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Punching Bag With Speed and Accuracy Gauge *

Ralph Robin Cacacho, Frederick Oyas, John Paul Priolo, Geuel Yasis, Winston Dereje

College of Engineering, Don Bosco Technical College, Mandaluyong, Philippines

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Abstract. This study reports on the design of a punching bag that has the capability to gauge a boxer's accuracy and speed. It aims to help the user of this prototype to improve condition which concerns the speed of the punch and accuracy to hit a designated target. A graphical user interface (GUI) allows the user to select from several training modes or to select a pre-defined training sequence. Real-time output measurements are displayed by the GUI after every registered hit.

Keyword: Speed and Accuracy Gauge, Punching Bag, Visual Basic program, Boxing equipment

1. Introduction

A knowledgeable trainer is crucial in the development of a boxer. Understanding his trainee's potential and limitations will guide him in which skills to improve. Because the boxer is so focused on his opponent he is usually unaware of his errors once inside the ring. This common occurrence highlights another importance of a trainer in a boxer's life. Being an observer outside the ring gives the trainer the ability to see what the boxer cannot.

Equipment specifically for training and developing the basic skills in boxing are available. Sophisticated electronic equipment used to develop the said skills are also accessible to professional boxers as well as indivual who prefer boxing as a recreational activity. What the people need in the professional field of boxing is an equipment that not only gauges the boxers basic skill but at the same time improve it.

Previous studies have been made like a punching bag with electronic horn [1] to signal the user when to start and to stop punching the bag, then an LCD display shows the actual power of the punches. Also there has been an electronic speedbag [2] which shows measurable feedback on a selected area where it has been in contact with the user for a number of times, thus measuring how fast the bag was being striked.

The present study fills a gap in this line of research, which requires a punching bag that has both speed and accuracy gauges. Speed in terms of how fast the boxer reacts as the target is being indicated by the system, and accuracy by means of how many hits landed on a designated area in the punching bag target zone.

The paper is arranged as follows. Section 2 discusses the system design which includes information about the prototype, the circuit connectivity, how the program works from punching bag to pc, and the GUI environment. Section 3 is the discussion of results where our formulated survey and interview among professional people from the field of boxing is detailed. Finally the Summary and recommendations are Section 4.

2. System Design

We used a punching bag as the material where the target points are to be enclosed. It is a leather type punching bag with wood shavings in the inside. On the target points, we used a molded fiber glass which is sufficient to hold and protect the tact switches and the LED from the pressure of the hits it will receive. Figure 1 shows that there are 6 target points (TP) connected on the punching bag placed according to a

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person's main target in the field of boxing, starting from the head upto the abdomen. On each TP are installed 10 tact switches that serve as the accuracy measuring connection on the punching bag and 1 LED in each TP which performs as the blinker as soon as the program is executed.

