

(SMAIZER) Smart Agility Speed Analyzer Implementation of Shadow Exercise Tool Based on Microcontroller in Increasing Agility of Badminton Athlete

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ABSTRACT

This study aims to shave the speed of badminton players and serve as a media trainer to improve the speed and agility of badminton players, especially the problem on the players to hit well and quality, should be rested on foot movement. for that must practice footwork diligently and diligently, with the creation of SMAIZER Tool. The method used Effective and efficient footwork (footwork) will facilitate athletes move in the field so that the required stamina will be smaller. Simulation results Tools that are processed to produce accurate data have software and hardware systems to input user movements as desired or can be randomly based on the indicator lights on the Shadow Trainer.

Keywords: Footwork, Auto, Measurement Instrument agility badminton player.

I. INTRODUCTION

Badminton is one of the most popular sports game in Indonesia. Satriya (2008, pp. 1) says "Individual badminton games can be played in one man against one or two against two." Using a racket as a hammer and an object as a hit, the game field is rectangular and is limited by lines and net to separate between the game area itself and the

opposing game area.

Judging from the characteristics of badminton games, components of the most dominant physical condition is agility. Subarjah (2007, p.29) says that "In badminton games, the components of prominent physical conditions are agility". This is because the athlete must be able to master the field and can move quickly and precisely in various directions. According to Sidik (2010, pp. 20) agility is the ability to change the direction of movement as soon as possible. " Agility describes the ability of one's movements to change direction quickly and precisely without losing balance.

So that becomes the most important element to be considered In sports badminton one of them is foot step (footwork). As good as an athlete smash will be useless if not accompanied by good footsteps in the field. Effective and efficient footwork will make it easier for an athlete to move in the field so that the required stamina and energy will be smaller. The existence of consideration of athlete's posture characteristics because the posture of each athlete is different like height, bone shape, and body balance is also different. During this time many badminton players have an irregular footsteps, this is because the equipment used in foot exercises (footwork) is still simple that is using a simple lamp that is turned on / off by the coach.

II. BACKGROUND

Based on interviews with some badminton trainers in Surabaya that the cause of athletes is difficult to develop and compete is the aspect of agility that has not been good, whereas in the badminton game the athlete must be able to move quickly in various directions to master the field. Agility does not form by itself, but through a process of training. Exercises to improve agility are quite varied, including shadow badminton and ladder. Shadow badminton exercise is one form of exercise used to improve footwork. According to Subarjah (2007, p.42) explains that "To practice the movement of the foot is done in several ways, such as by doing shadow strokes, taking kok in a certain position position and make moves / move towards a certain and others"

Based on research Pudjijunarto, et al (2013) about footwork aids obtained results that the tool can work well but there is no scientific research that proves the tool is able to improve the agility of an athlete. To answer these problems, in this study is not excessive that the tool footwork based on microcontroller that has been produced will be implemented on badminton athletes in an effort to improve agility. By applying this tool, it can be used to monitor the success rate of an athlete's training appropriately and can be used as a reference for obtaining appropriate methods and ways to improve an athlete's performance.

III. RESEARCH METHODS

The research method used is research development or research and development (R & D). Research and development method is a research method used to produce a specific product and test the effectiveness of the product (Sugiyono, 2013)

Based on the problems that arise we seek to create innovative works that outupnya useful to the community, based on strong theoretical science we are trying to implement and implement the form of a tool (SMAIZER) Smart Agility Speed Analyzer Implementation Shadow Tools

Microcontroller based on which the application of this tool is based by Law and Physics Theory, in this case is Newton's Motion Law.

According to Newton's Law of Motion a force of matter will increase in size if a power impulse is directed to the direction of the force of the object. However, if given a repulsive or opposite force from the force of the object. then, will reduce or slow down from the rate of the object style. Through this principle SMAIZER Application "Smart Agility Speed Analyzer" can be realized, through the basic equation of force that is :

Gaya (F) =

$$F = m.a$$

So based on the Usage of Equation above can be obtained a new equation that is the equation used in application SMAIZER tool "Smart Agility Speed Analyzer" that is:

$$p = \frac{F}{A}$$

Where :

$p = \text{Tekanan (N/m}^2\text{)}$

$F = \text{Gaya (n atau dn)}$

$A = \text{Luas Alas atau Penampang (m}^2\text{ atau cm}^2\text{)}$

Sehingga gaya tekanan pada Alat SMAIZER "Smart Agility Speed Analyzer" bergantung pada injakan dari tumpuan kaki yang jatuh dari lompatan atlet pemain badminton.

