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Application of individual activity recognition in the room using CNN Alexnet method

Kerly Prastika^{1*}, Lina^{1}**

Informatics Engineering Department, Faculty of Information
Technology Universitas Tarumanagara Indonesia

* kerly.535160077@stu.untar.ac.id

**lina@untar.ac.id

Abstract. Technological developments in the digital age are experiencing rapid improvement, especially in the field of sensing technology and network infrastructure. Where due to this, the technology that is more sophisticated and low prices can be affordable by ordinary people. Developments in the field of sensing technology and network infrastructure have enabled the development of intelligent software that can provide real-time analysis of certain situations in an environment, with the aim of improving the quality of human life [1]. Security camera systems, such as Closed-circuit Television (CCTV) are widely used, and can be found in places where monitoring is needed [2]. Low prices and increased use of CCTV in many areas make it easy to use. However, this traditional CCTV requires humans to monitor scenes continuously [3]. Of course, it is very inefficient to ask people to monitor the scene. Therefore, we need an individual activity detection application in the room that is able to recognition to human activities. To detect human activity, aspect ratio and Euclidean Distance are used, while for the recognition, the Alexnet Architecture Convolutional Neural Network method is used. The test results obtained a success rate of 100% for detection of human activity, a best success rate of 96% for recognizing human activity.

1. Introduction

Technological developments in the digital age are experiencing rapid improvement, especially in the field of sensing technology and network infrastructure. Where due to this, the technology that is more sophisticated and low prices can be affordable by ordinary people. Developments in the field of sensing technology and network infrastructure have enabled the development of intelligent software that can provide real-time analysis of certain situations in an environment, with the aim of improving the quality of human life [1]. Recognition of human activity is one of the most popular studies in the field of Computer Vision. This relates to several applications that are useful in areas such as visual surveillance, human performance analysis and human-computer interfaces [4]. Computer Vision plays an important role in facilitating human daily life in this digital era. Where, the rapid exchange of information and sophisticated technology can produce applications that are especially useful in the field of visual surveillance. Security camera systems, such as Closed-circuit Television (CCTV) are widely used, and can be found in places where monitoring is needed [2]. Low prices and increased use of CCTV in many areas make it easy to use. However, this traditional CCTV requires humans to monitor scenes continuously [3]. Of course, it is very inefficient to ask people to monitor the scene. Therefore, we need an individual activity detection application in the room that is able to recognition to human activities. To detect human activity. Many studies on the recognition of human activities are carried out by recognize them through Skeleton Data [1] [5] [6] [7] [8]. However, to build the Skeleton Data requires a large computational power so it will be difficult to implement. N.



Albukhary and Y.M. Mustafah [9] introduces a recognition to human activity which recognizes based on distance of human movement and aspect ratio only. This will make the recognition easy to implement, because there are no steps to make a skeleton, so the computational power required is not large.

2. Method and Application

2.1. Application preparation

The the Alexnet Architecture Convolutional Neural Network method is used along with, aspect ratio, and euclidian distance. Using model that obtained by training 2500 image of human activity from the predetermined classes which is consist of 5 classes that is standing, raise hand, span hand, sitting, and sitting cross-legged. And implement the other method into the test application that how this test application was made.

The methods used during the process of making the application are as follows:

2.1.1. Euclidean Distance

Methods that determine the area of detection happening so that the application can work faster because it reduces the detection process.