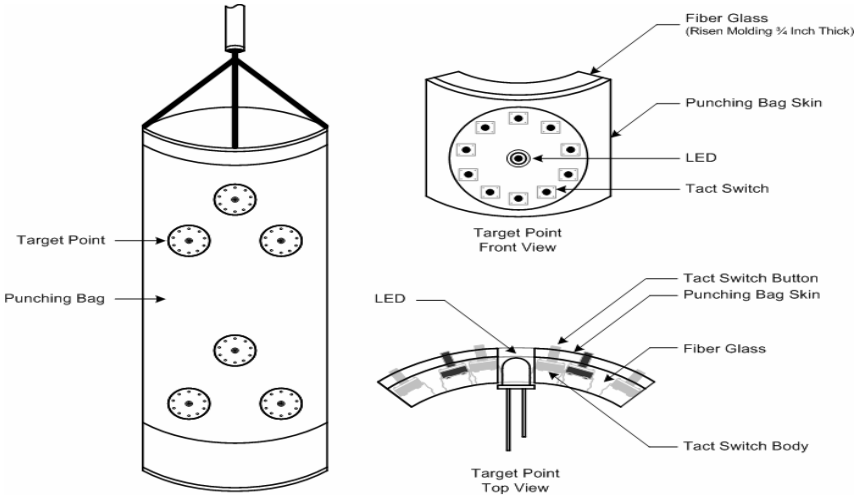

Figure 1. Punching Bag, Tact Switches, LED

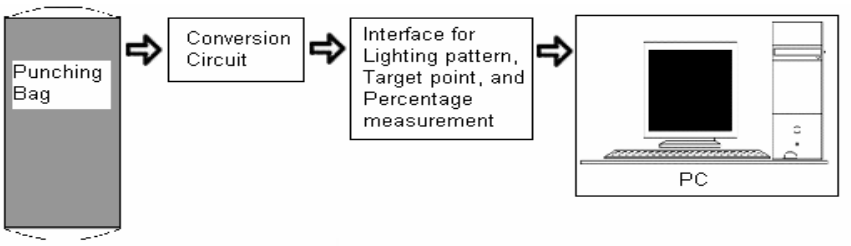

Figure 2. Interface

Figure 3 shows the process flow diagram of the design. It begins with the user filling up the graphical user interface (GUI) with personal information and details about the training mode he desires. Depending on which mode was selected, the program in the PC executes a random LED lighting pattern sequence. In any case, the user is required to try to hit the pre-determined target points. For every three hits registered by the system, the program displays the results on the GUI, and allows the program to continue looping until the last sequence has been executed by the user. Towards the end of the program, the user is afforded the option to print the results.

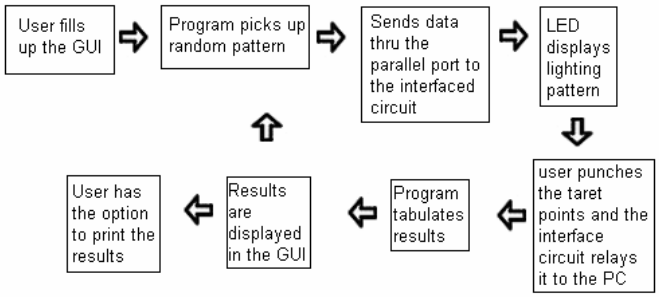

Figure 3. Process flow diagram

Figure 4 shows the Graphical User Interface where the user inputs personal information and selects among several training modes. In this example, boxer *Juan dela Cruz* is a *minimum weight* user with 105 lbs. His training selection indicates that he chose a *beginner mode* as his level of practice. He also selected the *tournament mode for speed and accuracy* where *30 sequence* will be given out by the program. With this chosen, he can expect the program to produce 30 random sequences, where each sequence lights up 3 LEDs in succession.

For reference, the buttons of the GUI are described as follows:

1 – WEIGHT CLASS. User can pick from 11 choices from minimum flyweight to welterweight

2 – NAME. User should type his/her name, accepts alphabetical characters.

3 – TIME. Actual time in the computer.

4 – DATE. Actual date in the computer.

5 – REGISTER. Activation button to select a training mode.

6 – PRACTICE MODE. User can select between Practice mode, Freestyle and Tournament.

7 – LEVEL. User may select his level of expertise, between beginner, amateur, and professional. This will indicate how fast the lighting pattern will blink.

8 – PUNCH #. Displays the punch number sequence.

9 – TARGET TO HIT. Displays the target point to be hit by the user.

10 – TARGET PUNCHED. Displays which target points the user has hit in a run.

11 – ACCURACY DISPLAY. Displays the percentage of accuracy on every target the user has hit.

12 – TOTAL. Displays the total score per sequence.

13 – SPEED DISPLAY. Displays the time where the user has finished in executing a sequence.

14 – OUTPUT SCREEN. This is where the results are displayed.

15 – START. Start button.

16 – PRINT. User can shoose this option if ever he want to print the results of his chosed practice.

17 – QUIT. Exits the program.

18 – NO. OF SEQUENCE. User can shoose from 10, 20, 30 sequences to be given by the program.

19 – TIME TO START. User can choose how many seconds before his practice starts.

