Web-Based Application for Single Elimination Tournament Using Linear Congruential Generator

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Abstract

Sport develops in various branches through various tournaments and is generally organized in the drawing mechanism. The process of drawing is to determine the opponent for each participant. The purpose of this study was to facilitate the organizing committee to manage the data participants and to draw the single elimination diagram match. Other purposes were to facilitate participants to gather information and to register the information via online system. Analysis of requirement formulated the needs of the system. The result of the analysis determined the concept of admin and user use case. The admin has some privileges in the selection and seed priorities of the participants. Subsequently, the system drew and randomised the scheme chart based on the seed category. This research had produced a web-based drawing application which was useful to support each single elimination tournament including of information, registration, and drawing process.

Keywords: Single elimination, tournament, draw.

1.   Introduction

A tournament is a sport activity to enhance the performance ability. The format of the tournament has evolved and became the standard format according to the type of games which are held. The organizer of the match, which adopts a certain system and chart format, judiciously put an athlete or a group of players in accordance with their capacity and performance. The situation is not likely to happen if the first favourite player will directly play against the second in the first round.

Computer offers several eases in many respects, especially regarding the computation. The objective of drawing system is to avoid personal subjectivity in composing a tournament chart. The theory of random number computation has been growing and can be applied to overcome the manual drawing method problem.

The aim of the study was to design a drawing sport tournament system chart using pseudo-random number generator.

2.   Pseudo-random Number Generator

Random number is widely used in computer programs, such as simulation of arrival time of customers, cryptography program, and statistics. There is no computing algorithm that actually generates random series of numbers perfectly. Random numbers generated by mathematical formulas are pseudorandom numbers, because of their reproducible behaviours.

The algorithm to generate random series of numbers is known as pseudorandom number generator or PRNG (Munir, 2011).

The most common method used to generate random number is Linear Congruential Generator (LCG). LCG is a PRNG in the formula as follow:

$$x_n = (ax_{n-1} + b)mod\ m$$

Where, X is the sequence of pseudorandom values, and $m, 0 < m$ is the "modulus", and $a, 0 < a < m$ is the "multiplier", and $c, c < m$ is the "increment", and $X_0, X_0 < m$ is the "seed" or "start value".

The period of LCG is less than m. If a, b, and m were chosen appropriately (b should be relatively prime to m), thus, the LCG will have a maximum period (m-1).

3.   Design and Methods

In the early phase, the admin and the user use case could be composed based on the requirement analysis.
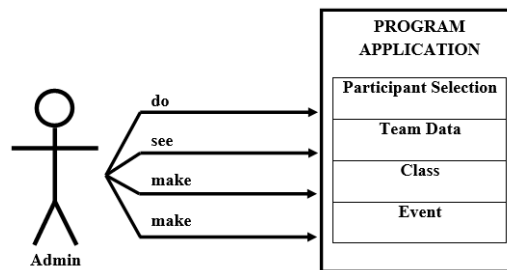
Figure 1. The admin use case chart.

Participant Selection consisted of the events and the registered participants. The admin selected and determined the athletes who fulfilled the seed category of each competed class. The system randomised and created the chart games. Team data contained a list of teams which had completed the registration. Admin was also able to see all athletes who had been registered. Class contained a list of contested match classes which were differentiated by weight. The admin could add, delete, and edit the classes in line with the needs of the game.
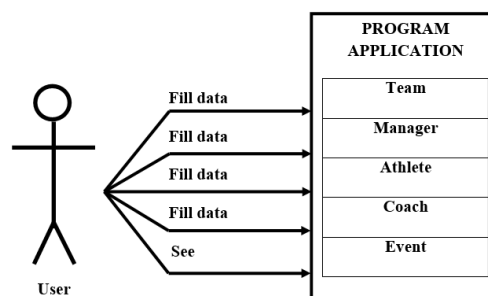

Figure 2. The user use case chart.

