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SMART FARMING AND SECURITY SYSTEM USING ESP32 AND CAMERA MODULE

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Abstract

The smart agricultural monitoring system is going to prevent unwanted access by wild animals, thus keeping away the crops from their hunger. In this case, the different sensors-integrated system contains IR sensors, soil moisture sensors, pH sensors, and temperature as well as humidity sensors in order to maintain good conditions for a farm. The IR sensor will detect living beings. On detecting these, it will send pictures to the owner via a Telegram bot from the ESP32 camera while making the buzzer beep as a warning signal. Soil moisture and pH sensors control irrigation by governing the pump motor according to defined thresholds. The system measures temperature and humidity also, which will be shown on an LCD. An LDR sensor also monitors light intensity, which varies its resistance based on changes in light intensity. This is an IoT-based solution, offering real-time monitoring and control to enhance farm management and security.

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Keywords: ESP32 Microcontroller, ESP32 CameraModule, IOT, PowerSupply, Protection, Smart Farming.

1. Introduction

Attacking animals is a common occurrence in India today. Without a detection system, these attacks killed villages and destroyed their crops. Due to the lack of security measures, the villagers remain vulnerable to their fate. Therefore, a proper identification system can help save lives and plants. People's crops were destroyed because they were often robbed by animals[1]. Crops and fields cannot always be fertilized[2]. Therefore, there is a high probability that the plants are eaten by cows and goats. This can lead to huge waste of crops produced by farmers[3,4,5]. To make good use of mobile communication technology, this paper aims to use the EsP32 camera module and send messages to farmers[6]. This system helps keep such wild animals away from farmland and also provides a control function[7]. The smell of rotten eggs has been found to help deter wild boars and vultures from destroying crops, so farmers hand-spray rotten egg solutions on fields and fire extinguishers are used to prevent wild elephants from destroying crops. The project is based on animal control and protection systems used on agricultural land to save crop damage by wild-animals[8,9,10]. In order to provide protection, this paper is different from authorized people using RFID (Radio Frequency Identification) , where many IR sensors (Infrared sensor) are placed in the area to determine any movement and therefore activate the cam-era when

action is noticed, Some of the procedures are used to stop wild-animals from entering fields and destroying crops include automating electro-nic fire extinguishers (for large animals such as elephants) and rot-ten egg sprays (for small animals such as wild boars and hedgehogs[11,12,13]). found useful for protection against wild animals. When such an intrusion is detected, an automatic notification is generated and the active camera is activated, which starts taking pictures and recording videos. The host can view the video on any smart device and access it later. Thus, it prevents crop loss and increases yield, which can be very useful for farmers, as well as protect the farm from intruders. Smart farming in agriculture involves the use of various software and hardware to optimize and automate daily operations. Primary agriculture is about using the new technologies that emerged in agriculture and livestock production at the beginning of the fourth industrial revolution to increase the quantity and quality of production[14,15,16]. , by maximizing the use of resources and minimizing environmental impact. Also, the introduction of technology in agriculture and livestock production will provide an opportunity to improve food security around the world[17]. Among the technologies that are revolutionizing today and determining the future of agriculture. The Internet of Things makes it possible to optimize the monitoring of farms, mainly with smart sensors that can measure everything from solar radiation to leaf moisture and stem diameter or, in the case of cows, the temperature of each animal. types of management decisions.

