

HOME SECURITY SYSTEM USING ESP32 CAM AND TELEGRAM APPLICATION

P.Madhu Kumar¹

J.Adithya Sai²

P.Anjali³

Madhukumar.patnala@becbapatla.ac.in

Adithyasai154@gmail.com

reddyanjali35999@gmail.com

R.Dharma Teja⁴

N.Vamsi Krishna⁵

dharmarangesetti3@gmail.com

Ch.Shankar⁶

Naraganivamsi13@gmail.com

chmskumar2002@gmail.com

¹Assistant Professor, ^{2,3,4,5,6} UG Students
^{1,2,3,4,5,6}Dept. of ECE, Bapatla Engineering College, Bapatla
Andhra Pradesh, India

Abstract: In today's world, security is the first issue that needs to be addressed. In terms of home security, we provide our users a simple way to use internet networking to manage the multiple devices in their houses. Modern technologies are developing so quickly that home security systems must be improved. We are utilizing IOT to develop a low-cost home security system because we recognize the value of home security. The goal of the home security system project is to make homes and other private spaces more secure by integrating the ESP-32 CAM with the Telegram app. An ESP-32 CAM module powers the gadget and records live video that is sent to a Telegram bot. The bot then uses motion detection to notify the owner's Telegram account. The project is implemented using the Arduino IDE and several libraries, including the Telegram Bot and ESP32 CAM libraries. The system is designed to be low-cost, easy to install and maintain, and very effective at deterring break-ins and other security breaches.

Keywords--Home Security, Internet of Things, Arduino, ESP32-CAM, Telegram application.

1. INTRODUCTION

An integral part of contemporary home automation is a home security system. The system's goal is to keep your family, valuables, and house safe from prospective intruders, criminals, and other security risks, using an ESP32CAM module and the Telegram app is one practical method of setting up a home security system. The ESP32CAM module is a low-cost, low-power, and small development board with image processing and Wi-Fi networking combined. It has a high-resolution camera built in to capture clear images of your home environment. You can get real-time alerts and notifications anytime the system notices any suspicious activity by connecting this module with the Telegram app.

Individuals who want to safeguard their homes and families against theft, vandalism, and other security risks are adopting home security systems at an increasing rate. Using an ESP32CAM module and the Telegram application all things considered, setting up a home security system that may assist you in safeguarding your house, family, and valuable assets is a wise choice when utilizing an ESP32CAM module and the Telegram app. Your home will be safe and well-protected against any potential security threats with this

system, giving you piece of mind knowing that your home is secured.

Technology is advancing quickly, which has a significant impact on a variety of illegal activities. It increases the likelihood of crime and attracts more people to do it, which causes the crime rate to rise faster than expected. Our homes, workplaces, banks, and lockers are all better protected from break-ins and illegal access thanks to this system. Nowadays, the majority of people employ a variety of security systems, such as CCTV, but because these systems are visible to the untrained eye, they will warn potential intruders. To prevent this, we are putting out an idea for a laser-based security system. We can avoid crimes like theft and robbery with the use of this security system, which can be installed both indoors and outdoors. The ESP32 CAM begins recording images as soon as it detects an intruder, and it notifies any device connected to Wi Fi of the intrusion along with the image.

2. LITERATURE SURVEY

1. The use of the Telegram application and ESP32CAM in home security system development has attracted a lot of interest lately. A review of the literature on the subject demonstrates the several methods and strategies that academics have put up to use these technologies to improve home security.

2. In the paper "A Smart Home Security System based on ESP32-CAM and Telegram Bot," by Li et al. (2020), A smart home security system with Telegram Bot and ESP32-CAM was suggested. The device featured a camera module for taking pictures of the user's home, which Telegram was used to send to the user's smartphone. Infrared and motion sensors were also part of the system to detect intruders and movement.

3. In the paper "Design and implementation of a low-cost home security system based on ESP32CAM," by Liu et al. (2021), Using the ESP32CAM, a low-cost home security system was suggested. In addition to motion and door sensors for intruder detection, the system

employed Wi-Fi to send data and images to the user's smartphone.