Team consisted of the team profile, manager name, and registered athletes. Manager consisted of the manager data. Athlete was a menu to provide the athlete data entry and to

compose a team. Coach consisted of the coach data entry. Event consisted of the reports of followed event.
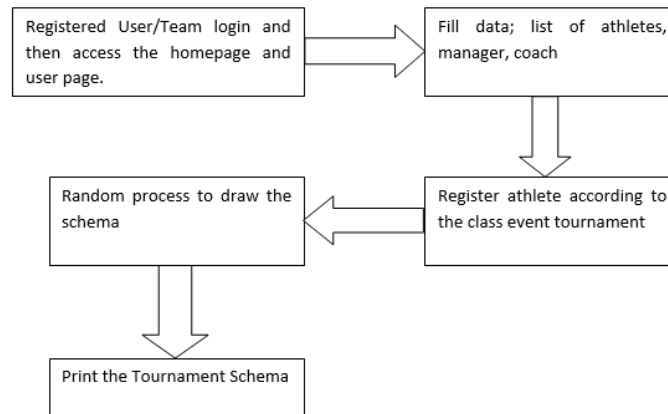

Figure 3. The Flowchart of user.

The users were required to register previously before logging in to get admission to the user pages. After a successful login, user should complete the team data entry including the data of the manager, coach, and athlete. After entering all necessary data applications, the users registered the athletes in the event that would be followed. The process awaited all team to register their athletes until a specified time. In the final, user would be able to print a chart games that had been drawn by the admin.
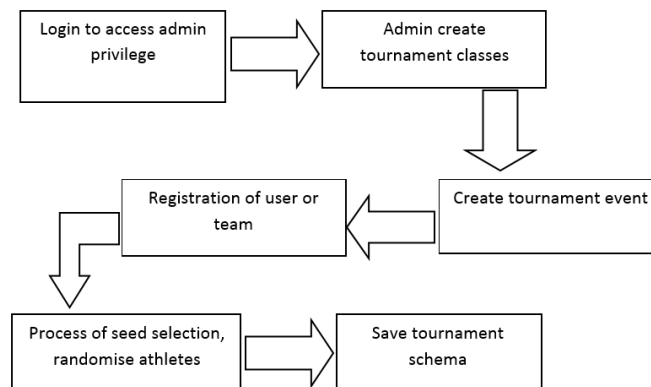
Figure 4. The workflow of Admin.

Initially, thedmin should login to get admission into admin page and create a match class. Furthermore, admin should list the entire enrolled athletes until a specified time. The next process was the selection of seed and draw athletes in according to the performance criteria which were differentiated by local, regional, national. After the drawing process, the admin should save the result.

3.1. Context Diagram

Context diagram was a relationship of the input and output in a system. The context diagram described the global flow of data from a user/team that would be manipulated as result of information.
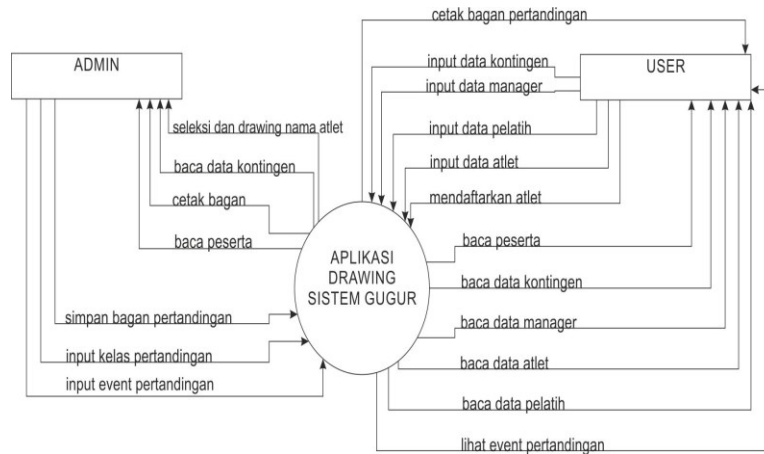
Figure 5. Context diagram

Web-based application for the Student Taekwondo League by using single elimination tournament involved two different types of the user access, admin and user/team.