Penelitian ini dilakukan selama 5 bulan pada tahun 2017/2018 lokasi basecamp universitas negeri Surabaya dan pada tempat GYM sekaligus lapangan bulutangkis yang ada pada Universitas Negeri Surabaya.

Alat dan Bahan yang digunakan ialah buku catatan binder, peratan tulis , laptop alat perekam , kameran dan buku refrensi dan panduan peneltian

Metode pengambilan data yang digunakan yaitu mengambil sampling dari proses

analyzed and participated directly in the process of observation analysis supported by the use of toeritis methods Research and Development (R & D).

Training Tools Footwork Based Microcontroller Wireless System is a prototype of Unesa campus research lecturer results through Competitive Grants research in 2016, Footwork Training Tool is able to optimize the effectiveness and efficiency of an athlete's movement in preparation for a match. The advantages of the prototype made are as follows:

1. Microcontroller Based Wireless System, consisting of Transmitter, sends signal from the measurement / sensor to a monitoring control system. Its electrical signals are 4 mA - 20 mA and the working voltage of the voltage signal ranges from 1 - 5 VDC and also 0 - 10 VDC.

Monitoring Control, using the laptop as the media. Display panel lights can be viewed through the laptop interface.

2. Ease of use, consisting of Knock-Down Design, the tool is designed to have two (2) unit parts that can be integrated when used. Control Unit and Panel Lamp Unit. Panel height can be set according to user's wish.

Moveable. Tools can be moved from one field to another.

Field Model Mat. Matrels are designed to be no longer partial, developed into field models. When a badminton player maneuvers movement from one point to another based on the indicator lights flame will be easier.

3. Record automatic data. The player's name, the name of the trainer, the player's training response time, the number of training loops, training combinations and time intervals of the players are automatically saved in the exercise when the instrument operates

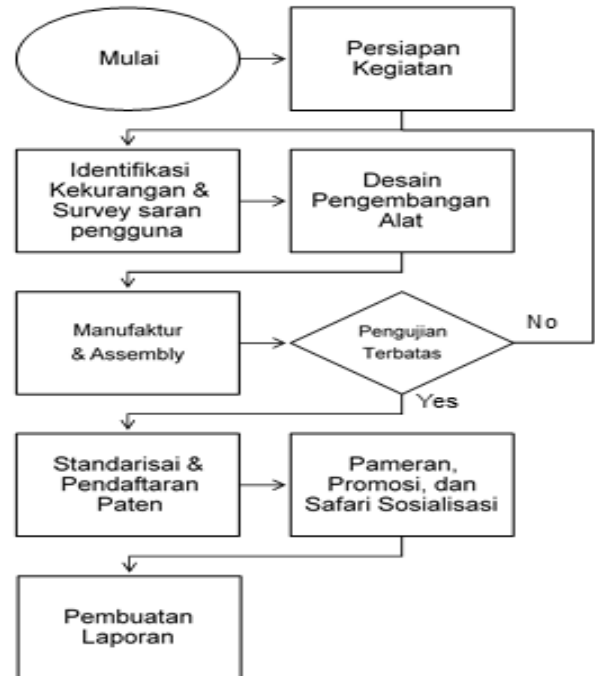


Figure 1. Flowchart Research Methods

Observation with the existing situation in the field

This activity is the first step in finding the necessary data, Observation and FGD (Focus Group Discussion) conducted by the team with the entrepreneurs, where the discussion discusses the working conditions of the entrepreneurs and the constraints experienced as well as the short-term and long-term impact which is obtained by the entrepreneurs from both the technological and economic aspects. Such as production capacity in 1 time process, how much market demand, and also social aspect will impact of / before and after the creation of tool.