4. In the paper "Home security system using ESP32-CAM and Telegram application," by Narkhede et al. (2021), Using the ESP32-CAM and the Telegram app, a home security system was suggested. A camera module in the system allowed it to keep an eye on the home surroundings and send pictures to the user's smartphone using Telegram. Additionally, a PIR sensor was added inside the system to detect movement.

5. Laser based security system using Arduino UNO by Paramitha Mondal, Madhusree Mondal. The sensor, Arduino UNO, ESP Wi-Fi module, buzzer, and LDR module are all part of the suggested system. This device captures a picture of the intruder and emails it to the registered email address as official proof as soon as the intruder buzzer begins to buzz loudly.

6. Laser based security system for home by Harshal Hemane, Debarati Sen. Mirrors are utilized in this suggested system to reflect laser rays so that they cover the area around the residence in all directions. Laser light strikes a mirror, bounces off of additional mirrors, and eventually lands on an LDR. The buzzer will beep if any of the laser's beams are obstructed.

3. PROPOSED SYSTEM

Considering everyone's safety. A laser-based security system is suggested, comprising sensors, the telegram bot application alert system, a UART TTL Module for programming the microcontroller (ESP32 CAM), and an ESP32 CAM for taking an image of the intruder. The LDR and Laser Module in the system are used to detect the intruder if they attempt to enter the monitored entry. The resistance of the LDR increases when the laser light shining on it is blocked. The ESP32 CAM takes a picture of the intruder as soon as the resistance of the LDR rises. The ESP32 CAM snaps a picture of the intruder and uses telegram bot to send it, along with a notification notice, to a device connected to Wi-Fi.

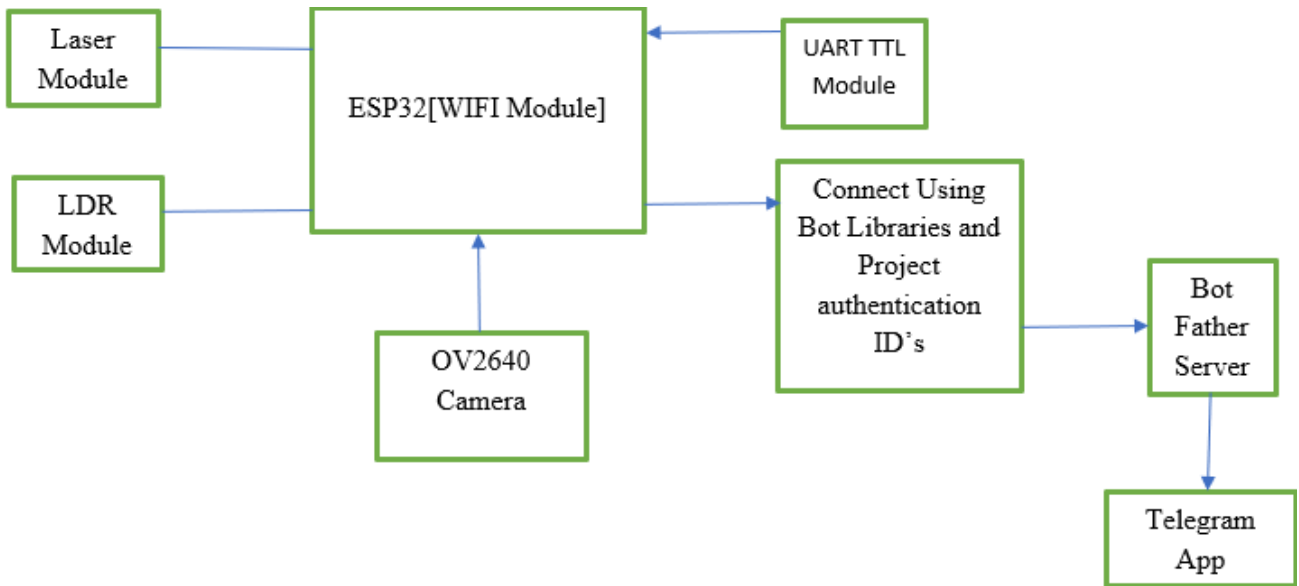


Fig 1: Block diagram of proposed system

COMPONENTS REQUIRED:

3.1 ESP 32 CAM

With a built-in video camera and microSD card slot, the ESP32 CAM is a feature-rich microcontroller. For Internet of Things devices that need a camera with sophisticated features like image tracking and identification, this affordable and user-friendly camera is ideal. A compact, low-power camera module based on ESP32 is called the ESP32 CAM. An OV2640 camera is included with it. ESP combines two powerful 32-bit LX6 CPUs with a seven-stage pipeline architecture, Wi-Fi, conventional Bluetooth, and BLE Beacon. It is appropriate for wireless positioning system signals, smart home devices, industrial wireless control, wireless monitoring, QR wireless identification, and other Internet of Things applications. It's the perfect answer for Internet of Things applications.



