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Shooting Simulation Based On Computer Vision Using Programming Language Phyton and Borland Delphi 7

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ABSTRACT

The purpose of this research is to be able to Design and Build a Scenario Video Shooting Simulation Based on Computer Vision Programming at the Military Academy using Python and Borland Delphi 7 Programming Languages to be used as a means of shooting practice by cadets. The research methodology employed uses the Waterfall method with research stages: Communication, Planning, Modeling, Construction, and Deployment. And the data collection method in making this Shooting Simulation uses Interviews, Observation, and Documentation. The design used in this study is UML (Unified Modeling Language) modeling. A system designer must follow the existing rules when he uses UML modeling. System testing in this study uses Black Box Testing. The result of this research is to produce an application that is easy to use in shooting training at the Magelang Military Academy.

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1. Introduction

Every soldier of the Indonesian National Armed Forces (TNI) Army (AD) must be able to shoot light weapons as an essential ability. The guidelines regulated in a technical manual are needed to achieve the expected shooting ability. The Technical Instructions (Juknis) on Shooting and Light Weapons Training following the stratification of the TNI AD guidelines are the elaboration of the Administrative Instructions (Jukmin) on the Development of Infantry Functions. This technical guide describes the general provisions, shooting techniques, and activities carried out in light weapons shooting exercises within the Indonesian Army [1].

The rifle is one of the supporting equipment for the TNI, and its primary function is used to shoot bullets accurately so that they hit the target, therefore shooting skills are an absolute must for soldiers, where they are the front line in defending the sovereignty of the Unitary State of the Republic of Indonesia [2]. Shooting activities are also one of the branches of sports and have given many achievements at home and abroad [3]. Sports activities have many supporting factors that influence achievements, such as physical condition, technique, tactics, and mentality [4]. In shooting sports, one must have physical, technical, tactical, and mental disorders. Besides that, athletes/soldiers must have good technical mastery because, without good technical skills, an athlete/soldier cannot realize his

achievements. One element of physical condition that affects shooting ability is agility. Agility is the ability to change the direction and position of the body or its parts quickly and precisely [5].

The Military Academy (Akmil) is an Indonesian Army education school located in Magelang City, Central Java. Military Academy prints Army Officers after carrying out four years of education. The basic principles of shooting techniques consist of Positioning Techniques (5%), Holding Techniques (5%), Aiming Techniques (5%), Trigger Pulling Techniques (70%), System Coordination Techniques (15%) including Breathing Techniques. In this exercise, simulations are used in shooting and using light weapons with two types of weapons, namely the long barrel (M16 rifle, SS1). Simulation is a methodology for carrying out experiments using a natural system model [6].

Several studies on shooting simulation by made shooting simulations by utilizing image processing technology which was used to detect laser shots that weapons would later fire as a substitute for bullets. Furthermore, research which makes the Monitoring System for IoT-based shooting practice scores, can be accessed by users via the Android-based internet to make it easier for trainers to see the increase in the shooters' skills. Research using Python programming language for Game Applications for Students in the North Kembangan Region and the Borland Delphi 7 programming language in research makes an Ekg Monitoring tool (Electrocardiograph) Based on a Microcontroller.

Shooting practice simulations using light weapons still require a large training area and costs quite a lot, and cadets are required to achieve completeness in shooting training simulations. Based on that, this research aims to make a shooting simulation with computer vision using the Python and Borland Delphi 7 programming languages to make it easier for cadets to carry out shooting simulations.

2. Method

2.1. Simulation Theory

Simulation is an integrated tool in planning and running complex logistics systems and duplicating/depicting an entire system's features, appearance, and characteristics. By conducting a simulation study, in a short time, the right decision can be determined at a cost that is not too large because everything is done with a computer [7].

2.2. Training Theory

Training provides experience to develop behavior, such as knowledge, skills, and attitudes to achieve something desired [8]. Training is a process of systematically changing employee behavior to achieve organizational goals, and training is related to the skills and abilities of employees to carry out current work [9]. Concerning the simulation in shooting and using light weapons, there are two types of weapons, namely the long barrel (M16 rifle, SS1) [10].

Figure 1. The M16 Rifle

The M16 rifle, also called the AR-15, the assault rifle was developed as the AR-15 by American engineer Eugene Stoner of ArmaLite Inc. in the late 1950s. The rifle received high marks for its light weight, accuracy, and volume of fire it can produce. The AR-15 was developed as a more portable alternative to the 7.62 mm (.308) battlefield rifle at the time, but the ArmaLite had limited success.

Figure 2. SS1 Rifle

It is the first assault rifle adopted directly from the FN FNC. This rifle has an empty weight of 4.02 kg, and fill weight of 4.38 kg. With NATO standard 5.56 x 45 mm munitions and a barrel length of 449 mm, the SS-1 V1 can fire very accurately up to 400 meters. Mobility in using the SS1 can be made easier with the collapsible butt and short barrel (FN and G2 pistols).

Figure 3. G2 COMBAT Cal. 9 mm (Pindad)

The G2 Combat pistol uses 9 x 19 mm parabellum ammunition. Widely used by the Indonesian armed forces, this pistol can be relied on in various situations. The 4.5-inch barrel length ensures good accuracy while maintaining the ability to deal with combat situations at very close range [11].

