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Face Detection and Tracking Using Live Video Acquisition in Camera Closed Circuit Television and Webcam

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***Abstract*— Human face detection is one domain in computer vision application. There are so many researches in the field of image processing on the face. Some researchers previously conducted research on face recognition, no matter from what tribe, how healthy, how old, they developed research on facial expressions, whether sad, normal or laugh. Some previous research also built on the face detection system focusing on environmental conditions. CCTV is generally used as a complementary security and is widely used in industries, military, airports, shops, offices, factories, and even today many housing have been using and applying this technology. CCTV uses signals that are closed, unlike the usual television that is broadcast signal. The use of CCTV with face detection, is expected to see the actual condition and detect any human presence on the video. Using the technology of tracking (tracking) and face detection, it can develop a system that can detect human presence, as for the implementation of this research is the application of technology Live Video Acquisition for the presence of human beings based on the detected face on the CCTV camera.**

Keywords*— *Tracking; Face Detection; CCTV; Live Video Acquisition

I. INTRODUCTION

The development of technology related to the processing using a computer is already growing rapidly, where the image processing (image) is using digital technology. As the technology advances, the graphic images are fully utilized to promote the welfare of mankind. Along with the development of creativity image can not be separated from the digital image processing. Image (picture) is a combination of points, lines, shapes, and colors to create an imitation or replica of a physical object, objects or goods (humans, animals, plants, fruits, etc.) [1].

Detection of human faces is one domain in computer vision applications. Face detection based on identifying and finding the location of the image of a human face in the image regardless of the size, position and condition [2]. Face recognition belongs to the technological development to be important in some areas, such as security, control systems including the presence or presence system [3]. Problems often occur in the face detection are the occlusion faces, poses and lighting factor. Many biometric systems can be applied to attendance system, but the most common uses the same authentication techniques [4].

There are many researches in the field of image processing on the face. Some researchers previously conducted research on face recognition, no matter from what tribe, how healthy, how old they also developed research on facial expressions, whether sad, normal or laugh. Some previous research also built on the face detection system focusing on environmental conditions.

Development of the application of face detection systems currently has a lot to do. Both are the development of the system as a presence and the application of the system to detect human presence. The research is not only focused on implementation, but also through the use of algorithms in the system. In this research, the author implemented face detection performed on the camera Closed Circuit Television or CCTV.

CCTV is generally used as a complementary security and is widely used in industries, military, airports, shops, offices, factories, and even today many housing have been using and applying this technology. CCTV uses signals that are closed, unlike the usual television that is broadcast signal. The use of CCTV with face detection is expected to see the actual condition and detect any human presence on the video.

To be able to recognize human feature, which is most easily done is to determine the presence of a human face, both in pictures and video. After the existence of the face is known, then the recognition process can be done. There are several methods for the identification process for face existence namely to use the base, neural network, and the color base [5].

CCTV cameras originally was created for the purpose of security surveillance (security surveillance system) to anticipate criminal crime (crime action), theft robbery, and many other things in connection with a crime and the activities that are not desirable. Advances in technology now make this camera not only it is used to monitor directly through the monitor, but it is also equipped with a camera CCTV recording system by using hard drive storage media.

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CCTV solution is the right, effective and efficient infrastructure proved to be reliable and useful, hence the use of CCTV is one of the complementary security systems for improving performance and the company's image. Because of the presence of CCTV, the security of the goods can be guaranteed. CCTV camera can also be used with the condition surveillance (monitoring) based IP. By using specific tools, such as IP video encoder or Digital Video Recorder (DVR), it can improve the function of CCTV for use in the environment [6].

Using the technology of tracking (tracking) and face detection, it can develop a system that can detect human presence, as for the implementation of this research is the application of technology Live Video Acquisition for the presence of human beings based on the detected face on the CCTV camera.

II. LITERATURE REVIEW

A. Research *Previous*

Face detection takes at least characteristic of biometrics, surveillance and forensics. After detecting a short in the image using the "brief description" then to search for the face in the image needs 2D feature extraction methods. Face detection process uses the feature extraction that is the development of methods that previously existed, namely Eigenfaces and Fisherfaces Frst [7].

A facial recognition system is a computer application that automatically identifying or verifying a person from a digital image or a video frame from a video source. One way to do this is by comparing selected facial features from the images and databases. This system can be used in security systems and can be aligned as well as collaborate with biometrics systems, fingerprint recognition system or the iris [8].

Face detection in other respects developed a system that leads to automatic presence system, but only to the extent the face detection of students in the class based on the face position that is the position of straight forward, rotation parallel 150 to the right, the rotation is parallel 150 to the left, lift the chin 150 up and down head 150 and based on the distance of the object's face, which is 100 cm, 150 cm and 200 cm, and calculate the number of students in the class. The testing showed seven facial images with the position and distance can be detected, from a total of 8 images of faces in the classroom, because impeded by other students [3].

