

Design of Detection and Counting System of Human Detector Camera Based on Opencv Using Python at Makassar Aviation Polytechnic

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ABSTRACT

Real-time monitoring of learning activities is crucial to ensure that all cadet and lecturer activities take place according to the rules. Deviations or delays in learning can be corrected immediately so that teaching and learning activities remain according to plans and targets. The purpose of the research is to design a user interface using the OpenCV-based Python programming language in learning activities. This research uses the Research and Development method by ADDIE model. Testing instruments use black box and functional. Design of the monitoring system utilizes Internet of Things (IoT) technology through a website to facilitate remote monitoring. The feasibility test by paying attention to the features of the monitoring system in this application runs effectively and can be implemented.

INTRODUCTION

Current technological advances have had a significant impact in various fields, including in the academic field of lectures. To simplify the academic service process. The Makassar Aviation Polytechnic, which is one of the Technical Implementation Units in the development of the Transportation Human Resources Development Agency which plays a role in educating human resources (Human Resources) in the field of Aviation Engineering and Safety, utilizes information technology in teaching and learning activities to increase efficiency.

Students who study here are required to stay in the dormitory except for weekends or holidays. So universities have a big responsibility to supervise, including efforts to prevent acts of violence and monitoring learning activities. Learning outcomes are one measure of the success of learning at a university, so it is necessary to monitor them easily. The supervision of student and lecturer learning is using traditional methods by checking door-to-door.

With the utilization of CCTV (Closed-Circuit Television) can monitor a situation in real-time and record all activities and events in a place at any time. CCTV is also used to maintain the information or property in it so that something unwanted does not happen. (Kholid et al., 2020). The importance of real-time monitoring to ensure that all cadet and lecturer activities run according to the rules is the main focus. The monitoring system is a system that assists the admin (user) in the data processing process, making it easy to monitor developments every day without having to come directly to the location. (Abidin et al., 2023)

LITERATURE REVIEW

The monitoring system is a system that can help the admin in the data processing process, which makes it easier for managers to monitor developments every day without having to come directly to the location. (Teknologi et al., n.d.) According to Rohayati (2014), the monitoring system can be interpreted as awareness of what you want to know, with an intensive monitoring system carried out to enable measurement over time, showing progress towards goals or otherwise. Meanwhile, according to Mudjahidin (2010) the Monitoring System is a continuous evaluation of the functioning of project activities in the context of the implementation schedule and the use of project inputs by the target group in accordance with design expectations. Human detection is a system that can hit objects in the form of humans, where the system can conclude that what is detected is a human. Human detection can be applied to monitoring systems that can operate in the surrounding environment, one of which is on CCTV cameras. (Wahyudi et al., 2022).

User Interface is a method used to interact between humans and the system. Sometimes the user interface or UI is referred to as a substitute for Human Computer Interaction (HCI) which includes all interactions that humans have with computers. (Jamilah &Padmasari,2022) The User Interface is designed using the Python programming language using OpenCV, able to display the movement and number of cadets and lecturers in a class in real-time using CCTV. In addition, the existence of IoT will make it easier for study program education staff to monitor remotely during the teaching and learning process.

METHODOLOGY

The method used in this research is a type of R&D (Research and Development) method with the ADDIE development model. According to Sugiyono (in Kurnia. et al., 2019), the ADDIE model has 5 stages, namely Analysis, Design, Development, Implementation, and Evaluation. The ADDIE model is used for a systematic approach to product development. (Purnamasari, 2023)

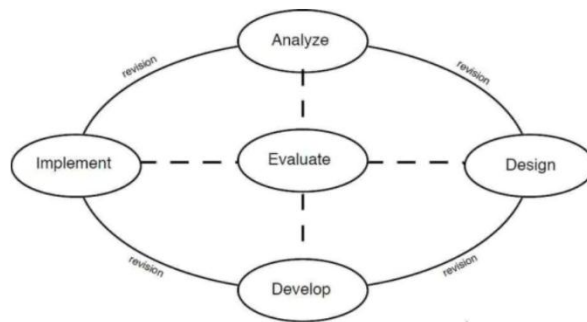


Figure.1 ADDIE Model

RESEARCH RESULT

System design which consists of system design and how the system works then includes the components that will be used in making this User Interface.

