SURVEILLANCE MONITORING USING ESP32-CAM MODULE

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ABSTRACT: The theme of this project is intelligent visual surveillance systems. In recent times, we used surveillance cameras for monitoring and recording moments, but manual surveillance and real-time monitoring is one of the most important and challenging branches of computer vision, which has been widely applied in peoples' life, such as monitoring security. The presence of surveillance cameras and a warning sign indicating that the area is under monitoring can serve as a significant deterrent to criminals and thieves, as the recorded footage can be used to identify people and trace their activities. It can be more advanced with Wi-Fi, which is a local area network running in a local environment or in a distributed setting. Wi-Fi network protocol is one of the leading communication technologies used in the IoT world which supports low transmit power along with low cost. ESP32 is the second generation of Express if corporation IoT solution and it includes Wi Fi. ESP32 reduces high network traffic and computing load. This system facilitates the user to receive notifications whenever the intrusion is detected with the help of sensors connected with the surveillance cameras.

Keywords: Surveillance, Security, Intrusion, Wi-Fi, User, Notification

I.INTRODUCTION

An embedded system is a special-purpose computer system that is designed to execute one or a few specific functions, often under time limitations. It's frequently found as part of a larger gadget that includes both hardware and mechanical components. A general-purpose computer, such as a personal computer, on the other hand, can do a wide range of functions depending on the programming. Embedded systems have become increasingly significant in today's world, as they manage many of the items we use on a daily basis.

An embedded system is a set of computer hardware and software that is either fixed in capabilities or programmable and is built for a certain type of application device. Embedded systems can be found in a variety of places, including industrial machines, automobiles, medical equipment, cameras, household appliances, aeroplanes, vending machines, and toys (in addition to the more visible cellular phone and PDA). A programming interface is provided for programmable embedded systems, and embedded systems programming is a specialist vocation. Embedded Java and Windows XP Embedded, for example, are operating systems and language platforms specifically designed for the embedded market.

The security paradigm has shifted from "investigation of occurrences" to "prevention of potentially catastrophic incidents" as a result of recent global events. Existing digital video surveillance systems simply provide the technology for capturing, storing, and distributing video, leaving danger detection to human operators alone. Surveillance video monitoring by humans is a time-consuming task. It's widely acknowledged that monitoring video feeds necessitates a higher level of visual focus than most other tasks. Specifically, vigilance, or the ability to pay attention and react to unusual events, is exceedingly difficult and prone to inaccuracy due to attention lapses.

II. RELATED WORK

[1] IoT Based Smart Surveillance System. This paper is presented by M Sri Lakshmi., C Padma IoT technology is being used in almost each and every aspect in this modern world. This paper elaborates the way of using the power of Iot in the field of Surveillance. The IoT based surveillance systems enables the user to view the activity from a remote location. It also facilitates the user to receive notifications whenever the intrusion is detected with the help of sensors connected with the surveillance cameras. This reduces the human intervention in the Surveillance monitoring and reduces the errors of manual surveillance.

[2] Implementation of Closed-circuit Television (CCTV) Using Wireless Internet Protocol (IP)Camera. This paper is presented by A Michael F Adaramola. In this paper, the implementation of Surveillance camera using Wi-Fi based technology is presented. The live streaming of vide based surveillance can be adapted for the image detection and tracking for real-time intelligent surveillance system design.

[3] Action Recognition using Surveillance system. This paper is presented by Rishabh Paunikar, Shubham Thakare, Utkarsh Anuse. Surveillance systems that use CCTV cameras or other surveillance equipment continuously record the footage while they are in use. The majority of the data is idle data, meaning there is no activity taking place. When viewing a previously recorded activity, the viewer must go through all of the film to determine when and what occurred.

[4] Automation in Surveillance. This paper is presented by Prajakta Jadhav, Shweta Suryawanshi, Mr. Devendra Jadhav. In this paper, the authors discuss the approaches in the automation and how to make it possible. It also mentions the storing the data in a minimal space. Most of the idle data where no event takes place occupies the storage and also the operator has to go through the entire footage to identify the particular incident. So, by using Smart surveillance systems, this time-consuming task can be reduced. This automation in surveillance can be achieved through Smart surveillance monitoring system.