Hierarchical Input Process Output model (HIPO) in Fig. 6 was used to prepare the description of Data Flow Diagrams (DFD). Tiered chart defined processes that could be used with the Data Flow Diagram notation.
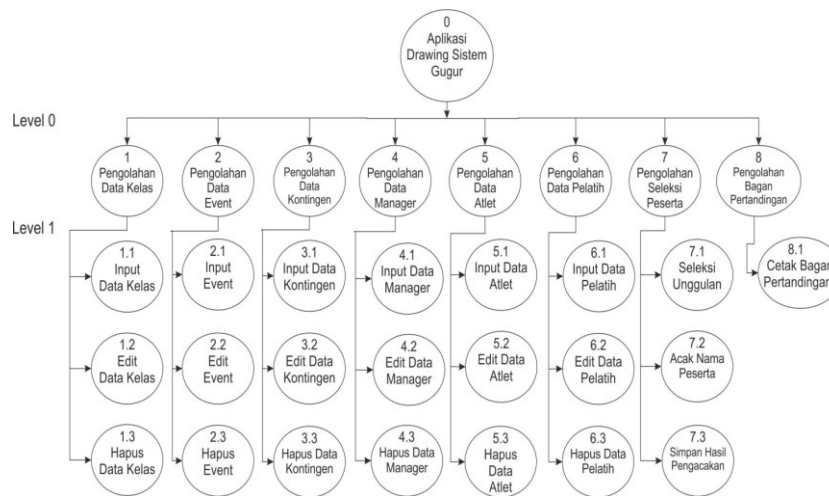

Figure 6.   *Hierarchical Input Process Output* model.

3.2. Data Flow Diagram

Data Flow Diagrams (DFD) is often used to describe an existing system or a new system which will be developed (Krisharnomo, 2012). DFD was a technique to illustrate the data flow by using certain approved symbols.

3.2.1 DFD Level 0

DFD level 0 was a model to describe the distribution processes in smaller modules which aimed to ease the common users who did not master the application of computer in order to understand the entire system.
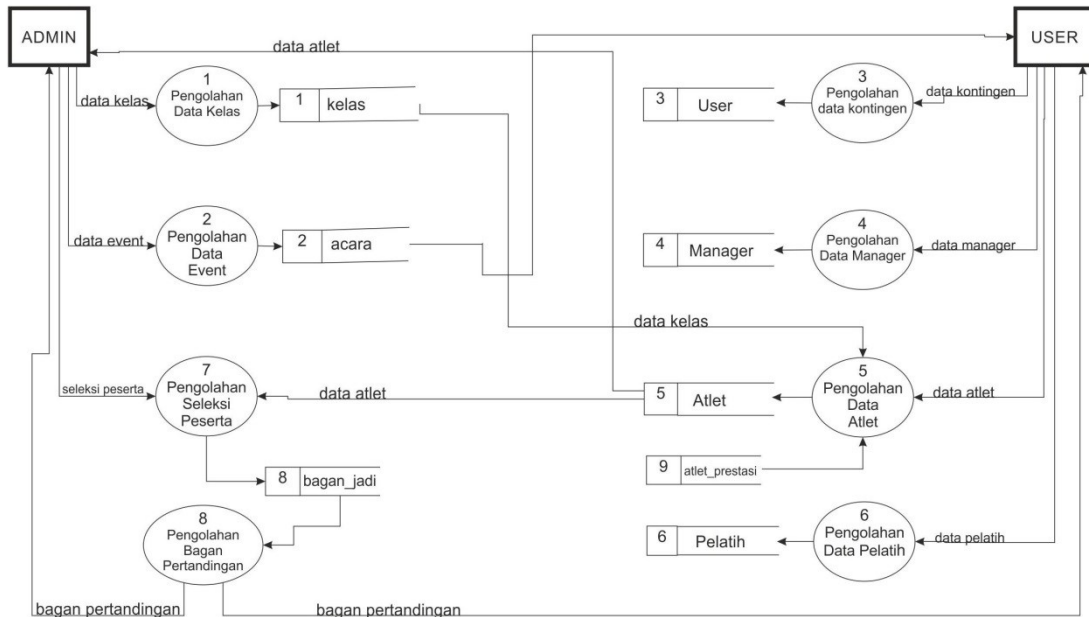
Figure 7. DFD level 0.