Fig 2: ESP 32 cam

3.2 LDR MODULE:

The LDR Sensor Module is used to measure light intensity and identify its existence. When there is light, the module's output is high; when there is no light, it is low. Potentiometers can be used to change the signal detecting sensitivity. "Photo Conductivity" is the basis for how the LDR Module operates. It is connected to pins on the board designated as AO and DO, respectively, for analog and digital output. When light levels reach a certain threshold, the DO port outputs high; when outside ambient light levels above a predetermined threshold, the DO output of the module outputs low.

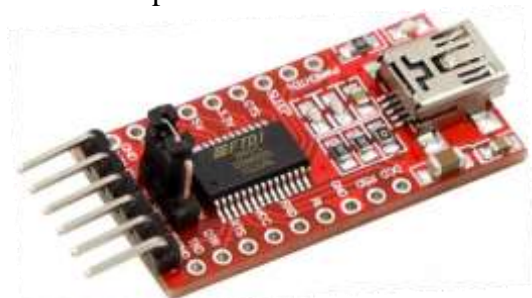


Fig 3: LDR module

3.3 LASER MODULE:

Laser modules are employed in many different applications where compact size, low power consumption, and extended operational lives are required. A low-cost, breadboard-friendly laser module with a 650 nm wavelength and a

5 V operating voltage is available. The laser head is provided assembled and consists of a light-emitting tube, condenser lens, and adjustable copper sleeve. A powerful glue stick is used to modify the lens's focal length, and it may be powered directly from a 5V DC source.



Fig 4: LASER module

3.4 UART TTL MODULE:

A UART board used for TTL serial communication is the FTDI USB to TTL serial converter module. It is a breakout board featuring a USB interface, Tx/Rx and additional breakout pins, and a 3.3 V or 5 V input capability for the FTDI FT232R chip. For communication to and from microcontroller development boards without USB interfaces, as the ESP32 CAM, FTDI USB to TTL serial converter modules are utilized.



Fig 5: UART TTL module

4. IMPLEMENTATION

4.1 HARDWARE IMPLEMENTATION:

The open-source Arduino Uno microcontroller board was created by Arduino.cc and is based on the Microchip ATmega328P microprocessor. It has six analog and fourteen digital I/O pins, and it may be powered by an external 9-volt battery or a USB. The board is the first in a line of USB-based Arduino boards, and it resembles the Leonardo and Arduino Nano. The board's ATmega328 microcontroller

is preprogrammed with a bootloader, making it simple to upload code without requiring an external hardware programmer.



Fig 6:Arduino UNO board

Although Windows is the recommended operating system, Linux, MAC, and Windows systems can all run the Arduino IDE (Integrated Development Environment) software. In IDEs, programming languages like C and C++ are used. For increased data storage, the Arduino Uno board can be powered by an external device, it features an integrated regulating mechanism that maintains voltage under control. Resetting the board and starting the program at the beginning are accomplished by a reset pin. Code instructions can be stored in the board's 13KB of flash memory. To turn it on, 5 V is needed, which can be directly supplied by an external converter or USB port.

