

# SMART IRRIGATION AND CROP PROTECTION FROM WILD ANIMALS

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**Abstract**— India is a nation dependent upon agriculture. Improving the efficiency and quality of agro-based goods therefore is very critical. The design proposed is an automatic system which assists the farmer in the irrigation process. It keeps alerting the farmer via an on-board LCD display and messages sent to the mobile of farmers. This project focuses on detecting wild animals along the farm's border and also saving water by switching on and off the motor based on soil moisture content. Here we use IR sensors to detect wild animals, soil moisture sensors to detect moisture content in the farm, some speakers to deliver some scary sounds so animals can be afraid to get into the field, and microcontrollers to collect sensor data. The microcontroller analyses the data and, based on that data, sends the signals to the speakers that it generates the sound to stop the animals from reaching the field and also sends the safety instructions to the cell phones of the nearest residents, farmers and the forest office. This will also send signals to turn on and off the motor based on the soil's moisture content through the soil moisture sensor information.

**Keywords**— IOT, Wild Animals, Humidity, Sensor

## 1. INTRODUCTION

The concept of IoT was introduced by a member of RFID development community in the year 1999. After it became more famous to the practical world because of rapid growth in mobile devices, embedded systems, cloud computing, ubiquitous computing and data analytics. The IoT technology can play a crucial role to improve the quality of lives in the application fields like transport, home appliances, healthcare, natural hazards and industrial automation [1]. In several areas, surveillance plays a major role, be it at home, hospitals, schools, public places, farmlands, etc. This lets us track a certain area and prevent fraud, and also provides evidence in the event of these incidents happening. Surveillance of farmlands or

agricultural land is very important in order to prevent unauthorized persons from gaining access to the field and also to protect the field from animals.

Different strategies aim only at surveillance that is mainly for human intruders, but we appear to overlook that the biggest enemies of these farmers are the animals that eat the crops. In the states of Tamil Nadu, Himachal Pradesh, Punjab, Haryana, Kerala and many other states, the issue of wildlife attack on crops i.e. crop vandalization is becoming very common. Wild animals such as monkeys, elephants, wild pigs, deer's, wild dogs, bison, nilgais, feral animals such as cows and buffaloes and even birds such as parakeets do a lot of harm to crops by running over them, eating them and vandalizing them entirely. This leads to low crop yield and substantial financial loss for farmland owners. This problem is so severe that due to such regular attacks on animals, the farmers often prefer to leave the areas barren. This system allows us to keep these wild animals away from the farmlands and also provides flexibility for surveillance. It was found that the smell of rotten egg helps prevent the wild pigs and deers from eating the crops, so farmers spray the rotten egg solution manually on their fields, and firecrackers are used to fend off the wild elephants that eat the crops.

Depending on the need, the system is automated so there is no manual labor, thus saving time and also avoiding crop loss.

## 2. LITERATURE REVIEW

Bindu D and Dilip kumar M D et al describe the protection of crop fields as a major content and a complex problem in this paper. Over the years, the animals from the protected area [PAs] constantly invade the crop field and the protection of this crop field has become a major concern. The methods that are currently being used are unsuccessful, so they present a realistic method to scare them off, by developing a device that studies the animal's behaviour, senses the animal and produces the

specific sound that irritates the animal and also warns the designated individual by sending a message. They also have a multi-class classification by providing zero false alarm levels and exact identification of species [2].

Krishnamurthy B, Divya M et al explains Agriculture going to meet people's food requirements and supplying multiple industry raw materials. But there will be major crop loss due to animal intrusion in the agricultural lands. Wild animals are vulnerable to crops. And tracking the local presence of animals is very important. Then the intervention of various devices to repel the dangerous animals will follow. They proposed a system for shielding farms from wild animals. Operational amplifier circuits are primarily used to detect animal interference from outside farms. The proposed monitoring scheme is to provide early warning of potential wild animal intrusion and harm. Solar Electric Fence is a modern-day alternative to traditional fencing methods for protecting crops & land. Electric Fence provides an important way to reduce animal losses [3].

Kshama s. Bhise defines the concept as being used to map Animal's position within wildlife reserves or national parks. For this purpose, they use an RFID module (Radio Frequency Identification Device) and a GSM (Global Network Mobile) modem. Forest officer or person with government authority must receive these SMS containing area in which the animals are observing [4].

Radio frequency identification (RFID) is used to identify a device that transmits an object or person's wireless identity (in the form of a specific serial number), using radio waves. It's listed under the broad automatic recognition technologies category [5].

Prof. Abhinav V. Deshpande explains the method of protecting farms from wild animals by ubiquitous wired network devices that are applied to farming along with conventional methods to increase the efficiency of protection. Operational amplifier circuits are used mainly for detecting interference of animals from outside farms. The proposed monitoring scheme is to provide early warning of potential wild animal intrusion and harm [6].

Electrical fences used in Current system to shield crops from wild animals. Since animals with

high electricity are harmed severely and it affects not just wild animals but also domestic animals and even human beings. The electrical fences are used to deter crops, but the current approach camera has been used to identify the animals that are economically costly. The signal is available in the device, but it only gives the warning to the forest officer, not to the people left on the farmland.

### 3. PROPOSED METHOD



Agricultural sector faces many problems nowadays due to a lack of water resources. Smart irrigation system has been used to help the farmers resolve the difficulties. Different sensors such as soil moisture, DHT11, PIR (intruder detection network) are connected to Arduino microcontroller's input pins within this device. The sensed sensor values are displayed in LCD. If the sensed value exceeds the threshold values set in the system, the relay circuit automatically switches the pump ON / OFF and it is connected to the driver circuit which helps to switch the voltage. The farmer will be intimated via GSM module about the current condition of the field. By using this device, the farmer can at any time access the details of the field condition anywhere. Animal detection system is designed to detect the presence of animal and offer a warning. In this project we used PIR and ultrasonic sensors to detect the movement of the animal and send signal to the controller. It diverts the animal by producing sound and signal further, this signal is transmitted to GSM and which gives an alert to farmers and forest department immediately.

