CHAPTER 4
# ANALYSIS AND DESIGN

4.1 Analysis

This project aims to monitor IoT-based security systems. In designing this system using ESP32-CAM as a microcontroller which is useful for controlling the course of a program and a PIR sensor as a motion detector. The working principle of this system is to inform via the telegram application when it detects suspicious movements around the house. The PIR sensor triggers the ESP32-CAM to take a picture and send the result to the homeowner's cell phone. When motion is detected, the system will also turn on the buzzer as a warning signal.

4.2 Design ESP32-CAM

The ESP32-CAM module is used as a microcontroller to control a program. This microcontroller is equipped with a wifi module on the chip as a support so it does not require additional internet. In addition, the ESP32-cam is equipped with a small 27x40.5x4.5mm camera module that can operate to provide images. ESP32-cam uses Arduino IDE as a program editor, which then functions to respond to the integrated camera so that it can send images when the sensor is active.
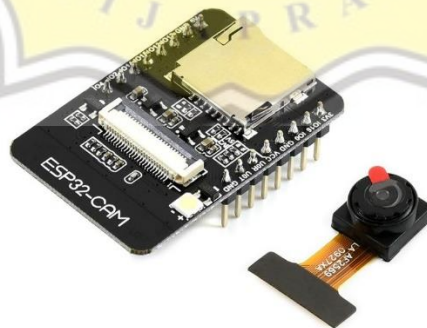
Figure 4.1. ESP32-CAM

4.3   Design PIR Sensor

Using a PIR sensor (passive infrared) which serves to detect human movement around the sensor. The way the pear sensor works is by capturing the heat energy emitted by living things so that it can produce an electric current. This PIR sensor is equipped with adjustable TX (time delay) and SX (sensitivity). This PIR sensor will trigger the esp32-cam to take pictures.

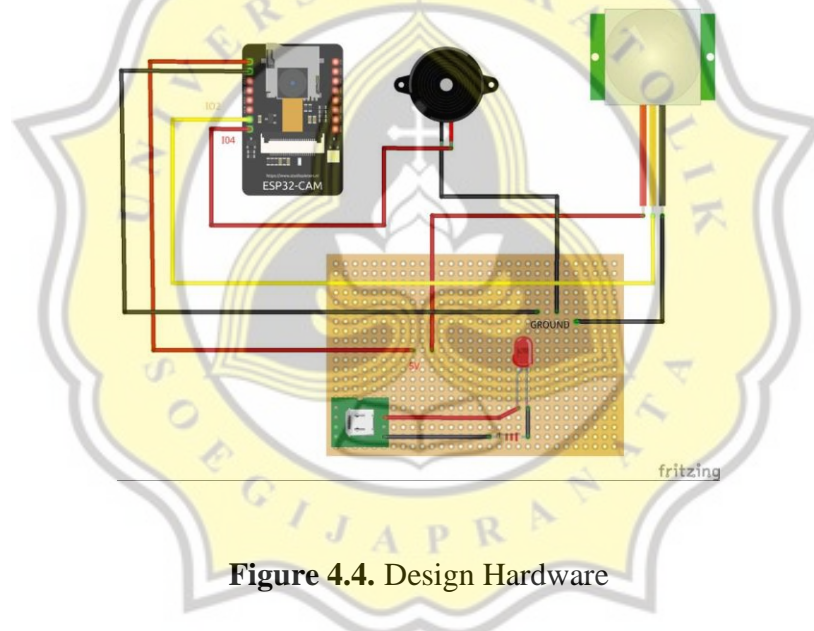**Figure 4.2.** PIR Sensor

4.4   Design Telegram Bot

The author uses a telegram platform that can be integrated for various internet services in this series of security systems. Telegram was chosen because it is open source so that every version can be developed. There is a bot feature in it that contains commands or messages sent by the user to then be forwarded through the bot API interface. Telegram is an interface for displaying notifications in the form of messages and images.
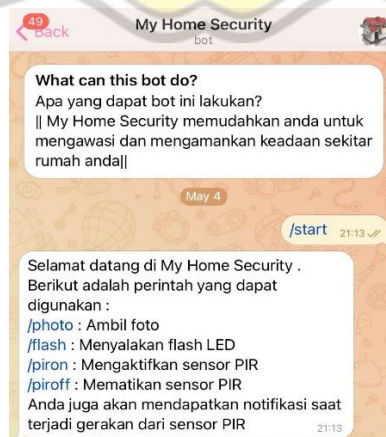
4.5   Design Program