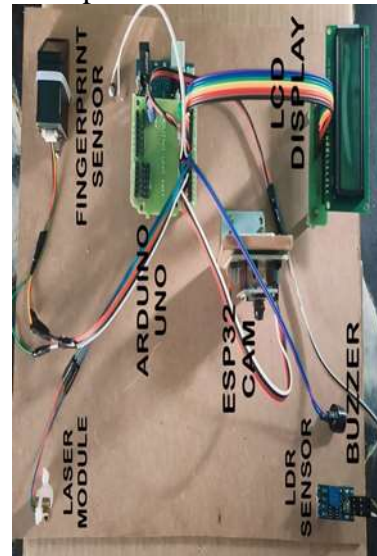


Fig 7: kit Diagram

4.2 SOFTWARE IMPLEMENTATION

The arduino Integrated Development Environment (IDE) is a cross-platform program that runs on Windows, mac OS, and Linux and is designed with C and C++ functionalities. With the aid of third-party cores, it may also be used to build and upload applications to other vendor development boards and Arduino comparable boards. The IDE's source code is made available under the terms of the GNU General Public License, version 2. Specific code structuring guidelines are used by the Arduino IDE to support the languages C and C++. Many standard input and output operations are provided by a software library from the Wiring project, which is provided by the Arduino IDE. Compiling and linking a program stub main() with two basic functions is all that is needed for user-written code to begin the sketch and the main program loop. The executable code is converted by the Arduino IDE using the program avrdude into a text file with hexadecimal encoding, which is then loaded into the Arduino board by a firmware loader program. Typically, official Arduino boards are flashed with user code using the avrdude uploading tool. The Processing IDE is a parent of the Arduino IDE, however, starting with version 2.0, the Processing IDE will give way to the Eclipse. Their IDE framework, which is built on Visual Studio Code. As Arduino gained prominence as a software platform additional.

5. ALGORITHM

Step 1: Connect the ESP32-CAM module to the home Wi-Fi network after installing and configuring it.

Step 2: Set up a new bot with the Bot Father service after downloading and installing the Telegram software on a mobile device. Take note of the chat ID and bot token.

Step 3 Using the chat ID and bot token, step three involves connecting the ESP32-CAM to the Telegram bot.

Step 4: Establish the trigger conditions for the security system, such as when a door or window opens or detects motion.

Step 5: Write the code that will enable the ESP32-CAM to recognize the trigger conditions and, if necessary, record a video or snap a picture.

Step 6: Transfer the recorded media to the Telegram chat linked to the bot using the Telegram API

Step 7: Establish what should happen when the security system is activated, such as an alarm going off or the homeowner being notified.

Step 8: Create the code that instructs the ESP32-CAM to carry out the specified action in response to a security system trigger.

Step 9: Completely test the system and make any required adjustments.

6. WORKING:

The ESP-32 CAM AI THINKER Module is a microcontroller that is an ESP-32 development board that has many GPIOs for connecting peripherals, an on-board flash light, support for Micro SD cards, and an Ov2640 camera. A tiny PIR motion sensor (AM312) in our project is utilized to determine if a person has entered or exited a door within its detection range. To determine if the door is open or closed, using the Magnetic (Reed/Switch) Door sensor. The MQ6 Gas/Smoke sensor is used in homes to detect gas leaks. To find out whether there is a fire in the house, using the Flame Sensor Module. The router is a gadget that connects to a modem and offers Wi-Fi. It transfers data from the internet to the Telegram app. The sensor notifies the telegram application of any issues it detects in the house by taking a picture and transmitting it together with a message. We can respond by using the instruction given to enable or disable the sensors.