3.2.2 DFD level 1 process 1

DFD level 1 process 1 described the process of class data performed by the admin. The processes that occurred on the DFD level 1 process 1 were input, edit, and delete the class data.
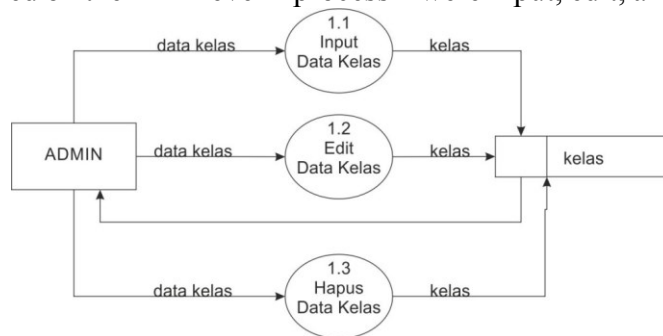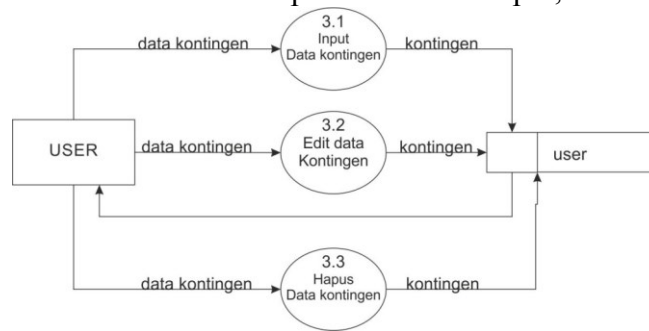

Figure 8.   DFD level 1 process 1.

3.2.3 DFD level 1 process 2

DFD level 1 process 2 illustrates the event data processing performed by the admin. The processes that occurred on the DFD level 1 process 2 were input, edit, and delete the event data.
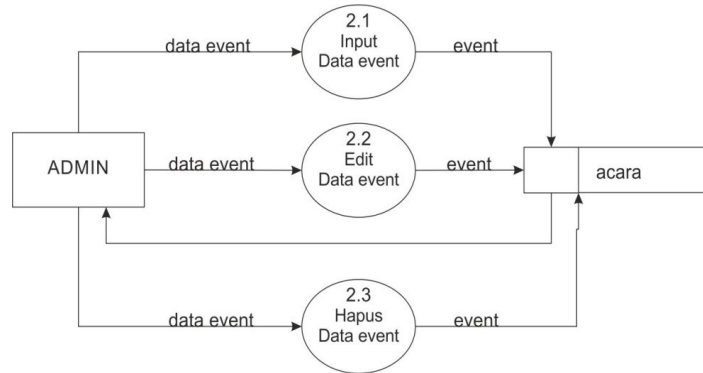
Figure 9.   DFD level 1 process 2.

3.2.4 DFD level 1 process 3

DFD level 1 process 3 describes the process of team data performed by user/team. The processes that occurred on the DFD level 1 process 3 were input, edit and delete the team data.

Figure 10. DFD level 1 process 3.

3.2.5 DFD level 1 process 4

DFD level 1 process 4 illustrates the processes of manager data which were consisted of input, edit and delete the manager data.

Figure 11. DFD level 1 process 4.

3.2.6 DFD level 1 process 5

DFD level 1 process 5 illustrates the manipulation of athlete data performed by user/ team which consisted of input, edit, and delete the athlete data.
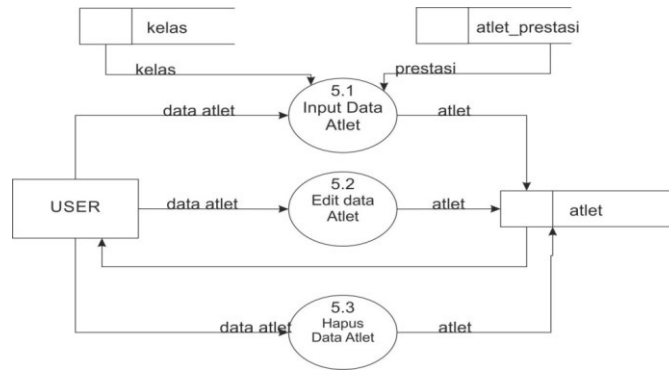
Figure 12. DFD level 1 process 5.

3.2.7 DFD level 1 process 6

DFD level 1 process 6 illustrates the manipulation entry of coach data which were included of input, edit and delete the coach data.
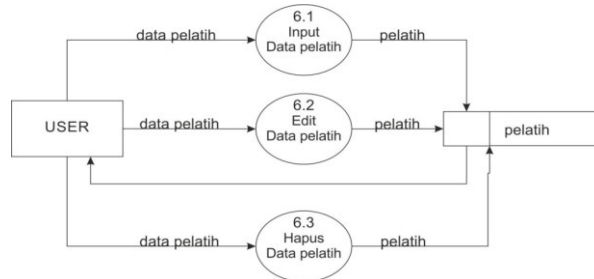
Figure 13. DFD level 1 process 6.