2. Materials and Methods

Proposed animal and human anti-theft system based on IOT It is developed with the concept of using esp32 with camera module movement (movement). We use motion sensors to detect animal movements and people. When the animal moves near the motion-sensor, the motion-sensor detects the animal's gesture and sends a signal to the micro controller. Next The ESP32 (micro controller) activates and captures images using the camera related to Notify farmers (farm owners) and send information about invasion, warnings It is going to be notified to the owner of the farm via the Telegram application. Photos taken with a camera and Notification of animal or human intrusion is sent to the owner of the farm. Through the warnings Farmers become familiar with suspects and can take additional measures to keep animals away from agricultural land. This will reduce animal damage, plant damage and increase productivity income for farmers. Below we have the block diagram of the proposed system The ESP32 camera module is a micro controller board that contains and manages the camera module should be prior as one of the main parts of this project. Motion-sensor whenever the motion-sensor detects motion, it is connected to the micro-controller board inputs to send signals to the micro-controller board. When the micro controller board is removed The signal received from the motion sensor captures the image of the camera. determine the action. After the image is taken, the photo is notified to the farm owner along with a warning notification Using Telegram application. In this project we are also going to build a Farmer Protection Smart farming system using IoT. The purpose of this program is to present Help farmers get live data for environmental control that will allow it to raise overall yield and product quality. This is smart agriculture using IoT systems From DHT11 sensor, humidity

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sensor, working with ESP32 Micro Controller, LDR, Water Pump and LED Display. When an IoT-based agricultural monitoring system starts, check soil moisture, temperature, humidity and soil temperature. This is then sent to the IoT cloud for direct monitoring. If the soil moisture decreases automatically start the water pump at a certain level.The live data will be displayed on the LCD Display we are using a Wi-fi module in order to have a world wide access to the farm data to the farmer in order to monitor the farm conditions this can be done through Blynk application as long as the system receives network the data can be accessed through anywhere through blynk application in absence of network the data will be displayed only on the LCD display In our Project we are using an Automatic pump which turns on when soil level falls below 40.

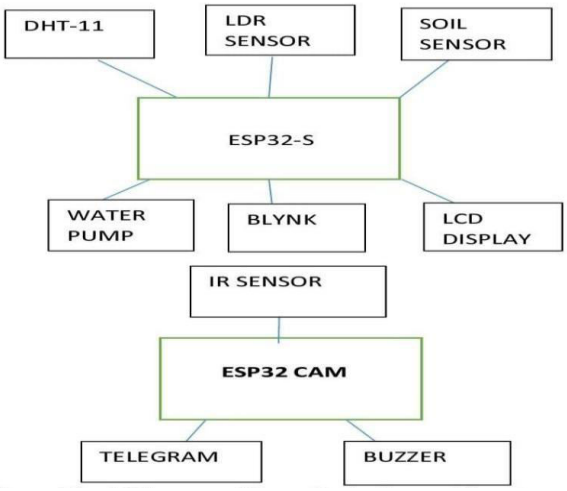

Figure 1: Block Diagram of Farm Protection and Smart Farming Using ESP32 Camera Module.

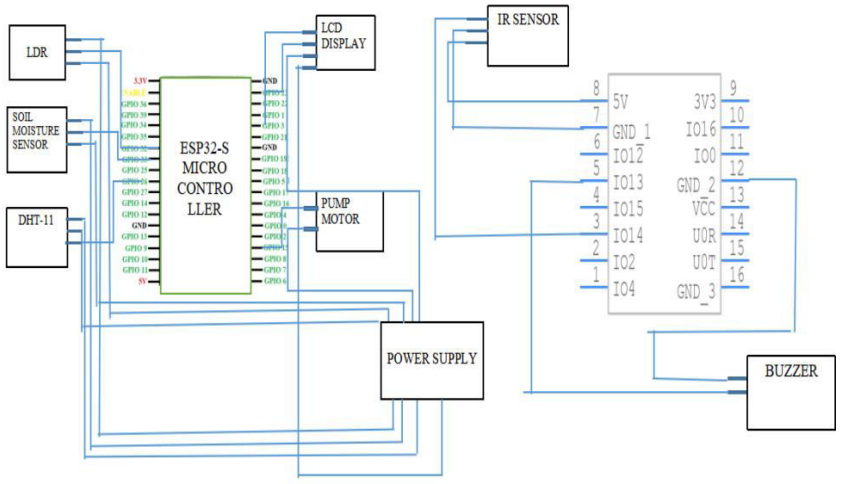

Figure 2:Schematic Diagram of Farm Protection and Smart Farming using ESP32 Camera Module