The design of this tool is placed in front of the house or fence to make it easier to detect the resulting human movement. The design tool is placed on the PCB (printed circuit board) as a holder or connector for the component legs to make it look neater. When motion is detected, the buzzer and LED will light together. The pear sensor will trigger the esp32-cam to take pictures and send text and photo notifications to the homeowner's telegram. This system can be turned off and on using commands already available on Telegram.

**Figure 4.4.** Design Hardware

4.6   Design System Blok Diagram

This system block diagram illustrates based on how the tool works as a whole. This block diagram has 3 conditions, namely at the time of input, process, and output. The PIR sensor and internet connection used come from a smartphone hotspot as input. LED, buzzer, user telegram as output. To supply power to the appliance, a 5v adapter is required.
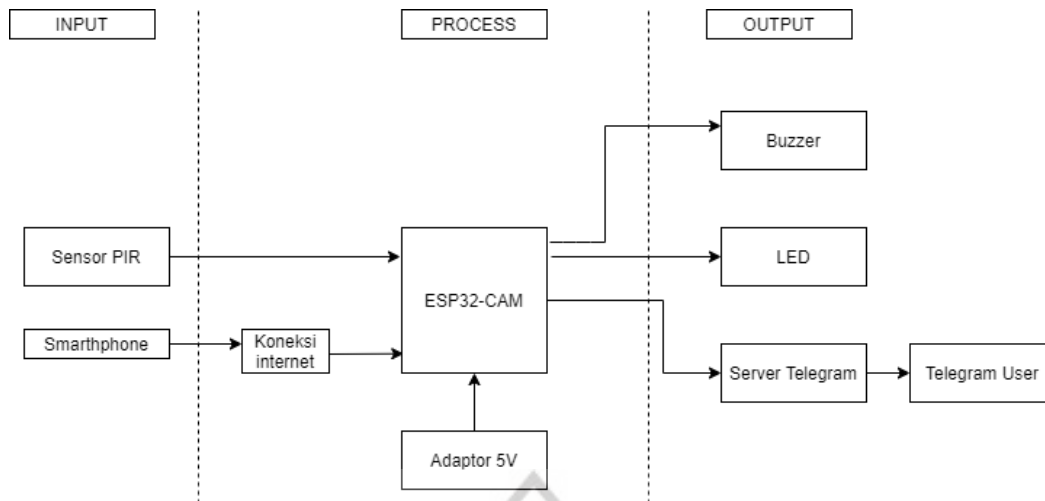
Figure 4.5. System Blok Diagram

4.7   Design Flowchart
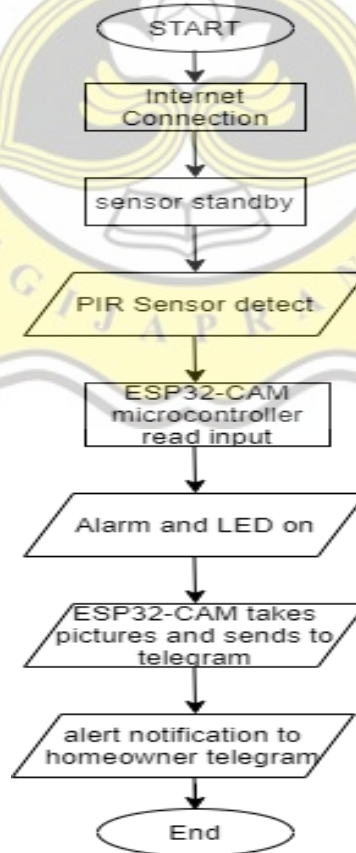
Figure 4.6. Flowchart

First, the PIR sensor will be ready to detect the presence of a Movement. When a movement is detected resulting from the emission of living beings, especially humans, the alarm and LED will light up. Then the ESP32-Cam will take a picture and send a notification to telegram as a warning sign.