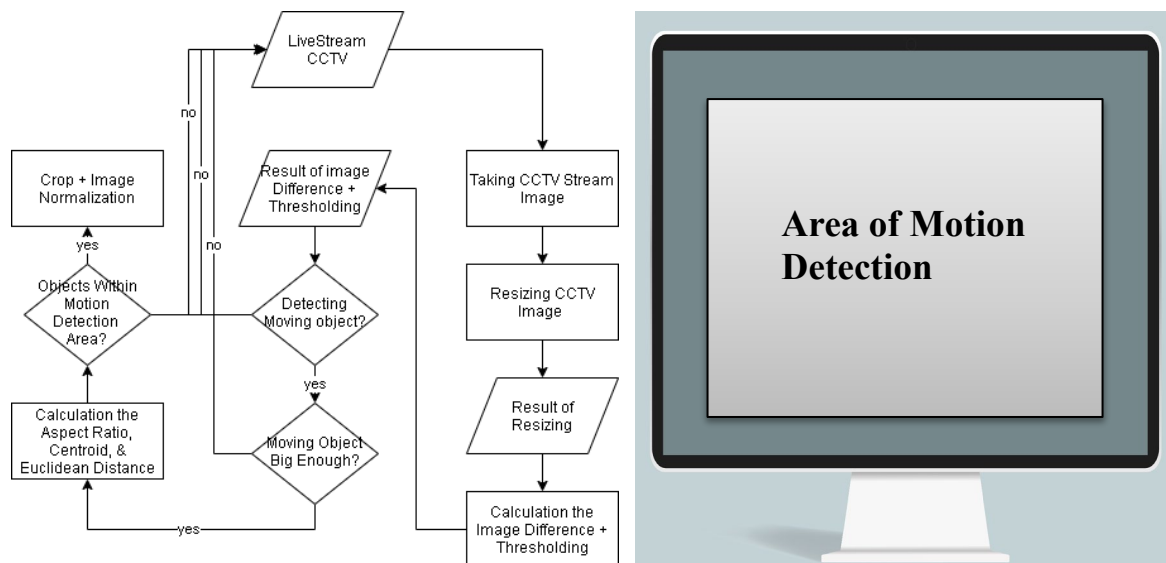


Figure 1. Euclidean Distance Method in the application & Illustration

2.1.2. Aspect Ratio

Methods that detect types of activities for selecting images which would be recognized for more accurate recognition.

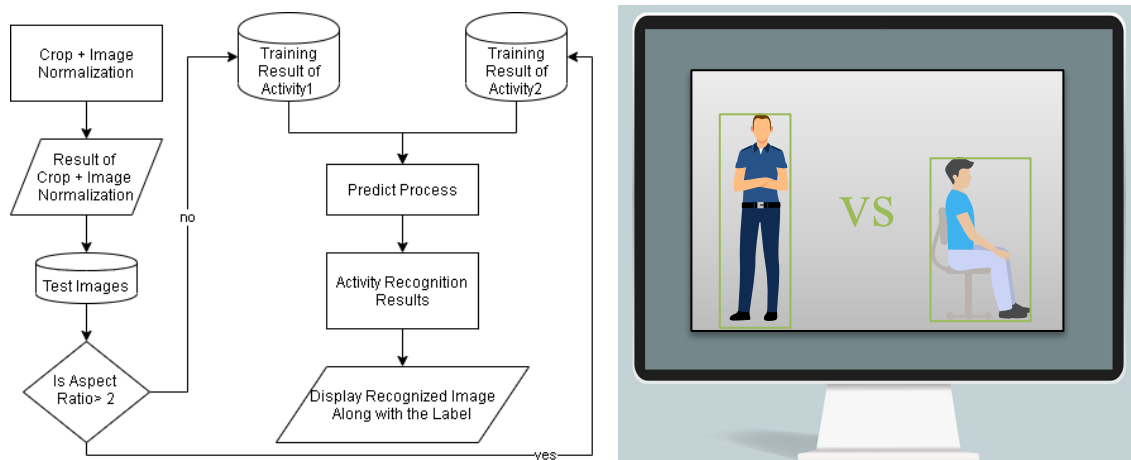


Figure 2. Aspect Ratio Method in the application & Illustration

2.1.3. CNN Alexnet

Recognition methods that used in this application, has a simple, light architecture, and having good performance.