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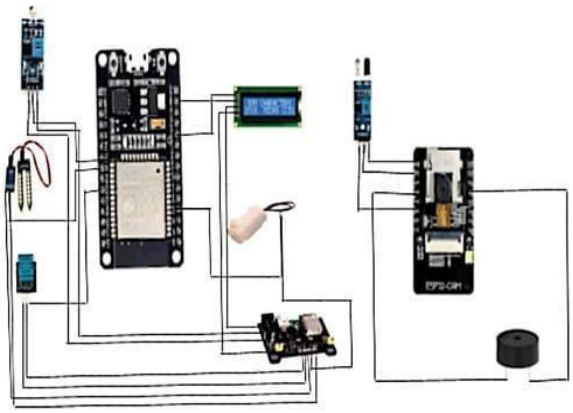

Figure 3:Circuit Diagram of Farm Protection and Smart Farming Using ESP32 Camera Module

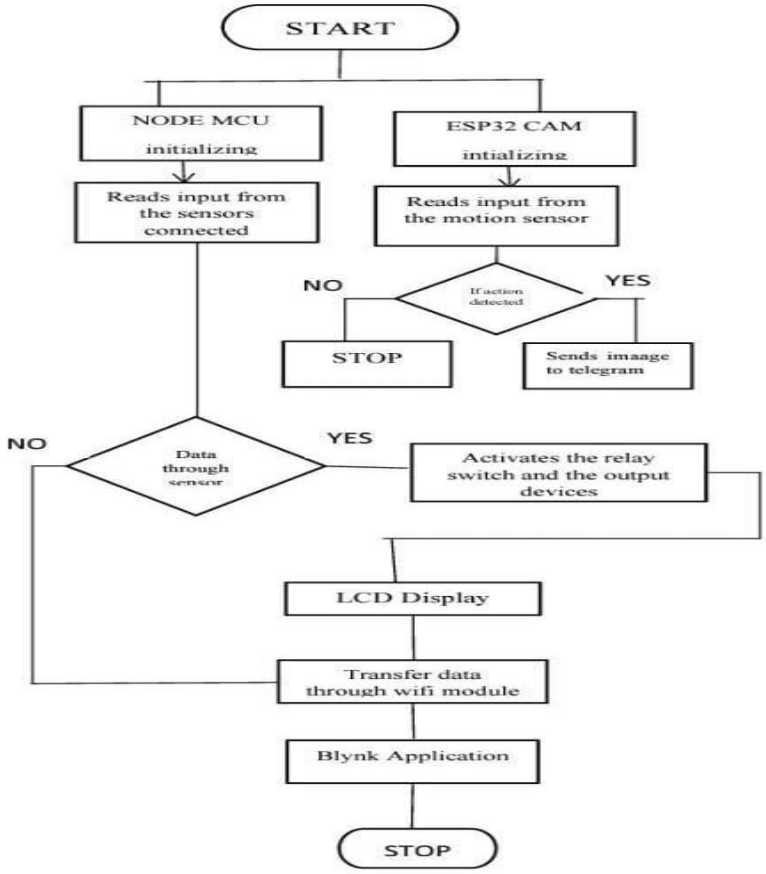

Figure 4: Process Flow denoting the flow process of the Farm Protection and Smart Farming Using ESP32 Camera Module System

2.1. Hardware Components

2.1.1. ESP32 CAM

General ESP32-CAM development board Includes ESP32-S processor, OV2640 camera, microSD card slot and various GPIOs connect peripherals. ESP32-CAM is small ESP32-S is a microcontroller-based camera module controller. Apart from this OV2640 camera There are many GPIOs for connecting peripheral device microSD slots to store photos. There are three pins GND and two pins for power: 3.3V or 5v. GPIO 1 and GPIO 3 are serial ports. You need this button to upload the code to your board. In addition, GPIO 0 also plays an important role because it determines whether the ESP32 is turned on or not. schedule or not. When GPIO 0 is connected to GND, the ESP32 is in flashing mode.

