Development of Silat Scoreboard Using LabVIEW

Wan Mohd Afiq Bin Wan Mohamad Anuuar, Zuriati Janin Faculty of Electrical Engineering Universiti Teknologi Mara, Shah Alam, Selangor, Malaysia e-mail: afiqanuuar@gmail.com

Abstract—This paper present the development of Silat Scoreboard for scoring system improvement in Silat Olahraga match. The development is comprises of three stages: parameter setting and profile, signal acquisition and score point indicator. The design includes all the appropriate components and facilities that necessary to function properly. The program is written using Gprogramming language potentialities of LabVIEWTM version 2011. It is proved that this type of scoring system gives great improvement in terms of flexibility and accuracy.

Keywords- LabVIEW; Silat Olahraga; Scoreboard;

I. INTRODUCTION

The Silat Olahraga is recognized as one of the martial arts that could be contested in Sukan Malaysia (SUKMA). In general, the evaluation for the Silat Olahraga would be knockout. There are three rounds for one match and the winner is the contestants that have win two out of the three rounds [1]. For each round, the contestant will try to gather as much points as possible within the duration of two minutes. Normally, the points are given by four judges based on the contestant's performance. This was done manually in which the scoring is based on the judges' observation at close range.

On top of that, there is also a possibility that a contestant will make two consecutive solid punches and it did touch the opponent's body. In this case, the judges only consider as one solid punch which correspond to only one point. However, there is a lack of evidence that could prove there are contacts between actions to body parts. Similarly, judges might not acknowledge even if there is hits that landed on the opponent's body part.

Hence, this project is carried out to improve the conventional judging and scoring system in Silat Olahraga match that could overcome the problem that has been stated in previous paragraph. In this work, a scoring system is designed using LabVIEW where the score points are determined not only from the actions but also from the location of appropriate body parts that the hit landed.

II. SILAT SCORING SYSTEM

Figure 1 shows the example of Silat Olahraga match at which the red contestant is trying to obtain point by giving a punch and followed by a kick to the body of the red contestant. However the red contestant resist by blocking the punch and the kick.



Figure 1. Silat Olahraga match.

Normally, the match is conducted in a full contact fight with empty handed in which the winner is determined by the number of points gained. In general, scoring points are counted based on the three actions: punching, kicking and knockdown. [2]

An action of punching is consists of a strike made using a hand closed to a fist. The point for this action was only given if this strike has a clear contact with the body of the opponent and made a loud "bang" noise. If any of the two condition mention above is not fulfilled, then the strike was considered as invalid. The body part that was hit by this hit could be at the front or at the back of the body of the opponent as long as it is not within the category of body part that could bring a deduction to the point.

Kicking on the other hand is a physical strike using the foot, leg or knee. The requirement for obtaining point for this action was exactly the same as for a punch. It must fulfill the condition that it has a clear body contact to the body of the opponent and made a loud "bang" noise. This strike could be hit at the front or at the back of the body of the opponent.

In addition, point also was given to the contestant for knocking down the opponent. There are many ways for the contestants to obtain points for knockdown. Firstly, the contestant manages to kick the calf of the opponent and made him fall. Secondly, the contestant manages to do an action of lifting the opponent and knock him down. Next, if the contestant was able to punch or kick the opponent and consecutively knock him down, then the points given are knockdown point and also a punch or kick point. Table I shows the standard scoring points practiced by SUKMA based on the three actions.

TABLE I. POINTS GAIN FOR ACTIONS

Actions	Points
Solid Punching	1
Solid Kicking	2
Knockdown	3

Besides, there are some restricted bodies parts that can cause scoring points deducted where the contestant should avoid: face and sensitive body parts. The deduction scoring points are shown in Table II.

TABLE II. POINTS DEDUCTION FOR ACTIONS

Actions	Points
Punch to the face	1
Hits to the sensitive part	2

Presently, there was no point given for the body location since the hits happens very fast and could lead into an unfair resulting judgment.

III. LABVIEW

LabVIEW acronym for Laboratory Virtual Instrument Engineering Workbench is a graphical programming environment that has been developed to facilitate the hardware with the software communication.