[5]. IoT Based Facial Recognition Security System. This paper is presented by Prashanth Balraj Balla, K.T. Jadhao. The main purpose of this paper is to set as an alert for home visitors and provide information about the visitors in a dynamic website and phone application. The alerts are sent based on the data acquisition using sensors and the alerts of intrusion or thefts, will be sent to the registered user along with the picture of the incident using a camera module.

[6]. A mobile-based home automation system. This paper presented by M. van Der Werff, X Gui, W.L. Xu, Massey University, New Zealand; They presented a system that included a java-enabled phone, a cellular modem, and a controller board with a microcontroller. A user can interact with the home automation system using their cell phone as a remote control.

[7]. Design and Implementation of Home Automation System. This paper presented by A. Alheraish, Member, IEEEA remote-control system is designed and implemented using the GSM cellular connection network. This design incorporates the controlled device, the microcontroller, and the GSM Module, allowing it to be used in a variety of applications. Instead of a microcontroller, the proposed M2M system in this study uses a PC as the terminal user.

[8] Design and Implementation of UPnP-Based Surveillance Camera System for Home Security. This paper is presented by Yi Gu, Myoungjin Kim Division of Internet & Multimedia Engineering, Konkuk University, Seoul, South Korea. The main focus of this article is on the rapid development of mobile devices and Internet services, and how these devices and services might be used to manage home security. We propose the UPnP-based Security Camera System (USCS), which uses UPnP technology to search, operate, and administer IP-based cameras, to broaden the range of usability of traditional home surveillance cameras.

[9] Smart surveillance monitoring system. This paper is presented by Akshat Jain, Owais Kazi Computer Engineering Department, Pune Institute of Computer Technology, Pune, India. The primary goal of this article is to demonstrate that in today's world, when everyone wants to keep their assets safe and secure, video surveillance for viewing a specific region has become a need. To address this issue, we developed a smart monitoring system for locations such as bank vaults and houses where human presence is not available. It is not necessary to continuously monitor the area with cameras in such situations. This consumes both the power and the storage space required for the footages. Using a PIR sensor, our system will detect human presence. For remote sensing and surveillance, Raspberry Pi operates and controls motion-detecting sensors and video cameras, transmits live video and records it for later viewing.

[10] Monitoring and controlling devices system by GPRS on FPGA platform. This paper is presented by Nguyen Van Cuong, Bui Van Thanh Trung. The major goal of this work is to provide a novel method for controlling and monitoring household appliances via GPRS utilizing an embedded system on an FPGA platform with the microprocessor Micro Flame and the real-time operating system Free RTOS, as well as using a PIR sensor to detect break-ins.

III. PROPOSED APPROACH

In this project, we'll use the ESP32-CAM to create a surveillance system that detects the presence of illegal people. With the ESP32-S chip, the ESP32-CAM is an extremely compact camera module. We can build a face recognition system using the ESP32-CAM module without any complex programming or additional components. We're going to use an ESP32 camera with IR sensors and an Arduino Uno in this system. If the sensors detect an illegal person entering, an alarm will be sent to the individuals via GSM module, as well as buzzer alerts at the surveillance system's premises.

The proposed functionalities of the design; we divide the system into two main units: data acquisition and system control. The data acquisition is modelled using the Arduino, IR sensor. Control system is through single-chip microcomputer controlling the GSM Module , SIM900A, ESP Camera, then the real-time display of the received information is achieved using ESPCamera.
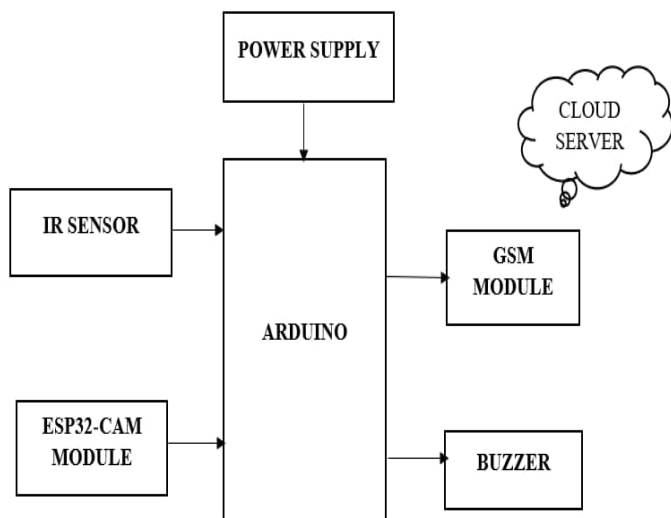
Fig1: Block diagram of proposed system