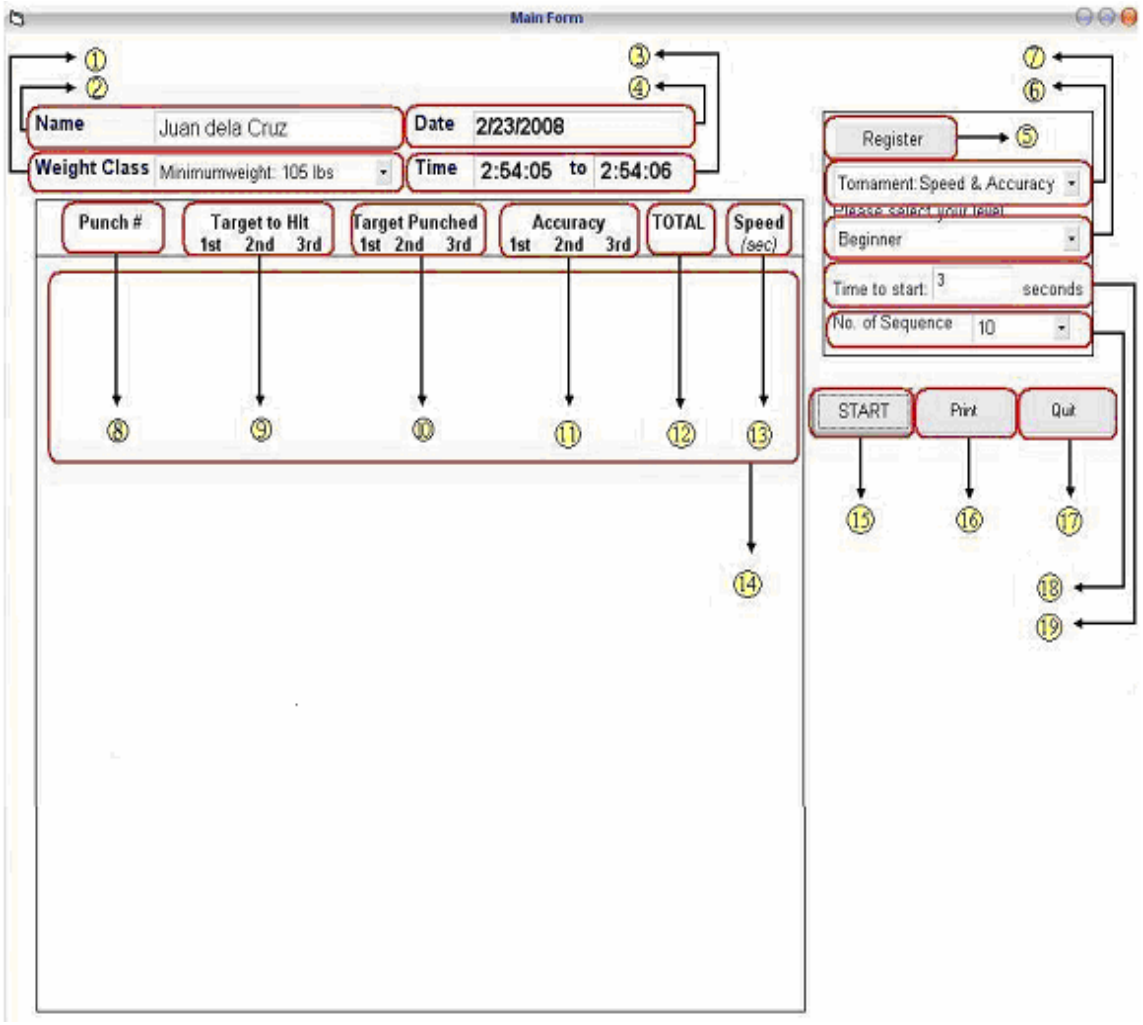

Figure 4. Graphical User Interface (GUI)

3. DISCUSSION OF RESULTS

In order to quantify the merits of the designed prototype, we formulated a set of questions which we then passed on to several experts to answer. In particular, the questionnaire focuses on six (6) areas, namely: (1) Accuracy measurement, if the tact switches were effective as accuracy measuring device, depending on how many tact switches were hit on a designated TP area and each TP corresponds to 100% (10% per tact switch) (2) Speed measurement, if the speed levelling per sequence is effective to gauge the speed of execution in a punch, (3) Placement of Target Points, effectivity of the 6 target areas and if this is effective as to be the designated target spots, (4) Combination Punches, if the random pre-set combination punch are effective in giving a sequence to be executed, (5) Level of Diffuculty, if the program's mode in choosing a user's level would be effective in training, (6) Overall Rating, if the trainors or boxers would use this device as a practice routine and if they would recommend others in the same field to use the design.

The subjects for the surveys and interviews were two boxing trainers and one professional boxer. The prototype was brought to them and explained by the designers. After which, the questionnaires were handed out to them to fill up while the designers assisted in clarifying some items that were initially unclear.

Figure 5 shows the summary of the ratings given to the project. In order to appreciate the context behind these numbers, the following comments were gleaned.

Accuracy Measurement. The experts cited that the accuracy gauge is a good basis in a real fight since the pattern is from a 10oz. Boxing gloves. One suggested that the switches should be decreased to 4, so that it can be easily hit in an instant, since the accuracy also varies depending on the user.

Speed Measurement. The experts cited that it is good in improving the speed of punch for beginners. They all agreed that this is a very important factor in a boxer's development.

