CHAPTER 1

1. Introduction

Everyday activities sometime require someone to leave the house empty, such as during work or school hours. This causes the house to be vulnerable to burglary and theft occurs, even though the house has been locked or tightly locked. Some people are very easy and skilled to open a door lock or padlock with just a small wire [1]. This requires a solution related to a security system that can monitor the house when some-thing suspicious happens so that it can be prevented immediately.

Several studies that have been carried out related to home security using facial recognition include re-search [2] using a Logitech C270 webcam as a face image taker. The system works by extracting faces that have been detected and applying face recognition with the eigenfaces as a means of facial recognition be-tween homeowners and thieves in real-time. The results of this study the system can recognize facial imag-es at.a.distances.of. 25 cm. with. a success. rate 90% with an average success of 72.5%, but in this study the accuracy level is still not good for door security. In research [3], the system uses a histogram of orient-ed gradient as the face image to be extracted. After obtaining the value of facial features, it will be classi-fied using k-Nearest Neighbor. The results of this study obtained facial recognition accuracy at a distance of 40 cm, which is 87.5%, but the average time required for the face recognition process is very long, which is 13.29 seconds. In research [4], using ESP32-CAM as a camera for taking facial images. The sys-tem can detect faces and ensure that the one who opens the door is the one who has access rights as the owner of the house. The results of this study the system will work to detect faces that have been registered so that the door lock will open for 5 seconds and will close automatically after 5 seconds but in this study no action was taken if the camera caught an unknown person. In research [5], using the Triangle Face method based on Raspberry Pi. This house door security system has the advantage of increasing security in opening the door of the house without using the house key. The said study, use of the Haar.Cascade.feature with OpenCV is used as a programming function for face detection. From the results of the first test, the face accuracy level is 92% with 104 lux lighting and the second test results have 84% facial accuracy with 53 lux lighting. In research [6], the method used is the Haar Cascade Classifier which compares unregistered human face objects with stored facial data. The system will open the door if the data matches the dataset. The results of the tests carried out 90 times, with.2 recognized faces and 2 unrecognized faces, the camera to object distance of 30 cm, 40 cm, and 50 cm obtained an accuracy of 91.11%. In research [7], stated that a system that uses Haar Cascade can detect faces accurately and efficiently. The accuracy of face detection using the Haar Cascade Classifier method is 75%. The entire system has been proven to work well in detecting and taking attendance objects correctly. In research [8], the system changes the input color image into a gray image using the OpenCV library. The position of the face is greatly influenced in detecting faces. This system cannot detect faces that have a nonfrontal position. Based on the test results on face detection.using the Haar Cascade Classifier method, the total accuracy obtained is 90% from the input image that has a face object with a frontal position,

while an accuracy below 50% is obtained from the input image that has a frontal face object and not frontal at all. In research [9], the system using the Cascade Classifier method still has shortcomings lighting If there is too little light in the captured image in real time, the face cannot be recognized and this system can still recog-nize more than one face object. In research [10], the system used for the face detection and recognition process uses the Haar Cascade Classifier method which identifies human faces accurately. The Haar Cascade Classifier is able to perform better facial recognition than the LBP algorithm and has good coverage for future implementations.

In this study the authors developed a home door security system using ESP32-CAM as facial recognition with the Haar Cascade Classifier. The haar cascade classifier method has the advantage of very fast computation, because it only depends on the number pixels in rectangle of an image. The ESP32-CAM equipped with a flash will help with lighting and improve facial recognition accuracy. This system is equipped with fingerprint sensor as a second security system to unlock the door. Process face recognition is accessed through the webserver. In this system, if a known face is detected in the database, the door lock will automatically open and if the face is not recognized, it will provide a notification in the form of a photo via telegram. In addition, there is a feature to unlock the door via the telegram application that can make it easier for homeowners when guests arrive.