3.2.8 DFD level 1 process 7

DFD level 1 process 7 illustrates the manipulation of contestant selection performed by the admin which consisted of selection of seeds, randomise participants, and save the tournament chart.
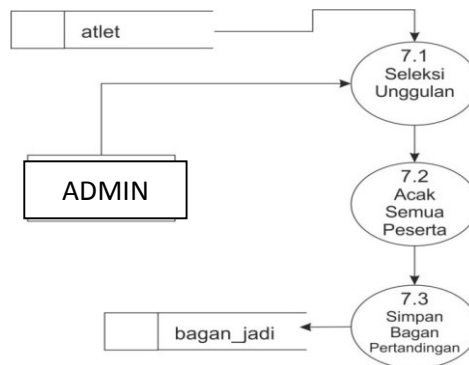
Figure 14. DFD level 1 process 7.

3.2.9 DFD level 1 process 8

DFD level 1 process 8 illustrates the manipulation of tournament chart performed by the admin and user. The process included the printable tournament chart which had been randomised by the admin.
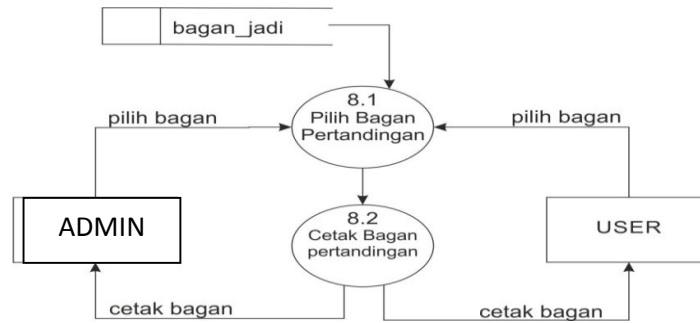
Figure 15. DFD level 1 process 8.

4.   Results

The application of the system was different between the admin and the user. Admin has privilege access to some feature such as the selection of participant, team, class, and event. Login is required to get privilege access.
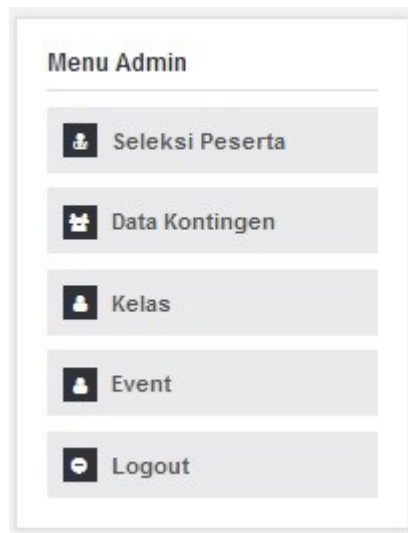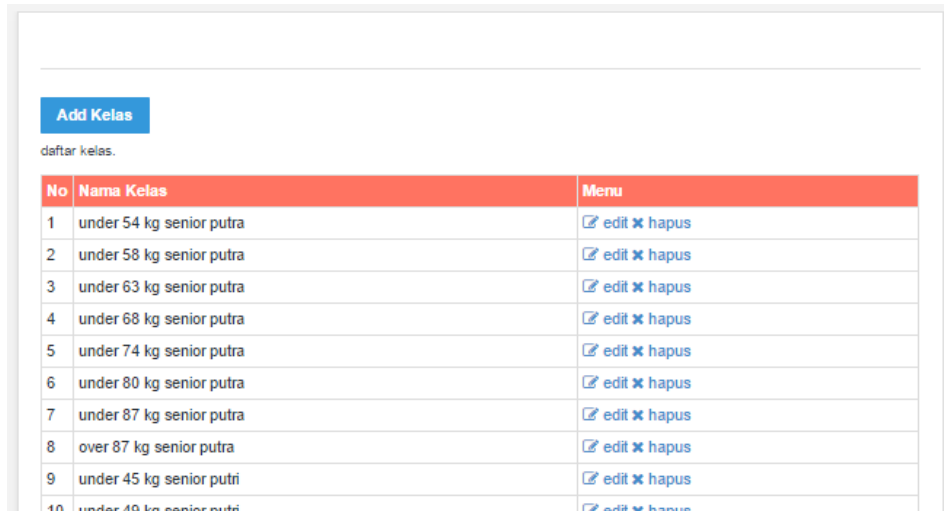
Figure 16. The admin menu.

