Thus, technology has been widely developed in badminton games (Singh and Yogesh, 2010). In a Badminton game, there are some basic practice techniques to well mastered, such as the racket holding, shuttle cock hitting, and footwork controlling techniques. To train the badminton athletes’ footwork performance, there are some practical methods used, such as shadowing practices (Icuk, et al., 2002). The commonly used footwork practice method instructed by the badminton coaches is through a traditional approach by directly instructing the badminton athlete to immediately reach the desired field points. This practice technique has some weaknesses, such as inconsistent instruction tempos, highly dependence on coach’s physical and mental conditions, unorganized practice time, boredom, having no independent exercises, easily predicted movement directions, and highly influenced by the coach’s characters. If this kind of practices is continuously made, the athletes’ physical conditions and the coaches’ concentration may continuously decrease that the coach may not optimally evaluate the athletes’ footwork since their concentration is mainly based on the instructions given. Based on the explanations above, it is greatly necessary to design a supporting device for the athletes’ footwork exercises based on a microcontroller technology. By using this supporting device, it is expected that the practices and models may be intensively organized that the achievement indicator may be objectively reached.

**METHODS**

The design of this research is known as R&D (Research and Development) since the research final objective is to result in a certain product of a supporting device for the badminton athletes’ footwork practices based on a microcontroller technology. This method consists of several designing stages: product design, design validity, design improvement, design making, product trial, product revision, and practice trial.

**RESULTS**

The design of this supporting device for the badminton athletes’ footwork practices based on microcontroller technology has six main components: 1) Mainboard; the mainboard in this device is the device brain which has the function to organize all this device’s performances. The picture shows that it is a series of board equipped with some sockets connecting the main board to the other components. The function of each socket should be carefully notified. The sockets serially installed on an aluminum bar from the right to the left consist of: socket for laser, handy, sensor,
and output. Besides, there is another socket located at the back of the main board for the power supply input from the adapter. 2) Adapter: the adapter in this device has the function to provide electrical power supply for the whole parts of this device. From this adapter, there are four cables connected to the main board through the installed socket at the back of the main board. The installation procedures will be further explained in the following discussion. The appearance of this adapter is as follows. 3) Transmitter: transmitter in this device has the function to transmit the laser beam to be easily caught by the receiver. Each transmitter has three lasers transmitting together to the receiver. 4) Receiver: the receiver in this device has the function to catch the laser beam from the transmitter. The receiver has three photodiode sensors to catch the transmitted laser beam. Beside sockets for cables, there are some other components. First, there are six red lamps for the sensor indicator lamps. If the second red lamp (seen from the back) is on, it means the RX is working as the sensor number two which delivers the signal to the mainboard as the second sensor and so forth. To change the sensor position (red lamp on), rotate the black circuit breaker located on the RX box. There are also three green lamps functioning as indicator lamps due to the presence or absence of laser to catch. If the green lamp number 1 (seen from the back) is off, it means that the first photodiode sensor has caught the laser beam from TX and so forth. 5) Handy: the handy in this device has the function as the device manager based on the provided menu, such as sensor check, manual, or automatic mode. Handy has two important parts consisting of LCD and keypad. First, LCD is a screen functioning to show writings which represent the operated programs in microcontroller. Second, keypad has the function to input scores or to select menu offered by the device. The cable socket is located below the handy. Meanwhile, the installation procedures and utilization of handy are discussed further. 6) Display lamp: the function of display lamp is to turn the lamp on showing the field points to reach. 7) Cables: the other components to know are cables which have the functions to connect one part to the other part centered in the main board. Those cables are explained as follows: a) Cable from adaptor: the cable from adaptor has only one end. It means that the cable comes out from the adaptor and is unable to be plugged off, while the other end is connected to the mainboard. This is a thin cable consisting of four fibers with different colors; b) Laser Cable (TX): Laser Cable has two ends connecting the laser box (TX) to the main board. The section consists of thin round cable with the gray color and there is a CD connector at the cable end. c) Handy Cable: Handy uses a rainbow cable consisting of 18 fibers. This cable uses DB25 connector (connector usually found in old printer). This device has only one cable with DB25 connector that it is quite impossible to be misconnected (exchanged); d) RX Sensor cable; UTP (LAN) cable is commonly used to connect RX with the main board through the DB9 connector. This device uses two cables utilizing DB9 connector, that is, RX sensor cable and lamp output cable. However, the output cable has a notification stating that the cable is for lamp output. In other words, the cable with DB9 connector without “output” written down is the cable for RX sensor, but there is the word “output” written down on its DB9 head connector. The design of this supporting device for footwork exercises based on microcontroller technology is
divided into two parts: hardware and software design. The system is commonly built with the following functions.

1. This device has the function as a supporting device for athletes to performing their footwork exercises. This device will display the targeted points to reach by the athletes on one time through the display lamp. This device may be operated in two modes: manual and automatic mode, with the following explanations. On its manual mode, the coach will input the targeted points (locations) to reach by the athletes manually through the keypad button. This mode principle is basically the same with the footwork practices conducted without any supporting device. The practice difficulty levels in this mode are greatly dependence on the coach’s conditions on a particular time. The difficulty level consistency may not be guaranteed in this mode. On its automatic mode, the coach may just input the practice time and the number of steps to follow in each set of practices. The practice difficulty levels may be determined from the practice time and the number of steps to follow in each set of practices. The comparison between time practice and the number of steps may determine how fast an athlete should move on each step.

2. This device has the function as a measuring device for the achievements made by an athlete to meet the targeted set of practices given by this device both in manual and automatic mode. The success of an athlete to meet the targeted set of practices is determined by the number of correct and incorrect steps made in each set of practices. Step precision is determined by the precision to the direction and the precision to reach the targeted points. To know the step precision, some array sensors for the targeted points are greatly required. To meet the needs of the above functions, this footwork supporting device requires 2 inputs (keypad and sensor array) and 2 outputs (LCD display and targeted location display). Keypad is used to input order and the required parameters. Array sensor is used to figure out whether or not an athlete has reached the targeted points (locations). LCD display is used to display the required information when performing the footwork practices. Meanwhile, the targeted location display is used to guide an athlete to figure out which targeted locations to reach in a particular time.

CONCLUSION

The developed device may be used as the supporting equipment for badminton footwork practices. The manual and automatic models are developed to adjust the practice difficulty levels for different athletes. The developed device may be utilized to measure the success of footwork practices stated in number of good and bad steps with the average time of each step made.

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