Arduino boards are able to read analog or digital input signals from different sensors and turn it into an output such as activating a motor, turning LED on/off, connect to the cloud and many other actions. We can control our board functions by

sending a set of instructions to the microcontroller on the board via Arduino IDE.

Here arduino is used to collect the data from the sensors such PIR motion sensor, IR Sensor and Soil Moisture Sensor.

### 3.1. SOIL MOISTURE SENSOR

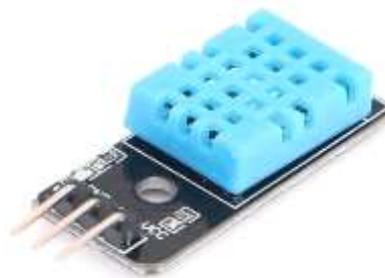


Soil clamminess sensors recognition the volumetric water content in soil. Since the direct gravimetric estimation of loosened soil moistness requires wiping out, drying, and weighting of a case, soil suddenness sensors degree the volumetric water content texture indirect by utilizing the utilization of some specific possessions of the tidy, containing electrical opposition, dielectric tenacious, or exchange with neutrons, as a mediator for the clamminess content material texture. The relationship some of the arranged assets and soil soddenness must be adjusted and would variety be able to dependent upon environmental added substances, for instance, soil kind, temperature, or electric fueled controlled conductivity. Considered microwave radiation is roused with the guide of the utilization of the earth moistness and is actualized for identifying in hydrology and cultivating.



### 3.2. DHT11 SENSOR (TEMPERATURE / HUMIDITY SENSOR)

Digital Humidity and Temperature sensor is a readymade module which is used to observe humidity and temperature by interfacing arduino microcontroller. We use **dht library** for interfacing module, with the help predefined functions we observe humidity and temperature values.



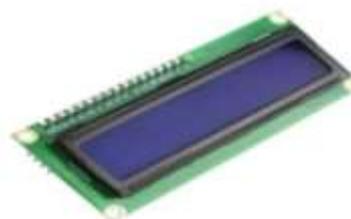
### 3.4. PIR SENSOR

All living objects, whose body temperature is more than 0oC, emit the heat in form of infrared radiation through their body, also called as thermal radiations. This Radiated energy is invisible to human eye. These Signals can be detected by using PIR sensor which is specially designed for such purpose.



### 3.5. LCD

LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LEDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smartphones, televisions, computer monitors and instrument panels.



### 3.6. SPEAKER

Regardless of their design, the purpose of speakers is to produce audio output that can be heard by the listener. Speakers are transducers that convert electromagnetic waves into sound waves. The speakers receive audio input from a device such as a computer or an audio receiver.



### 3.7. GSM

GSM (Global System for Mobile communication) is a digital mobile network that is widely used by mobile phone users in Europe and other parts of the world. GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot.



### 3.8. RELAY

Relays are switches that open and close circuits electromechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit. As relay diagrams show, when a relay contact is normally open (NO), there is an open contact when the relay is not energized.



## 4. ALGORITHM

- Step 1.** If any animals' movement was found
- Step 2.** Goto step 3, else go to step 9.
- Step 3.** The sensors capture the data and send it to the aurdino.

- Step 4.** Aurdino and GSM collects the data from the sensors.
- Step 5.** Send those data to the cloud server.
- Step 6.** Server process the data received from the aurdino.
- Step 7.** Send the signals to the atuaters, and mobiles of the users.
- Step 8.** The actuators perform the actions based on the data from the server.
- Step 9.** Go to step 1.

## 5. METHODOLOGY

The proposed system uses an Arduino board which forms the main heart of the system, the different sensors and camera is interfaced to the board. As soon as the PIR sensors go High on detecting motion within a range of 10 meters, the camera will be turned ON which first captures an image and then starts recording the video for about five to six minutes, which will be stored onboard as well as cloud, simultaneously a message will be generated automatically to the registered number using a SIM900A module to inform about the intrusion along with the details of the temperature and humidity obtained by interfacing dht11 temperature and humidity sensor. If the motion detection is due to an authorized person with a valid RFID, who is mostly a farm worker, his attendance gets recorded automatically. Whereas if the motion detection is due to that of an unauthorized person without the valid RFID tag, the system further processes the image and video using Haar feature based Cascade Classifiers for object detection, and decides if the entity is an animal or human intruder. If found to be human after processing the available information the system raises an alarm, to notify people about the intrusion. But if the intruder is an animal, the system decides what action has to be taken based on the number of PIR sensors that have gone high. These sensors are mounted vertically either on a pole at the fencing, access points or in a watch tower employed in that area.

## 6. CONCLUSION

The problem of crop destruction by wild animals has become a serious problem for the farmer. Effective solution and urgent attention are needed to solve this serious problem. To solve the problem of farmer we have designed a smart earlier detection and protection system with the help of

IOT. The main aim is to prevent the loss of crops and protect agricultural farming area from wild animals which causes major damage to the agricultural area. As the detection of presence of animals near the forest boarder its very helpful to take early precautions. So, our technical approach will be helpful to the farmers in protecting fields and save them from financial losses and also saves them from unproductive efforts that they endure for the protection of their fields. Measuring four parameters such as soil moisture, temperature, humidity and the system also includes intruder detecting system. Due to message updates farmer can know about crop field nature at anytime, anywhere.

The proposed system is only limited for a village surrounded area that is near to the forest area. In future can enhance the to a wide range area also with additional effective sensors

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