The admin was allowed to add, edit and delete the tournament event in accordance to the current regulation. Fig. 17 shows the display of tournament class.

Figure 17. The Tournament Event.

The admin had the authority to create, edit and delete the tournament event in Event property. Fig. 18 shows the display menu of Event.

Figure 18. The menu of event.

Concerning with new event, a form was required to create a new event which was consisted of name of event, code, description, organiser, location, registration dateline, duration of event, and quota.

Figure 19. The form of the event.

Furthermore, the admin had to wait all users to register until the dateline before selecting the participants. In the selection process, the admin preferred the seeds, randomised the participants, and created the tournament chart.

Figure 20. Selection of participants.

Figure 21. Selection of seeds.

The admin selected the participant in all tournament classes including the seed criteria. In determining the seed, the admin had to consider the achievement of the athletes.

If the participants were less than 4, 8, 16, or 32, then the remaining participants would be bye or in other words the participants who received a bye opponent would automatically advance to the next round without playing previously.

Figure 22. The tournament classes.

After choosing one of available classes, the application would display the tournament chart. There were two options whether to re-randomise chart or to save the current chart. Fig. 23 shows the display of the tournament chart.
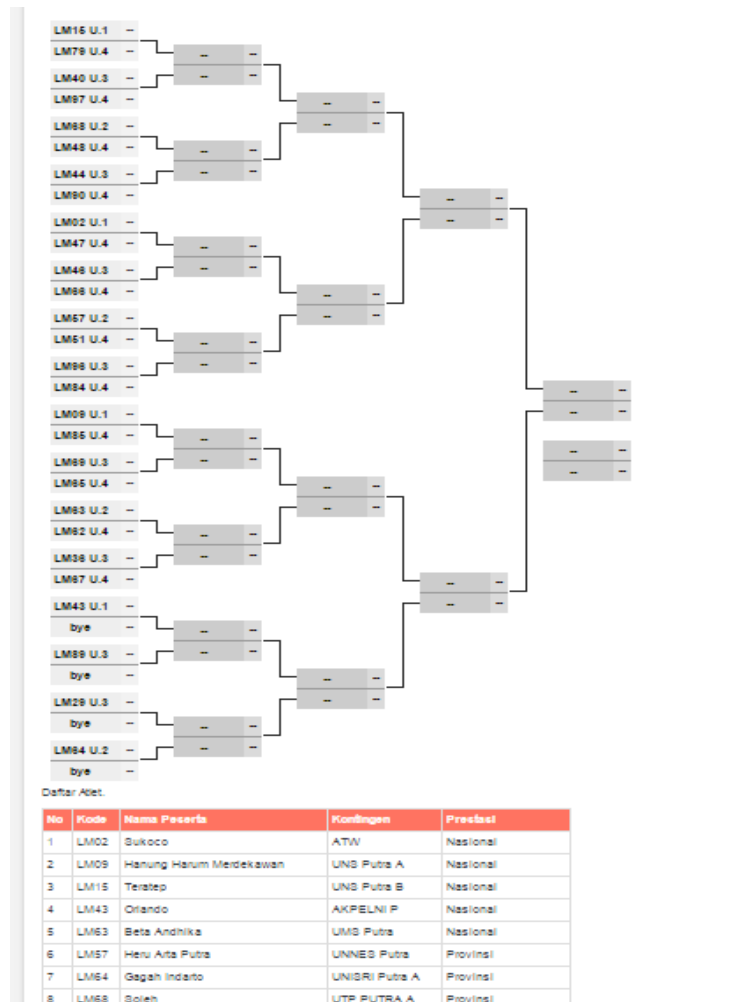

Figure 23. The tournament chart.

The user/team would be able to print the tournament chart if and only if all charts had already been processed and saved.

Figure 24. The tournament event.

5. Conclusion

The application of single elimination tournament in the Taekwondo League is able to manage the event and eventually to support the event committee. This study proved that the drawing method was able to apply an algorithm of numbers in a computer-based system. The benefits obtained from the system included the ease of application, especially for the organizers of sport events and the conduct of computer-based drawing. It also provides information for the participants and the global users. The result of questionnaire proved that 86% of the user stated the application was user friendly, and 79% stated the interface was in appropriate as well as stimulating content. It was also able to manage the other similar single elimination variety of sports.

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