2.1.2. DHT11 Sensor

DHT11 is usually used Temperature and humidity sensors. Censorship Comes with a special NTC for measurement 8-bit microcontroller for temperature and output constant temperature and humidity values information. This sensor is factory calibrated and thus easy to interface with other microcontrollers. The sensor can measure temperature from 0°C to 50°C humidity from 20% to 90% with accuracy ± 1 ° C and ± 1%. So if you want to measure this range, this sensor may be the right choice.

2.1.3. LDR Sensor

(Light Dependent Resistor) is a special type of resistor in the state in which the principle of photoconductivity means that resistance varies with intensity . It decreases as its resistance decreases light intensity. It is often used in light sensors, light meters, automatic street lights and so on that must be sensitive to light. Also called a light sensor.

2.1.4. IR Sensor

Infrared (IR) sensors are electronic devices that measure and detect infrared radiation around. Infrared radiation accidentally discovered by astronomers In 1800 William Herschel named it. During the measurement divided by the temperature of each color of light prism), he found that the temperature was only when it peaked behind the red light. IR is invisible to the human eye because the wavelength is longer than the human eye of visible light (although still in the same form) electromagnetic spectrum). Whatever comes out heat (anything with a high temperature five degrees Kelvin) emits infrared raditation.

2.1.5. LCD Display

This component is exclusively designed for use with microcontrollers. This is used to display various messages in sub-messages liquid crystal display. LCD display in our project used to display temperature and humidity values and inform the farmer.

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2.1.6. Pump Motor

DC 3-6 V Mini low motor pump price, small size submersible motor pump. This is it Operated from a 2.5 ~ 6V power supply. He can take it up to 120 liters per hour with a very low flow Consumption 220mA. Connect the drain hose plug the motor into the socket, submerge it in water, then turn it on This is it. This is the motor pump we used in this project automatic installation of the pump motor as soil moisture decreases 40. and the humidity level turns off automatically It rises above 40.

2.1.7. Buzzer

Active buzzers are called active; they can emit sound directly when connected with a battery. Can generate active buzzers single tone is set to 2 khz by most factory On the other hand, passive buzzers It takes waves to make sound.

2.1.8. Soil Moisture Sensor

A soil moisture sensor measures the amount of water on the ground. Direct gravimetric free soil moisture measurement requires removing, drying, and weighing the sample to determine the moisture content of the soil. Such sensors do not directly measure soil moisture soil electrical resistance, dielectric constant, or neutron impact. , as a proxy for humidity.

3. Results and Discussion

A low-cost Arduino board built with an ESP32 module will be integrated using ESP32 CAM Module with sensors for smart provisioning farming and helping farmers in economic parameters. CAM is used as an ESP32 Micro controller to Capture images of Intruders or any animal The IR Sensor senses Motion and sends it to the Farm using Telegram. Another ESP32 micro controller is used on the board This sensor is connected to LDR sensor and DHT sensor 11 is used to show the temperature, humidity and price on the LCD display and informs the farmer about its use Blynk app.