The use of facial recognition system can be applied in various fields, as well as to the process of employee absences. The project in the form of an identification system that is based on a natural human characteristic, namely the face, which is used for attendance purposes. The system consists of software with a webcam as an input to generate the input image. The method used to identify faces one of which is a method using template matching and conversion of RGB image to the gray level (grayscale) used for image processing and database as a container for a captured face image [9].

B. Theoretical Review

1) Image

The image is a representation (picture), likeness or imitation of an object. Output image as a system of optical data recording can be in the form of photos, the analog form of video signals such as images on a television monitor, or digital nature that can be directly stored on a storage medium [10].

Digital image is as a function of the two-dimensional light intensity f (x, y) where x and y represent the spatial coordinates, and the value of f at a point (x, y) is proportional to the brightness (gray level) of the image at that point.

2) Digital Image

In general, digital image processing refers to the processing of two-dimensional images using a computer. In a broader context, digital image processing refers to the processing of data every two dimensions. Digital image is an array that contains the values of real or complex which is represented by a specific bit stream. An image can be defined as a function f (x, y) sized M rows and N columns, with x and y coordinates of spatial and intensity of f at the point of coordinates (x, y) is called intensity or gray level of the image at that point [11] ,

3) Image Processing

Image is information that is generally stored in the form of mapping bits, or commonly known as a bitmap. Each of the bits forming a single point of information, known as pixels. Or in other words, a pixel is a single point image that consists of one or more bits of information. The units of pixels is usually ignited by the position x, y position and the value of a pixel (color or gray). In one area of the image, entirely made up of pixels. Therefore, the file that stores the image usually very large in size. Image is usually saved with the name of the BMP. To reduce the size of the file, usually a compressed image file using certain techniques, for example the famous JPEG or GIF [9].

4) Closed Circuit Television (CCTV)

Closed Circuit Television (CCTV) camera that displays an image and video capture using signals that are closed, unlike the usual television that is broadcast signal. CCTV cameras has function as a picture taker, there are some types of camera that differentiate in terms of quality, the use and function. Two of the most important thing are, camera CCTV analog and Camera CCTV Network where analog cameras using a solid wires for each camera means, every camera will be connected to the DVR or system directly. Camera Network or commonly called IP Camera could use networks which means it will save in terms of installation because network is parallel and branching and it does not require a special cable to each camera in accessing [12].

5) Live Video Acquisition

Live Video Acquisition is one library function provided by Mathworks MATLAB, to be used in calling camera or webcam. The library can be used in applications that are built using Matlab [13].

III. DISCUSSION

A. Methods

The system development method used was the Iterative Development Model, which consisted of several stages:

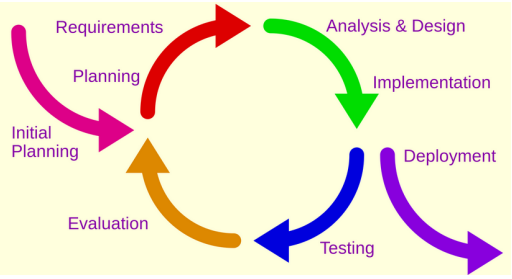


Fig. 1. Iterative Development Model [14].

Figure 1. Iterative and Incremental development is any combination of both iterative design or iterative method and incremental build model for software development. The combination is of long standing and has been widely suggested for large development efforts. Iterative and incremental development are essential parts of the Modified waterfall models, Rational Unified Process, Extreme Programming and generally the various agile software development frameworks [14] [15].

B. Results and Discussion

1. Analysis

The needs used were webcam and CCTV. As for the structure of the system architecture used was in Figure 2 below.

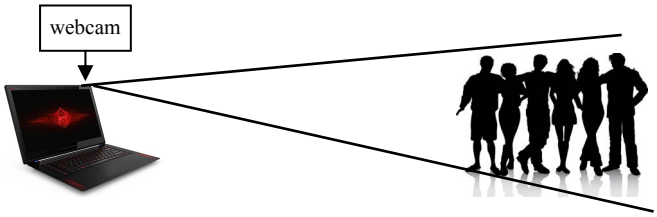


Fig. 2. General Architecture System.

In figure 2 it can be seen that laptop webcam or used computer will detect the presence of human and will do live tracking with the identification of human face. The same process will be applied to CCTV which will detect the presence of human beings based on the face caught. While in Figure 3 the implementation of Face Detection and Tracking Using Live Video Acquisition on CCTV cameras are integrated into the computer system storage.