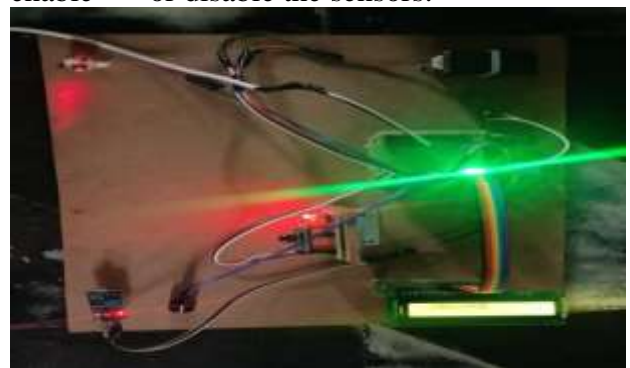


Fig 8: kit working diagram

7. RESULT:

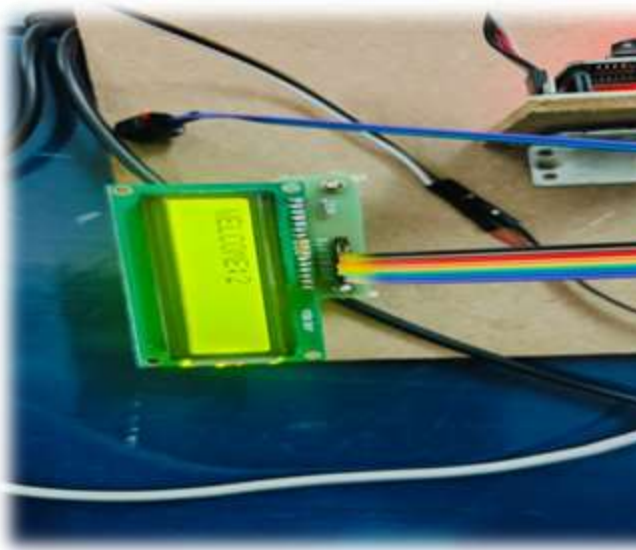


Fig 9: Authorised access

entry

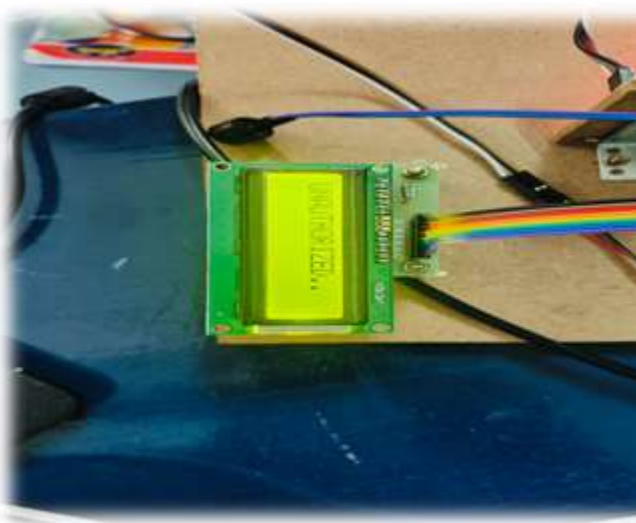


Fig 10: Unauthorised entry



Fig 11: Telegram Bot result

8. CONCLUSION:

The proposed approach helps to prevent robbery, theft, and crime. It also adds an intelligent way to detecting intruders. Avoiding thieves ensures the safety of our financial possessions, and so this method protects us against all. This system is both low-cost and resilient. This security system can be employed in a variety of commercial facilities, including banks. This reactive technique has modest processing requirements, making it suitable for surveillance, industrial applications, and smart environments. Hopefully, this mechanism will lend a helping hand to society.

9. REFERENCES :

- [1]. Parmitha Mondal, Madhusree Mondal, "Laser Based Security System Using Arduino UNO", Volume-8, Issue-6, June-2018.
- [2]. Harshal Hemane, Debarati Sen, "Laser Based Security System for Home", Volume-5, Issue-1, January-2018.
- [3]. A.B.N.V.Prasad, K.Ravi Raj, K.Siva Ganesh, M.Lithin Siva swamy Naidu, N.Phaneendra, "laser security alarm system", Vol-7, Iss-2, Apr-2020.

[4]. Debarati Dutta, "Laser Security System", Volume-7, Issue-4, April-2016.

[5]. Arigela Sai Kalyan, Balibineni Bharat Teja Raju, Mudraboina Venkatesh, "Door Lock Security Using Raspberry Pi and QR Code", Volume-8, Issue-3, March 2021.

[6] "ESP32-CAM Security Camera with Telegram Notifications" tutorial by Rui Santos on Random Nerd Tutorials website: <https://randomnerdtutorials.com/esp32-cam-security-camera-with-telegram-notifications/>

[7] "ESP32-CAM Home Security System with Telegram Notifications" tutorial by IoT Design Pro: <https://iotdesignpro.com/projects/esp32-cam-homesecurity-system-with-telegram-notifications>

[8] "ESP32-CAM Security Camera with Motion Detection and Telegram Notifications" tutorial by Rui Santos on Random Nerd Tutorials Website: <https://randomnerdtutorials.com/esp32-cam-securitycamera-motion-detection-telegram/>