reference model; see the index of Arduino boards for a comparison with previous versions.

Figure 2: Diagram of Arduino Uno

1.GSM Module:

GSM stands for global system for mobile communication and is a mobile communication modem (GSM). In 1970, Bell Laboratories came up with the idea for GSM. It is the world's most commonly utilized mobile communication system. GSM is an open and digital cellular system that uses the 850MHz, 900MHz, 1800MHz, and 1900MHz frequency bands to provide mobile voice and data services. A GSM network consists of the following components:

• A Mobile Station is a mobile phone that includes a transceiver, display, and CPU and is controlled by a SIM card that operates over the network.

• Base Station Subsystem: This system connects the mobile station to the network subsystem. It is made up of the Base Transceiver Station, which houses the radio transceivers and manages the protocols for mobile phone communication. The Base Station Controller, which manages the Base Transceiver station and serves as a link between the mobile station and the mobile switching centre, is also included.

2. ARDUINO UNO:

The ATmega328-based Uno with Cable is a microcontroller board. It contains 14 digital input/output pins (including 6 PWM outputs), 6 analogue inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It comes with everything you'll need to get started with the microcontroller; simply plug it into a computer via USB or power it with an AC-to-DC adapter or battery.

In Italian, "uno" means "one," and it is the name given to the future Arduino 1.0 release. Moving forward, the Uno and version 1.0 will be the reference versions of Arduino. The Uno is the most recent in a series of USB Arduino boards and the platform's
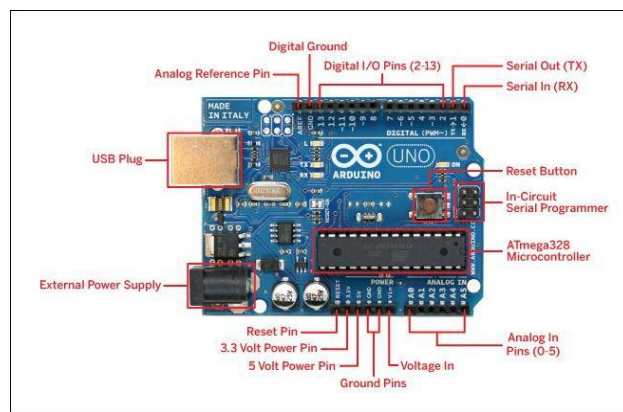
3. ESP-32 CAM MODULE:

The ESP32-CAM development board includes an ESP32-S processor, an OV2640 camera, a microSD card slot, and various GPIOs for connecting peripherals. The ESP32-CAM is a small camera module that runs on the ESP32-S microcontroller and costs around $10. Aside from the OV2640 camera and many GPIOs for connecting peripherals, it also has a microSD slot for storing photographs. the AI-Thinker ESP32-CAM

Fig 3: ESP-32 CAM Module

4.IR SENSOR:

An infrared sensor is an electrical device that emits infrared light in order to detect certain features of its surroundings. An infrared sensor can detect motion as well as measure the heat of an item. This sort of sensor, also known as a passive IR sensor, measures solely infrared radiation rather than emitting it.

FIG 4: IR Sensor

5. Power Supply:

A power supply is a device that supplies power to at least one electrical charge. It usually transforms one type of electrical power to another, although it can also convert energy forms other than electrical energy, such as solar, mechanical, or chemical. Most computer power supplies also contain an input voltage switch that may be changed to 110v/115v or 220v/240v, depending on your location. This switch position is critical due to the varying power voltages supplied by power outlets in different nations.