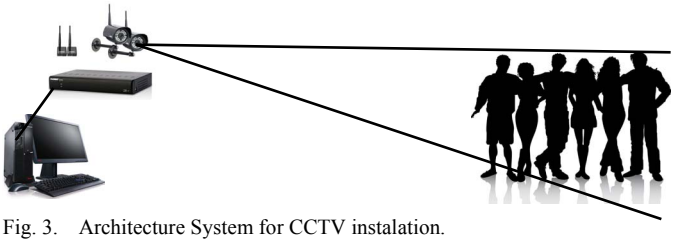


Fig. 3. Architecture System for CCTV instalation.

2. Design

At the stage of making the author that the process on the software Mathworks MATLAB 2015b. MATLAB (Matrix Laboratory) is a numerical computing environment and fourth-generation computer programming language, a programming language developed by The Mathwork Inc.

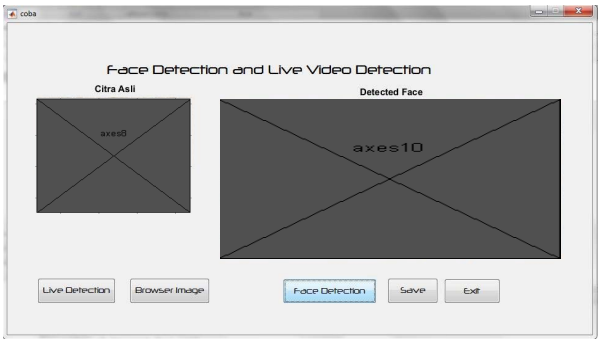


Fig. 4. Design Interface an Application

3. Testing

Based on the testing plan that has been prepared is to test over a distance, the influence of light and the number of objects which can be seen as follows:

TABLE I. TESTING THE RANGE OF CAMERA WITH OBJECT

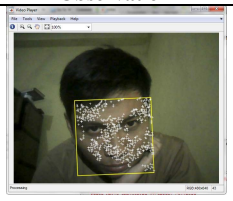
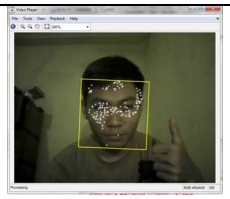
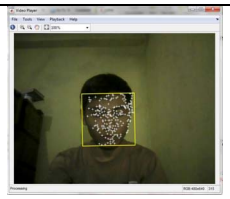
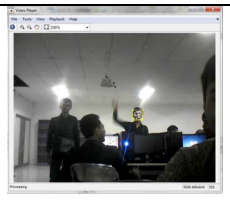
Process	Expected Results	Observation	Results
Camera with a distance of 50 cm with the object	The camera can display objects and detect a human face		Accepted
Camera with a distance of 100 cm with the object	The camera can display objects and detect a human face		Accepted
Camera with a distance of 150 cm with the object	The camera can display objects and detect a human face		Accepted
Camera with a distance of 300 cm with the object	The camera can display objects and detect a human face		Accepted

TABLE II. TESTING USE LIGHT

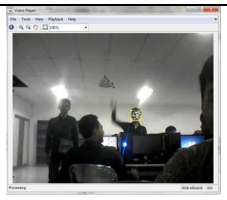
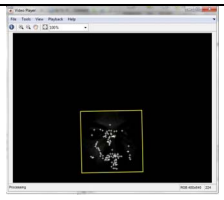
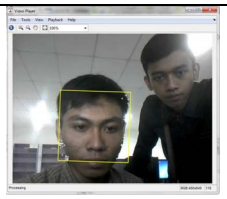
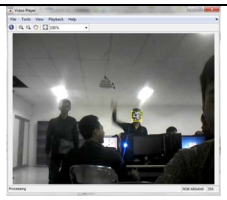
Process	Expected Results	Observation	Results
Room light (Dim)	The camera can display objects and detect a human face		Accepted
Light Space (Light)	The camera can display objects and detect a human face		Accepted
light Dark	The camera can display objects and detect a human face		Accepted

TABLE III. TESTING HUMAN EXISTENCE

Process	Expected Results	Observation	Results
One person	The camera can display objects and detect a human face in accordance with the existing number		Accepted
Two persons	The camera can display objects and detect a human face in accordance with the existing number		Accepted, but it does not detect all faces
Three persons	The camera can display objects and detect a human face in accordance with the existing number		Accepted, but it does not detect all faces and still detect one face

IV. CONCLUSION AND FUTURE STUDY

The results of this study can be concluded that the use of Live Video Acquisition can be used to detect the presence of humans captured by CCTV and Webcam with Face Detection and Tracking. Based on test results, the application can capture objects and detect human presence at distances up to 300cm with lighting conditions are dim or low light, bright even until dark. However, the results of this research still has a weakness, that has not been able to detect the number of people more than one, so it is hoped that for further research it can be scaled back for the detection number of people to more than one man and the arrest distance objects can also be improved further.

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