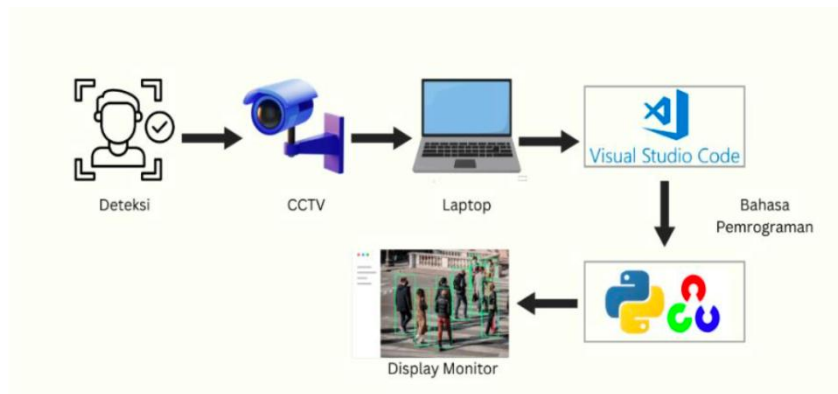


Figure.2 System Design

The system design explains that the way this system works starts with CCTV or Webcam to capture objects in the form of people to be detected, then the object is processed using Visual Studio Code as a text editor as well as running the program with Python and OpenCV programming languages which acts as the main processing place where the object in the form of the person will be detected. Furthermore, it can be displayed on the monitor. Detection is equipped with a viewer display that displays data such as the number of people detected and features for brightness and contrast.

System Components

The hardware used in this system includes several important components. First, a laptop or PC serves as a display for the User Interface (UI) that will display the results of human detection. Second, webcams or CCTV are used as an object capture tool that the system will later detect. Third, the keyboard serves as a medium for typing data that will be input into the system. In addition, this hardware must support the minimum specifications required to run the software used in the development of the Human Detector Camera User Interface.

Several applications and programming languages were used for software, including Python, OpenCV, and Visual Studio Code. Python was chosen because it has a simple and easy-to-understand syntax, and supports various libraries relevant to image processing. (Santoso & Kristianto, 2020) OpenCV is an open library that provides various design blocks for vision experiments on computers and applications that require real-time image and video processing. (Surya Ningsih et al., 2022) Visual Studio Code is used as a program code editor software that provides a wide range of features for application development. (Saputro et al., 2021) The combination of hardware and software is expected to be able to produce an effective and efficient system for automatic and real-time monitoring of learning activities at the Makassar Aviation Polytechnic.

Testing Technique

The testing technique used in this research is black box testing or functional testing. Where this testing technique is carried out to test whether the monitoring system can function and be useful with goals and expectations. The black box testing technique is used to determine the execution results of the process of each feature in the program that has been developed, whether it is to the user's needs. (Wicaksono, 2021)

DISCUSSION

Data Analysis Methods

Data analysis techniques are an effort to systematically search and organize the results of observations, interviews, and other results to increase the researcher's understanding of the cases studied and study the findings for others. (Nurdewi, 2022). The research uses data analysis techniques by collecting data that will be used by looking at how the system was designed on this User Interface, data analysis with the following data processing procedures:

1. Using the ADDIE method with 5 stages
 - a. *Analyze*, At this stage, analyze the functional requirements of the application, Data collection from students was carried out by observation, questionnaires and interviews. Assessments are carried out honestly, objectively and with full responsibility for the lecturers.
 - b. *Design*, The second stage is design or planning. At this stage the researcher carried out initial planning by making a program flowchart and dividing work. The flowchart is prepared based on the results of the needs analysis study.
 - c. *Development*, At the development stage, an evaluation or trial is carried out on the design and improving it
 - d. *Implementation*, The implementation stage in this research is the stage for implementing the human interface design that has been developed in real situations in the classroom.
 - e. *Evaluation* (Using black box testing).
2. Then it was obtained from the test results using black box testing on the Human Detector Camera User Interface as a tool for monitoring learning activities at the Makassar Aviation Polytechnic.