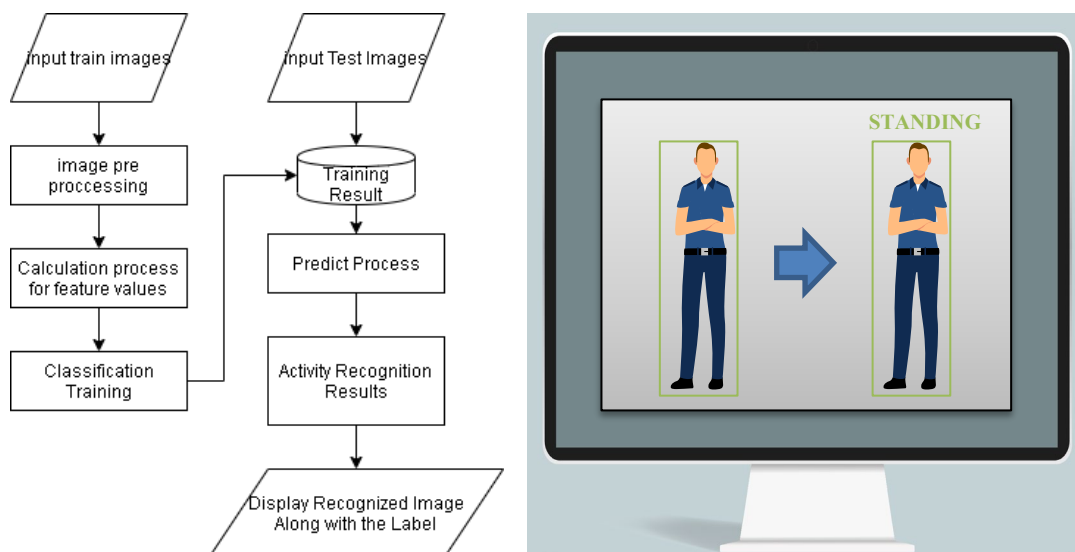


Figure 3. CNN Alexnet Method in the application & Illustration

2.2. Method

Test methods implemented to test the accuracy of the detection and recognition function of the application. To observe the accuracy of the test application, a Black Box testing by checking the output of the program if it is in accordance with the design and function of each.

3. Results and discussion

3.1. Result of test application accuracy

The testing is done on the author's personal computer with the following specifications

1. AMD FX-7500 Radeon R7, 10 Compute Cores 4C+ 6G 2.10GHz
2. Memori 12 GB RAM
3. VGA Dual AMD RADEON R7 + R5 M230DX-2GB
4. Harddisk 500GB

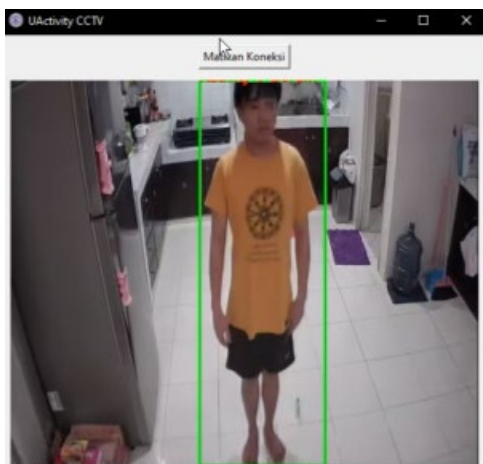


Figure 3. example of application testing for detection function

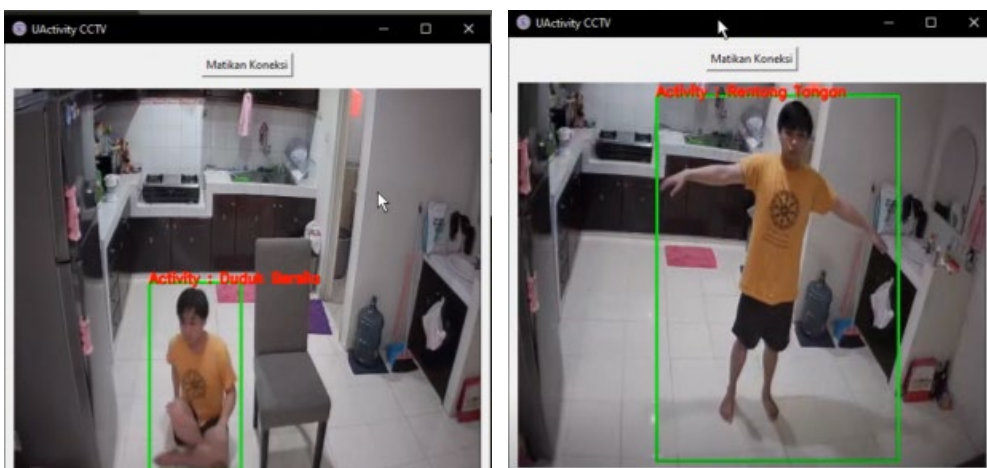


Figure 4. example of application testing for recognition function

Table 1. Result test of application detection & recognition function for each classification

No	Name of Activity	Correct	Wrong	Total	Accuracy
1	Standing	146	54	200	73%
2	Raise Hand	176	24	200	88%
3	Span Hand	151	49	200	75.5%
4	Sitting	176	24	200	88%
5	Sitting Cross-legged	192	8	200	96%
Average		168.2	31.8		84.1%