Study of literature

The Literature Study contains a series of search and assessment activities of relevant and reliable sources in the collection of material and become a reference in writing this PKM. The literature we use includes mechanical engine elements (Robert L. Mott), Mechanisms and Machine Dynamics (Dr. Ramses Y. Hutahaean, MT), and Book of Element Engine Volume I (G. Niemann, Anton Budiman, Bambang Priambodo). In

this step we get reference design, work, and security system in making SMAIZER tool.

Designing

The next step is planning and making machine design "SMAIZER." Based on the results of the discussions of the implementing team, lecturers and partners, the design of the appropriate "SMAIZER" machine, which this design has been discussed with the relevant parties. Design design This tool uses 2016 inventor software as shown in the picture below:

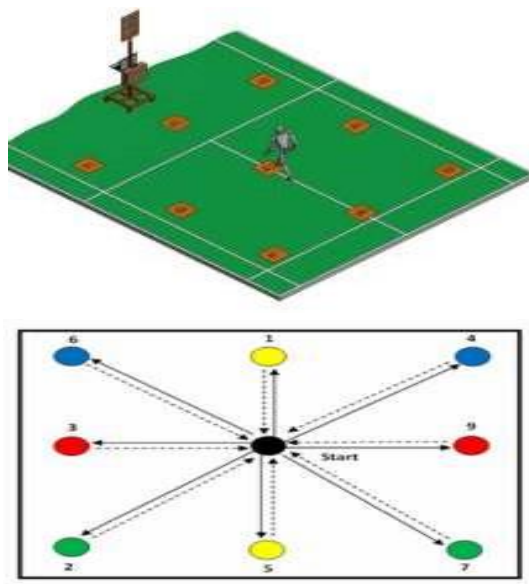


Figure 6. Layout of the SMAIZER Mechanism.

After the design is made the next stage of Design analysis From the initial design that has been created, analyzed together to find out the various possibilities in the process, whether it can be used, what is in accordance with the wishes of partners, what are the constraints, how to overcome them, then what alternatives are used.

Procurement of Tools and Materials

Before the work begins, it is necessary to purchase the ingredients in and the tools used in the SMAIZER tool.

Toolmaking

Once everything is available, including tools

and support tools to be used, the next step is to manufacture or assemble components from the SMAIZER tool. Usually this process takes a long time but our target is 1 month for machining work. If you encounter obstacles and problems usually use the services of a public garage or hire a handyman to finish making SMAIZER tools, but here we are trying to make the machine itself.

Test Machine

SMAIZER Machine Testing. is intended to ensure that the performance of each component of the machine-making results can function in accordance with what is expected. The test will be conducted at the sports venue of Universitas Negeri Surabaya, in Surabaya's wetan tongue.

Implementation of Machines and Monitoring

After the created SMAIZER tool has been tested and gets good and maximum results, then Tool is submitted to related parties, and testimony in order to get an opinion of how the performance of SMAIZER tool. Monitoring is done to monitor the condition of the tool used by related parties, then documented and taken also analyzed data - other supporting data.

Publication and Filing of Patents

The results of our program will be published both scientifically and in mass media with the aim of making people aware of the benefits generated by SMAIZER tools that we create. Given the number of benefits generated by the PKM we created as well as in the GOOGLE PATENT search results no one has filed a patent regarding our tool.

Evaluation

The evaluation and refinement stage of the SMAIZER Tool shall be carried out after the testing of the device has been performed. At this stage will be assessed system work of the tool, both from the movement and the functioning of the light sensor, the stability of the tool and the form of perfection of the results of processing. If

the tool does not meet expectations, failure analysis and corrective action will be performed.

Report Creation

Reporting is made after all steps are completed so that the results obtained from making the SMAIZER tool can be explained in detail according to the data obtained.