LabVIEW program is in contrast to text-based programming languages which it uses dataflow technique. A dataflow paradigm is where the code is not written, but rather drawn or represented graphically similar to a flowchart diagram. LabVIEW program is made up of two components known as front panel and block diagram [3-4].

A. LabVIEW Front Panel

LabVIEW front panel is the interactive user interface that constructed with different elements such as controllers, indicators, meters, constants and graph plotter. For instance, controllers are knobs, push buttons, dials and other input devices.

B. LabVIEW Block Diagram

LabVIEW block diagram is the graphical source code that defines the functionality of the instrument. In this case, the program execution follows connector wires linking processing nodes together. Unlike most programming languages, LabVIEW compiles code as it is created thereby providing immediate syntactic and semantic feedback and reducing the time required for development and testing.

IV. METHODOLOGY

The development of the Silat Olahraga's scoreboard comprise of three main stages: parameter setting and profile, signal acquisition and score point indicator. The design includes all the appropriate components and facilities that necessary to function properly. The program is written using G-programming language potentialities of LabVIEWTM version 2011. The details of each stage are discussed in the next paragraph. [5-6]

Parameter setting and profile: In this work, the system is designed in such that all the needed settings are configured before the match started. For instance, the setting includes number of match, name of contestant and score points. By default, the score points given would not only base on the action, but also for the body location of the opponents at which the hits land. With regard to this, the body locations that were used in this project are as shown in Figure 2.



Figure 2. Body Locations for Silat scoring points.

In this work, there exists a button that is use to start the match. For example, when there is no match, this button displays *Match Stop* in which all of the previous settings becomes active and the controls becomes inactive. Whereas, the display of *Match Run* indicates the match is started in which all of the previous settings becomes inactive and the controls becomes active. The flow chart to start the match is shown in Figure 3.



Figure 3. Flow chart for starting the match.

On top of that, there are also reset button and time delay function between each hits. The reset button is created to clears the memory from the previous match and reboots the scoreboard whereas the time delay is the function at which all controls for both contestants was turn off after the strike completed.

Signal acquisition: The scoreboard for Silat Olahraga is designed in such that scores will be given immediately when the action of kicked, punched or touch hit the body locations shown in Figure 2 [7-9]. In this work, each action is measured in units of voltage which is then converted into the form of the score based on the location of the shot. Table III shows the action that corresponds to the voltage reading. These readings are obtained from the sensor developed by other student. Hence, further information regarding these ranges will not be discussed in this work.

TABLE III. VOLTAGE RANGE FOR ACTIONS

Voltage range	Actions Perform
0 -1.99 mV	Simple touch
2 - 3.99 mV	Touch
4 - 6.99 mV	Punch
$7-10 \mathrm{mV}$	Kick

The scores obtained by the contestant are then saved in Excel Microsoft file format for further work. In this work, Excel was selected as a data storage since it is a spreadsheet program that is based on a table format. In other words, it is simply a big collection of rows and columns into which the user can enter numbers, words, pictures and sounds [10]. However, the user may modify the format to suit the specific requirement.

Score Point Indicator: In this stage, the winner of the match and full point gained are put on displays. The indicator was designed in such that if the points gained by both contestants are 0, then the scoreboard will display *GO GO GO*!!! with total points of 0. If any contestant has higher accumulated points, then the scoreboard will display the name for the winner with total points gained. If both contestants have equal accumulated points, then the scoreboard indicator will display *It Is a Tie* with respective points [11-12].

V. RESULTS AND DISCUSSION

Figure 4 shows the front panel for improved silat scoreboard. The corresponding G-programming is shown in Figure 5.



Figure 4. The scoreboard front panel



Figure 5. G-Programming for silat scoreboard

The front panel of the silat scoreboard in Figure 4 consists of three frames in which first frames the name of the contestants and number of match are entered. The points for each action and body locations are setting in the second frame. The third frame shows the menu for data saving. There is also a button that was used to indicate that the match has started. During this stage, all of the enabling and disabling for all of the controls are been configured for safety purpose.