6. Buzzer:

A buzzer or beeper is a mechanical, electromechanical, or piezoelectric audio signalling device. Alarm clocks, timers, and confirmation of human input such as a mouse click or keyboard are all common uses for buzzers and beepers. Buzzers are electronic transducers with a DC power source that are commonly used in sound devices such as computers, printers, copiers, alarms, electronic toys, automobile electronic equipment, telephones, timers, and other electronic products.

Fig 5: buzzer

IV. SOFTWARE DETAILS

IDE, which stands for Integrated Development Environment, is an official Arduino.cc software that is primarily used for authoring, building, and uploading code to the Arduino device. Almost all Arduino modules are compatible with this open source software, which is simple to install and begin compiling code on the fly.

STEP 1: HOW INSTALL ARDUINO IDE:

You may get the software from the Arduino website. As previously said, the software is available for popular operating systems including as Linux, Windows, and MAX, so make sure you're downloading the relevant software version for your operating system.

- If you want to download the Windows app version, make sure you have Windows 8.1 or Windows 10, as the app version is not compatible with Windows 7 or earlier versions of Windows.

- The IDE environment is mainly distributed into three sections

  - 1. Menu Bar
  - 2. Text Editor
  - 3. Output Pane

As you download and open the IDE software, it will appear like an image below.
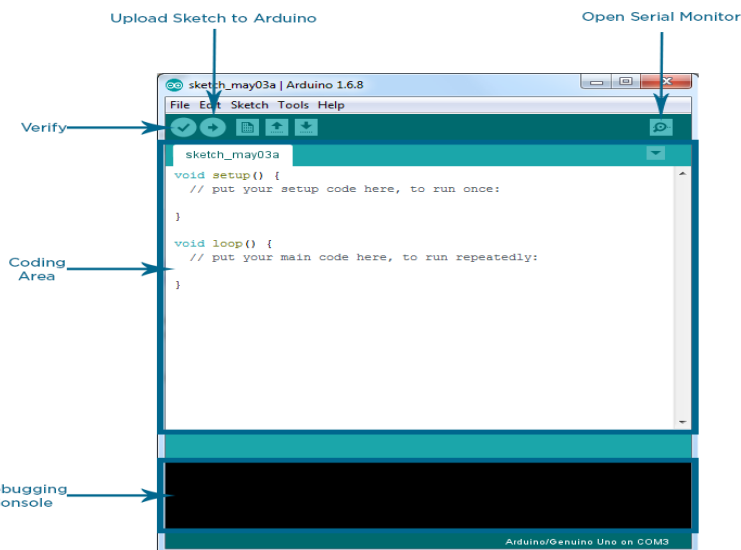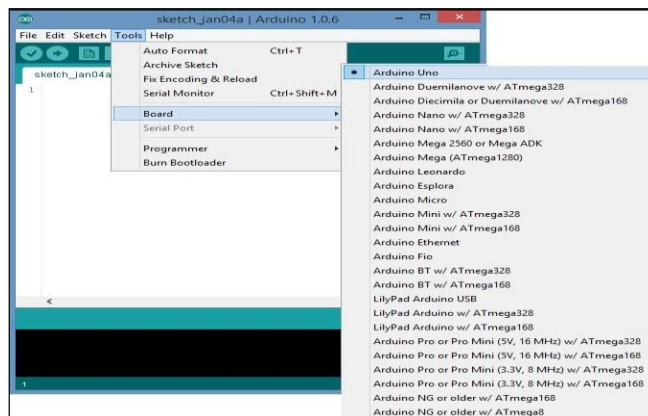

Fig 6: Arduino IDE Environment

Step 2: How to select board:

To upload the sketch, you must first select the appropriate board and the ports for that operating system. The figure below shows what happens when you click Tools on the Menu.

Fig 7: Selecting the board

V. WORKING AND IMPLEMENTATION

the registered Email account.