Placement of Target Points. The experts were common in citing a need to improve the placement of the target points. One suggested that the areas for TP1 and TP4—which correspond to the face and abdomen of the opponent—be enlarged. At the same time, the other TPs should be moved farther to the "sides" since boxers usually need to try out some body punches.

Combination Punches. As a boxer, he claims that this does not really matter at all since in a real fight, "you don't know which combination to do since your opponent evades and attack as well". In addition, the Trainers think that a pre-determined sequence should be added so that he knows what his trainee is expected to perform.

Level of Difficulty. The experts agreed to this part of the design, that there should always be a levelling mode, since there are varied users of the project. It is especially beneficial for beginners.

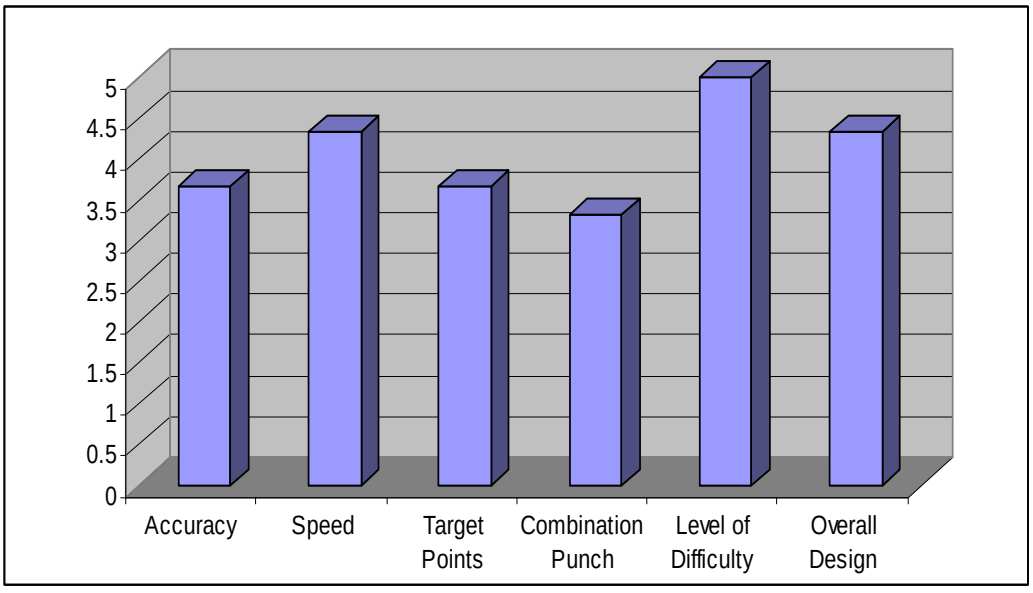

Figure 5. Data Graph

Overall Rating. The trainers would like to have this as part of their trainee's practice; they were common

in citing that it is good for beginners and there maybe times that they do not need to watch for their trainees and just look at the results of the practice. The professional boxer cited however, "The design has good features but only as a part of a boxer's training, it is not all about speed and how accurate your punch is, there are also other factors, such as power, footwork, and a lot more."

4. Summary and recommendations

This study has reported on a computer-interfaced punching bag that could measure boxing speed and accuracy. A punching bag is selected as a material to receive the impact that serves as enclosure for the speed and accuracy gauge. The program produces random sequence for the user to follow, as it is interfaced with the logic circuit, output signal is presented through the circuit within the punching bag. Accuracy and Speed is then being measured from the point of contact from the punching bag and the user, giving the computed speed and accuracy as the output.

One factor that affected the system was the user's mode of punch, since tact switches are designed to be pressed, a point of contact which is not directly proportional to the tact switch may affect a possible output.

It is foreseen that this design will help trainers and trainees alike in such a way that they would be able to gauge and monitor their improvement when it comes to speed and accuracy in delivering a punch. The data can be stored for future references and record.

5. Acknowledgements

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6. References

[1] Murphy R. L., (1986) Punching Bag and Suspension System. United States Patent. 4721302. January 26, 1988.

[2] Carlin J. A., (1986) Reaction Time and Force Feedback System. United States Patent. 4763284. August 9, 1988.

[3] Halvorson M. (2002) *Step by Step: Microsoft Visual Basic 6.0 Professional*. Seattle: Microsoft Press.

[4] Black J. M. (2003) Methods and Systems for Providing Quantitative Assessment and Relaying of Fighter Performance. United States Patent. 7128692. October 31 2006.

[5] Gardner M. (1968) Punching Bag Support or Stand. United States Patent. 3510131. May 1970.