Figure 6 and Figure 7 shows the scoreboard scoring points panel and sample data stored in an Excel Worksheet file respectively. Basically, the voltage signals are acquired from the sensors developed by the other students. However, due to many constraints, the input signals to the Silat scoreboard are simulated. This is illustrated in Figure 6.



Figure 6. The scoring points



Figure 7. Data Storage in an Excel file.

Figure 8 shows the sample hits perform by red contestant named Faizal. For instance, the scoring point obtained by the contestant is 3 point for actions and 6 point for body location. In this case, the identified action and body location are punch and chest respectively.



Figure 8. Hits perform by Faizal

As shown, each point that has been obtained by any contestant is stored into an array shown in Figure 9. Array is the memory that contains a maximum of ten rows of the score points that has been obtained by each contestant. The total score points for each contestant is calculated and compared.



Figure 9. Score points in array

Any score point that has been stored in the array is automatically sent into an Excel Worksheet file for storage purpose. Whenever a new score point is stored into the array, the data in the Excel Worksheet file are also updated. Other than that, some of the inputs that have been configured by the user earlier are also stored along with the score points into the Excel Worksheet file.

Figure 10 shows the score point indicator. For instance, the contestant named Hafiz has gain 68 score points that indicate he had won the match.



Figure 10. The score point indicator

The corresponding score points in Excel Worksheet file is shown in Figure 11. This Excel Worksheet file could be open via the button shown in Figure 10.



Figure 11. Excel Worksheet File

VI. CONCLUSIONS

The development of Silat Scoreboard for scoring system improvement in Silat Olahraga match has been successfully created and tested. It is proved that this type of scoring system gives great improvement in terms of flexibility and accuracy.

ACKNOWLEDGMENT

I would like to sincerely thank my Supervisor, Mrs Zuriati Janin for the guidance and support for this subject. I also would like to thank Mr Rahmat, lecturer from FSR for the advice and comments on the work that has been done. I also would like to express my gratitude to my colleagues, Ahmad Subki Bin Samsudin for his cooperation from the hardware stage that lead into the completion of this project. Last but not least I would like to thank my family for always encouraging me and supporting me throughout life.

REFERENCES

- Jawatankuasa Teknikal dan Pertndingan, Peraturan Pertandingan Pencak Silat Olahraga (Lelaki Dan Wanita). Sandakan: Sukan Sabah, pp 4-5
- [2] Anuar Abd. Wahab, Silat Olahraga. Kuala Lumpur: Dewan Bahasa dan Pustaka, 1996, pp 219

- [3] LabVIEW, *Getting Started with LabVIEW*. Austin: National Instruments, April 2003 Edition, pp 9-65
- [4] LabVIEW, LabVIEW User Manual. Austin: National Instruments, April 2003 Edition Part Number 320999E-01, pp 21-286
- [5] Dr. Erci M. Schaffer, *How to Develop and Effective GUI Standard*. Human Factors International, 1998, pp 3-27
- [6] Brad A. Myers, "Graphical User Interface Programming", ACM Transactions on Computer-Human Interaction, vol. 2, no. 1, pp 64-103, March 1995
- [7] P.J. Deitel, H.M. Deitel, C How to Program. Prentice Hall, Fifth Edition, 2007, pp 32-183.
- [8] Johnson and Gary W, *LabVIEW Power Programming*. Neew York: McGraw-Hill Professional, 1998, pp2-115
- [9] LabVIEW, LabVIEW Performance and Memory Management. Austin: Natinal Instruments, pp 1-25
- [10] Learning Microsoft Excel, vol. 1, Computer Training, 1990, pp 1-15
- [11] C.Dean, "Computer-controlled Scoreboard at the Olympic Games", Electronics and Power, August/September 1972
- [12] Song Yang, Wen Xiangming, Sun Yong, Zhang Liang, Yan Lelin, Lin Haitao, "A Scoreboard Based Method for Goal events Detecting in Football Videos", IEEE Computer Society, 2011, pp 248-251, doi: 10.1109/DMDCM.2011.19