2.3. Computer Vision

Computer Vision is how computers/machines can see, and computer vision techniques can visualize data and analyze it in images or the state of videos. The main goal of Computer Vision is that a computer or machine can imitate the perceptual abilities of the human eye and brain or even outperform them for specific purposes [12].

2.4. Phyton

Python is an object-oriented scripting language. Python can be used for various software development purposes and run on multiple operating system platforms. Python is a programming language that is freeware or a free tool in the true sense, and there are no restrictions on copying or distributing it. Complete with the source code, debugger, and profiler, the interface contained therein for the service interface, system functions, GUI (graphical user interface), and database [13].

2.5. Borland Delphi 7

Borland Delphi is a programming language that works within the scope of MS Windows. Borland Delphi can take full advantage of the capabilities of MS Windows. Delphi itself is a secret project in Borland that evolved into a product called AppBuilder. Shortly before Borland's first release, Novell App builder was released, so Borland had to give the project a new name. Its ability can be used to design application programs that look like others based on MS Windows [14].

2.6. Research Flow

The type of research used in this research is descriptive research, namely to find out how to shoot the cadets. Descriptive research is research that aims to collect information about the status of an existing symptom, namely the symptoms that existed at the time the research was conducted. In system development using the Waterfall method development research is a research activity that aims and seeks to develop or complement existing or known knowledge. This method can also be called a

linear sequential model, using a systematic and sequential approach in system development, starting through the process of analysis, design, coding, and testing [15]. This model takes a systematic and sequential approach. This waterfall model, also known as the traditional or classical model, provides a sequential, sequential software life flow approach starting from analysis, design, coding, testing, and support stages [16]. It is called a waterfall because the passed stages must wait for the completion of the previous stage and run sequentially [17].

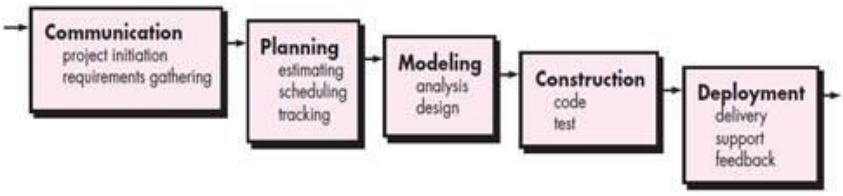

Figure 4. Waterfall Method [18]

The advantages of using the waterfall method include [19]:

1. The sequence of the work process using this method becomes more orderly than one stage to the next.
1. From the user side, it is also more profitable because it can plan and prepare all the data and processes that will be needed.
2. The schedule becomes more uncertain because the schedule for each process can be determined indeed. So that it can be seen the target of completion of program development. With a definite sequence, progress can also be seen for each stage.

3. Result And Analysis

3.1. Method of Collecting Data

The data source of the subject of this research is a Shooting Simulation based on Computer Vision Programming, where the application uses Python and Borland Delphi 7 programming languages to assist in shooting practice. The object of the research is the shooting practice process using shooting simulation with programming language at the Military Academy. The data collection used in the research are:

1. Interview is a data model by asking questions or asking questions directly to competent parties. Direct interviews were conducted with the Coordinator of shooting materials at the Military Basic Military Department.
2. Observation collects data by observing and directly documenting matters relating to shooting simulations with Delphi.
3. Literature study method by analyzing data that has been obtained based on references in this study, for example, books, journals, or other sources related to research, to obtain conclusions that follow the subject matter.

3.2. System Design

The system design used to design and build this Shooting Simulation is UML design, which includes: use case diagrams, class diagrams, sequence diagrams, and activity diagrams.

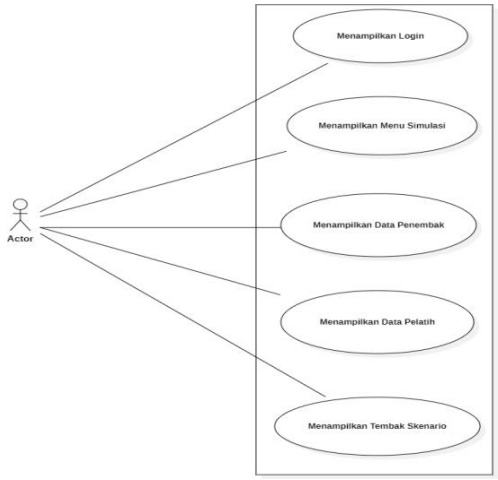

Figure 5. Use Case Diagram

Use cases describe system functions from the point of view of external users and in an easy-to-understand way. The use case is a reorganization of the system's functional scope, which is simplified again [19]. The picture above explains the proposed method, while the use case scenario describes the sequence of steps in the process, whether performed by the actor on the system or by the design of the actor. The user scenario for video shoot simulation can be seen in figure 6.