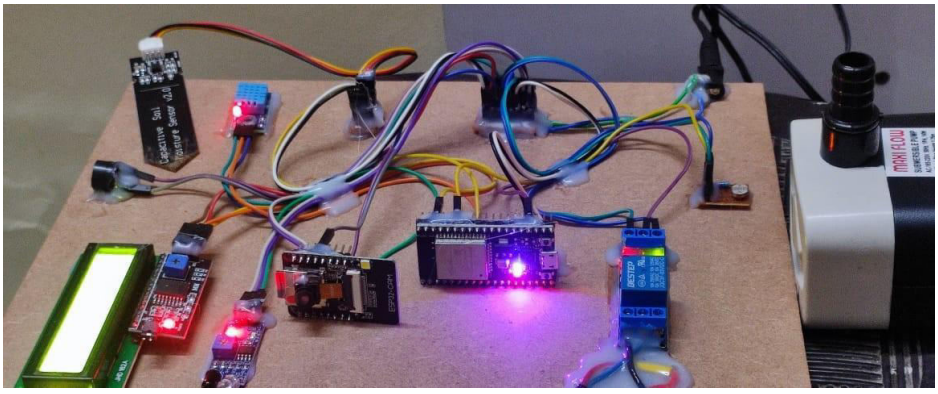

Figure 5: Hardware Model of the Farm Protection and Smart Farming Using ESP32 Camera Module which consists of ESP32 Micro Controller,ESP32 Camera Module,LCD Display,IR Sensor,DHT 11 Sensor,LDR sensor, Buzzer,Soil moisturizer Sensor,Pump Motor and Relay

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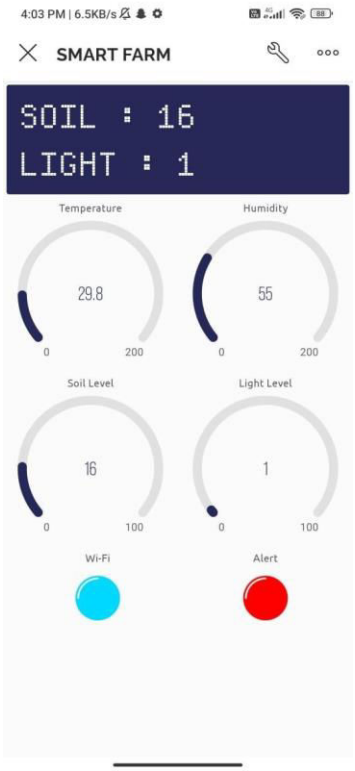

Figure 6: Information on Blynk Application which is representing the soil and light level to the Farmer through the Application which can be accessible from anywhere in the world

Figure 7: Information on Blynk Application which is representing the temperature and Humidity level to the Farmer through the Application which can be accessible from anywhere in the world

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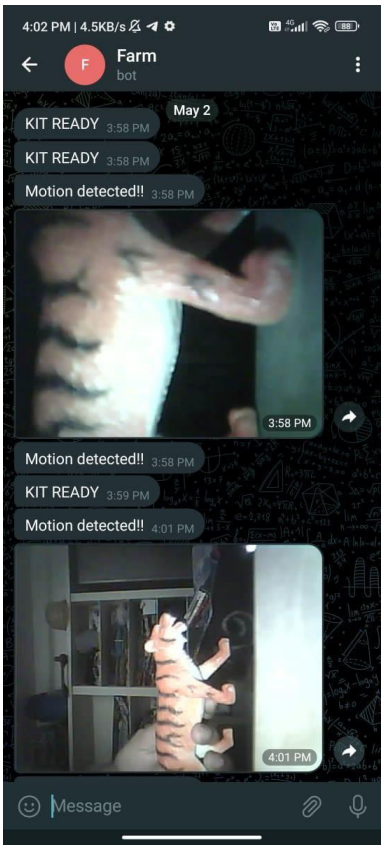

Figure 8: Message Received through Telegram to the Farmer when animal enters the Farm

4. Conclusion

Farm Protection and Smart Farming using ESP32 with a cam-era slot acts as a bot to alert the owner of the farm when entering found. This system detects and captures the movement of living things. It is used in micro controllers and camera modules. Arduino-IDE is used for writing and debugging code to the microcontroller board. Telegram is to send warning messages and photos to the owner of the farm. Up on using these tools and tech-no-logies developed a system to detect wild animals and notify farm owners in accordance with smart farming which is also used in this system with a ESP32 micro controller by connecting various sensors such as DHT11,LDR,Soil sensor,LCD display and water pump which will be notified on the LCD display and also this system provides world wide access to the farmer using wifi-module which shows Farm Condition on the Blynk Application.This System reduces animal damage to crops as well as helps farmers get better yields.

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