IV. RESULTS AND DISCUSSIO

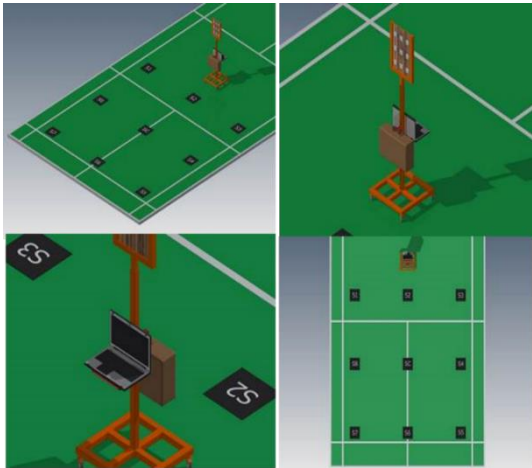


Figure 3. 3D Design of SMAIZER tool

SMAIZER invention tool is able to shave the speed of badminton players and can be used as a media trainer so that can improve the speed and agility of badminton players. With dukuang components consisting of:

- Loop lamp (repetition). Can be set how many times the cycle of repetition of the lamp as an indicator of motion of badminton players during practice.
- Lamp Combination. Using eight (8) combinations of flame lights on this tool. This combination can be set to light up in sequence or randomly during practice.
- Data Record. Serves to store user data during the exercise (including: player response time, player name, player agility level).

With working system This tool is connected with software and hardware to input user

movement (user) as desired or can be randomly based on the indicator lights on the Shadow Trainer. It consists of two units

- Lamp panel unit; lights are automatically lit when badminton players step on the field press sensor. Flame lights can move sequentially or randomly with different cycles (loops).
- Unit control box; the input data on the software is a start-up for the tranismitter / receiver in response to the existing signal

Core components:

Transmitter

Sensor Press

Reserver 1 piece

Display

Carpet Finil

Square Mat

Overall progress of activities until this progress report is compiled by 87% with the following description.

Table 3.1 Presentasi ketercapaian program

No.	Kegiatan	Persentase	Ketercapaian
1	Persiapan kegiatan	10%	10%
2	Identifikasi kekurangan & survey saran pengguna	10%	10%
3	Desain pengembangan alat	30%	30%
4	Manufaktur & assembly	10%	10%
5	Uji coba	15%	10%
6	Standarisasi dan pendaftaran paten	10%	5%
7	Pameran I3E dan promosi	10%	7%
8	Pembuatan laporan	5%	5%
Total		100%	87%

Substantially, the implementing team has not faced any problems that hinder the implementation of activities. All activities that we do relatively no obstacles, from the technical aspects of making tools and software design can be implemented well because the team consists of multidisciplinary science, work scheduling and team coordination is also done well this is evident from the achievement of progress activities that have reached 87% and the

implementation team is very optimistic to complete the activities according to plan.

Results that have been obtained from this machine

This research produces a SMAIZER prototype "Smart Agility Speed Analyzer", which after simulation of device performance calculation and data analysis is generated SMAIZER tool "Smart Agility Speed Analyzer" by able to speed up badminton player and can be used as media trainer so that can improve speed and agility of badminton players. this machine is equipped with berbagai sophisticated components one of them, the observation results can be directly viewed and programmed directly through the computer. The productivity of device performance can improve agility and can reduce the training process that excessively enforces the athlete to drain a lot of energy.

The benefits of this research are:

1. tool (SMAIZER) Smart Agility Speed Analyzer Implementation of Shadow Exercise Tool Based on Microcontroller can Increase Agility of Badminton Athlete
2. Knowing mechanism (SMAIZER) Smart Agility Speed Analyzer Based Microcontroller
3. Knowing the technology performance test (SMAIZER) Smart Agility Speed Analyzer.

V. CONCLUSION

Until this preliminary report is prepared, progress of PKM program activities has reached 87%. All activities carried out are in accordance with the original plan, including the use of the budget. During the execution of activities

experienced little constraints related to the administrative process, but by doing intense coordination with the secretariat, LPPM Unesa and fellow implementing teams, the constraints can be solved. Seeing the progress of activities that have been achieved, the implementing team feels optimistic to complete some activities that are still in the process of implementation so that all (100%) of the activities are implemented according to the initial plan.

Suggestion

PKM program is very useful especially for students to add insight and hone softskill useful later, not only from the academics, but also useful for the general public because the estuary of its activities to increase the national economic growth. Therefore, this kind of program needs to be done on an ongoing basis.

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