3.2. Result of test application accuracy against interference

The testing is done on the author's personal computer with the following specifications

1. AMD FX-7500 Radeon R7, 10 Compute Cores4C+ 6G 2.10GHz
2. Memori 12 GB RAM
3. VGA Dual AMD RADEON R7 + R5 M230DX-2GB
4. Harddisk 500GB

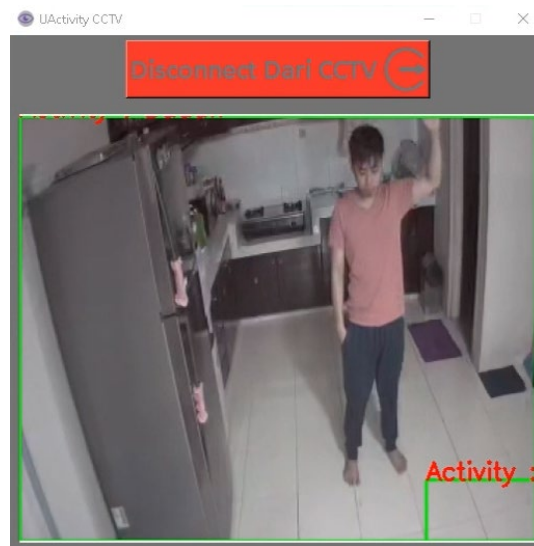


Figure 5. example of application testing for detection function against interference

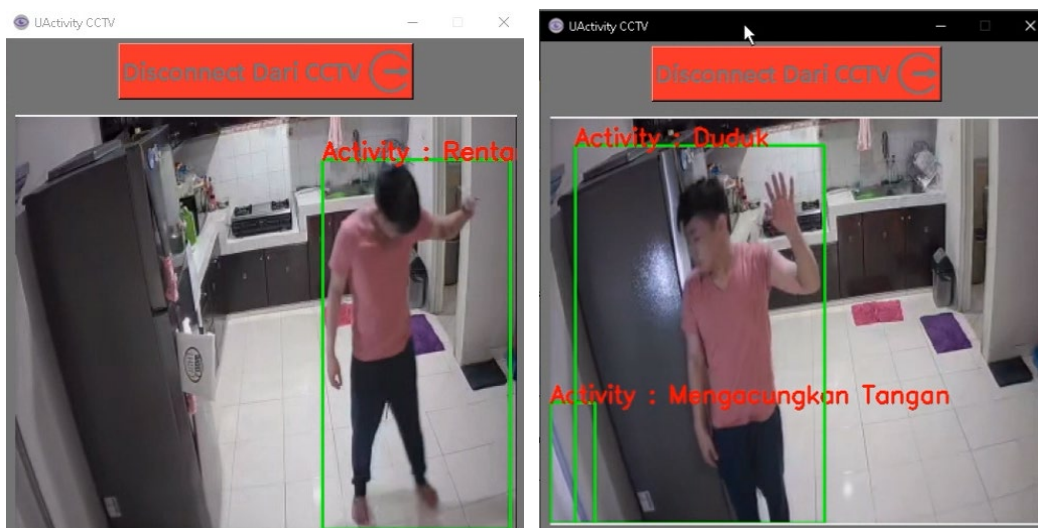


Figure 6. example of application testing for recognition function against interference

Table 2. Result test of application detection & recognition function against interference

No	Name of Interference	Correct	Wrong	Total	Accuracy
1	Shadow	16	184	200	8%
2	Light Reflection	88	112	200	44%
3	Eratic Light Intensity	12	188	200	6%
Average		38.7	161.3		19.3%

Based on the result of accuracy test, the average accuracy of detection and recognition for each classification is 84.1% (Table 1) and the average accuracy of detection & recognition function against interference is 19.3% (Table 2). The accuracy difference that occurs against interference is quite significant.

4. Conclusion

A research has been conducted to obtain the accuracy of detection and recognition function. as an application for human activity detection and recognition in the room. The following is a conclusion from the test.

1. Euclidean Distance and Aspect Ratio methods can be used for activity selection. And the activity detection test obtained 100% success.
2. The alexnet CNN method is quite good at detecting and recognizing activities. And the best activity recognition test was 96% successful.
3. Shadows can affect the results of detection and recognition.
4. Surrounding reflections can affect the results of detection and recognition.
5. Applications need a room with controlled light conditions to get good results.

5. References

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