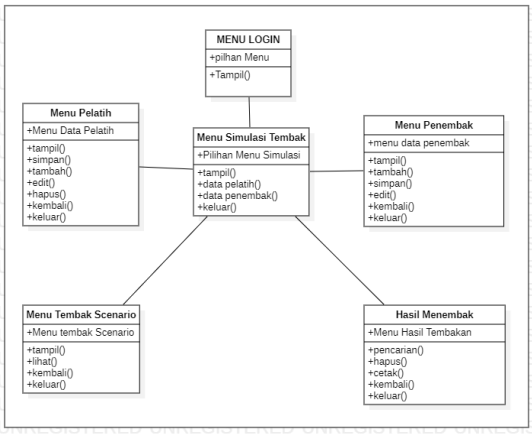

Figure 6. Class Diagram

An activity diagram of the user's main menu is intended to find the trainer and shooter data menu and interact with menu options. The central menu activity diagram can be seen in Figure 7, and the sequence diagram of the main menu can be seen in Figure 8.

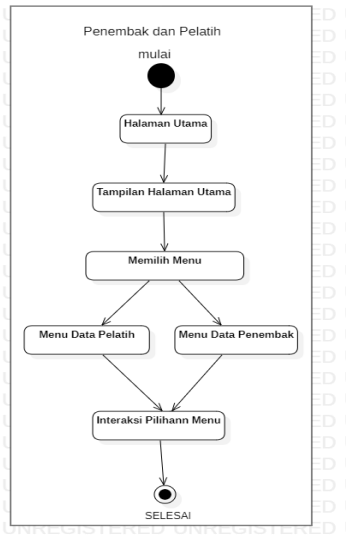

Figure 7. Activity Diagram Main Menu

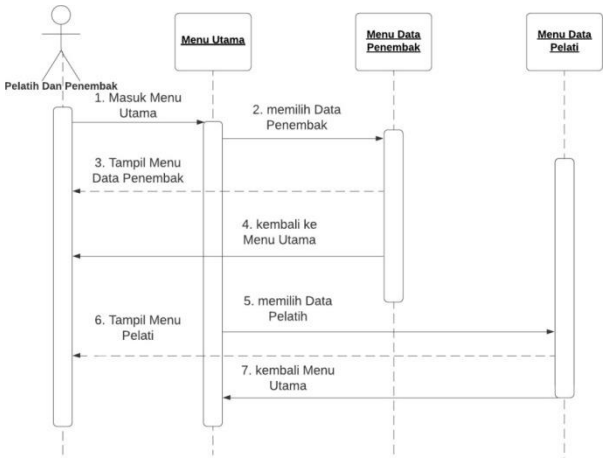

Figure 8. Sequence Diagram Main Menu

3.3. System Interface Implementation

1. Login Menu

Figure 9. Login Menu

This is the Login menu from the Video Scenario Shooting Simulation application using the Programming Language. In this login menu, there is an inscription. Fill in the username and password.

2. Main Menu

Figure 10. Main Menu

This is the main page menu in the Shooting Simulation application, and there are several menus, including Shooter Data, Trainer Data, Shoot Scenario, Shooting Results, etc.

3. Shooting Scenario Menu

Figure 11. Shooting Scenario Menu

This is the Scenario Shooting page menu here. The user or user (shooter) will do a shooting test. What needs to be done is to fill in the shooter's and the trainer's names. After that, a video will be played to do a shooting test. There is also a menu Shooter data, result coach data, shoot scenarios and some buttons in this Scenario Shoot Menu.

4. Shooting Practise Results Menu

Figure 12. Shooting Practise Result Menu

This is the menu of the results of shooting scenarios carried out by cadets or users. This menu will show tables or statistics during our shooting test, starting from our shooting score, name, coach, hit, etc.

3.3. System Testing

Testing this device uses the black box testing method because this test is carried out based on what is seen, only focusing on functionality and output. The purpose of what is seen is to display the shooting simulation video scenario using a programming language, focusing on functionality and output, namely the function and workings of the shooting simulation application. And whether the buttons in the application can function properly or not, and when the button works, whether it can issue the output we want. As seen in the making of this shooting simulation are trainers and cadets. Black box testing focuses on the functional requirements of the software made to find out how the system works and the focus that has been built. With this test, the software's shortcomings can also be seen so that it can be a means for consideration and development of this software or application in the future. The following is a black box test:

Table 1
Blakcbox Testing Scenario

No	Scenario	Result
1	This shooting simulation application using Programming Language can help shooting trainers to be more efficient in conducting tests on cadets at the Military Academy	Valid
2	This Shooting Simulation application saves more costs and makes it easier for coaches and cadets	Valid
3	The cadets find it more accessible in the shooting test by using this shooting simulation application	Valid
4	This shooting simulation application can increase firepower	Valid

4. Conclusion

Researchers have succeeded in designing and building a video shooting simulation application based on computer vision at the Military Academy and proven by black box testing and were well received by cadet students. And this application is only devoted to cadets at the Magelang military academy. Suggestions that can be given are Must have or install Delphi software to run this application, it cannot be multiplayer or used together, and the application must first be introduced to the user or user so that

they can operate the shooting simulation application properly and smoothly, requires a closed room to maximize the appearance of the program and cannot use the media of the shooting tool, still using the mouse as the media to shoot.

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