Result

Making this human detector camera user interface design starts with creating a layout display design and features that will be used, and creating a login page design. The Website Login Page is the main page when accessing the output of the system through the website that the admin uses by entering the username and password that has been registered to be able to access movement monitoring in a room.

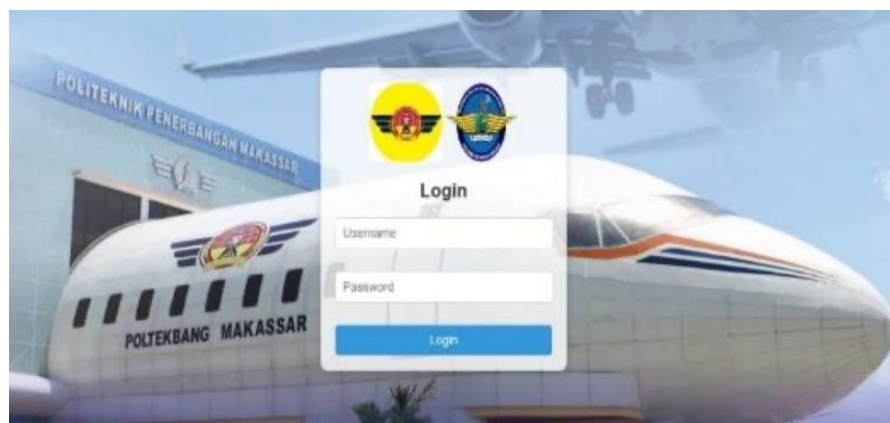


Figure 3 Login Page

Layout View of User Interface Human Detector Camera

The Layout User Interface Human Detector Camera Layout is the main display when running this system which will facilitate interaction with the system interface and function to detect and calculate human movements.



Figure.4 Layout View Interface

Figure 4 shows that the system can be operated and succeed

CONCLUSIONS AND RECOMMENDATIONS

In this section, testing is carried out on the User Interface using the Black box testing technique. The purpose of this black box testing technique is to test the external functionality of the system and ensure that the system can operate according to the specified specifications. The User Interface Human Detector Camera uses the Python language, with a detection method using mobilenet_SSD based on a neural network (artificial neural network) and retrieving HTML and Javascript data programs then the data is processed in the Visual Studio Code application.

1. Login App Testing

In this section, a test was carried out by opening the login page. The login page on this system is the main page when accessing the output from the system through the website URL. Display the login page, this page will ask the user to enter the username and password that has been registered, if the username and password are correct, then the user will be directed to the main page.

Username : Telnav

Password : Telnav13

Table.1 The result of test Login Application

No	Scope	Parameters of success indicator	Result
1	Enter username and password correctly	Login to the main page	Succeed
2	Enter username and password incorrectly	Login Failed	Succeed

Table 1 shows that scope of result test login application has been operated and succeed. This project can be continue to next testing.

2. User Interface Human Detector Camera Testing

This section is carried out by displaying the main page and features of the OpenCV-based human detector camera user interface with the Python programming language. The display of the human detector camera is the main display when running this code system, the system will detect and count the number of people in a room.

Table 2. The Results of test User Interface Human Detector Camera

No	Scope	Parameters of success indicator	Result
1	Video view with detection	Video view with detection	Succeed
2	Button "Start"	Button "Start"	Succeed
3	Button "Stop" Button "Logout" Fitur slider "Brightness"	Button "Stop" Button "Logout" Fitur slider "Brightness"	Succeed
4	Fitur slider "Contrast"	Fitur slider "Contrast"	Succeed
5	Will show a video with detection and counting the number of people	Will show a video with detection and counting the number of people	Succeed
6	Will display video in real-time	Will display video in real-time	Succeed

Table 2 illustrates data of test User Interface Human Detector Camera by respondent such as 6 part and the results is succeed.

ADVANCED RESEARCH

The OpenCV-based Human Detector Camera User Interface with the Python programming language was created using Visual Studio Code as the text editor and involves capturing HTML and Javascript data in system development. This system is very helpful for the Makassar Aviation Polytechnic, especially the Air Navigation Technology Study Program, to monitor the movement and calculate the number of cadets in a room. The neural network-based Mobilenet_SSD detection method allows monitoring to be carried out remotely through an accessible link.

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