Fig 8: Flow chart

Fig 9: Registered mobile alert message

Fig 10: Registered e-mail alert message
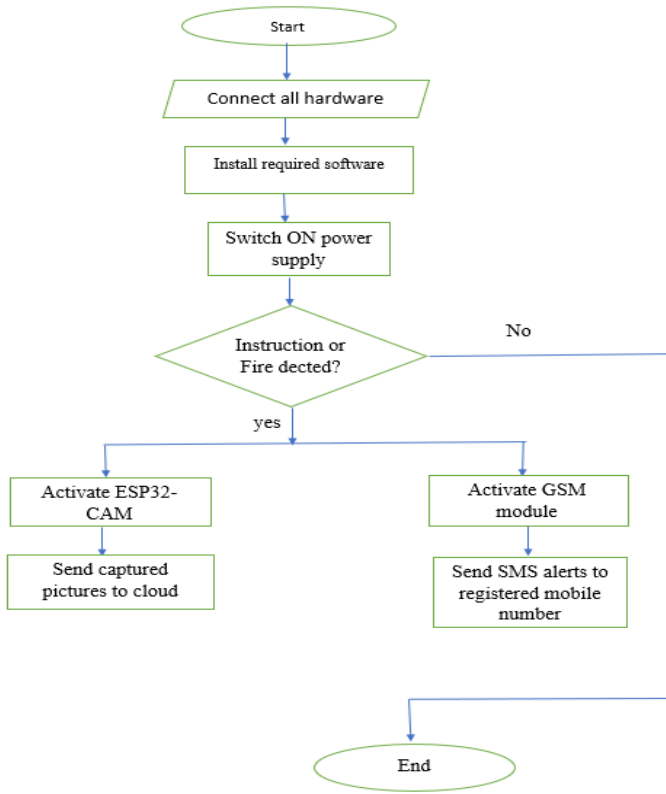
- Connect the hardware requirements for the proposed system according to the connection diagram.
- The code for the Arduino and ESP32 cam module is written with the help of Arduino IDE software.
- The details of hotspot required for ESP32 cam is given in the code.
- The details of registered mobile number and Email account is given in the Arduino code.
- Switch on the power supply.
- If any intruder is detected or any fire is detected through IR sensors, an image of the intruder or the fire is captured using ESP32 camera.
- With the help of a GSM module an SMS alert stating "Intruder alert "or "Fire alert" is sent to the registered mobile number.
- The picture captured is sent to the registered Email account stating "Photo captured with ESP32-CAM and attached in this Email".

VI. RESULTS

By this project, we are implementing a smart surveillance system using ESP32-CAM module. So, by using this system, if an intruder is entered into the home or any suspects were walking around your home one can get an immediate alert to their mobile through SMS along with-it buzzer will generate an alarm. This system is implemented based on Arduino UNO that processes and detects the presence of an intrusion Captured pictures are sent to
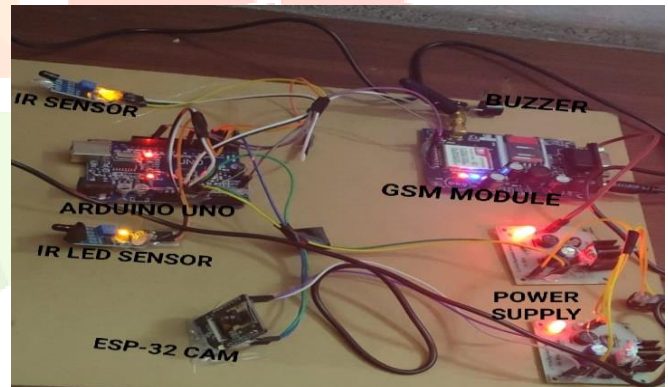

Fig 11: connection diagram

CONCLUSION

As a result, we may infer that our system is capable of achieving all of the aforementioned goals and of overcoming the existing system's challenges. With our proposed system, surveillance is vastly improved. The designed system enabled us to achieve the following goals: real-time monitoring, reduced human intervention, and use of active sensors in the field.

FUTURE SCOPE

More home appliances will be controlled by incorporating various sorts of sensors in the next years. Sensor fusion, low-power digital components, and smartphone cellular capabilities can all be used to extend the life of such devices. Physically handicapped persons will benefit greatly from this equipment in the future.

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