# FARM SURVEILLANCE ROBOT

**Prof. Anitha C G, Nishanth S L, Ullas H V, Yashwanth D S, Yogesh M**

[a] Professor, Vidya Vikas Institute of Engineering and Technology,Dept. of ECE,Mysore,India 570011,
[b]Student,Vidya Vikas Institute of Engineering and Technology,Dept. of ECE,Mysore,India 570011,
[c]Student, Vidya Vikas Institute of Engineering and Technology,,Dept. of ECE,Mysore,India 570011,
[d]Student, Vidya Vikas Institute of Engineering and Technology,,Dept. of ECE,Mysore,India 570011,
[e]Student, Vidya Vikas Institute of Engineering and Technology,,Dept. of ECE,Mysore,India 570011.

**Abstract: Many people from the countryside are migrating to the urban cities for their livelihood. The farmland and their plantation land are being abandoned creating the issues of safety to the farm and property by the unauthorized entry and wild animal. Surveillance plays a major role in many fields be it at home, hospitals, schools, public places, farmlands etc. It helps us to monitor a certain area and prevent theft and also provides proof of evidence. In the case of farmlands or agricultural lands surveillance is very important to prevent unauthorized people from gaining access to the area as well as to protect the area from animals. Various methods aim only at surveillance which is mainly for human intruders, but we tend to forget that the main enemies of such farmers are the animals which destroy the crops. Plantation farm land are much prone to poaching when there is no proper surveillance. This can adversely create losses to the owner of the plantation. This leads to poor yield of crops and significant financial loss to the owners of the farmland. This problem is so pronounced that sometimes the farmers decide to leave the areas barren due to such frequent animal attacks and security issues. This system helps us to keep away such wild animals from the farmlands and plantations as well as provides surveillance and continuous video surveillance of the farm perimeter. This system also sends the images to the owner situated far from the land and provides a primary alert if specified wild animals are detected.**

## 1. Introduction

Agriculture is done in every country from ages. Agriculture is the science and art of cultivating plants. Agriculture was the key development in the rise of sedentary human civilization. Agriculture is done manually from ages. As the world is trending into new technologies and implementations it is a necessary goal to trend up with agriculture also. IOT plays a very important role in smart agriculture. IOT sensors are capable of providing information about agriculture fields. we have proposed an IOT and smart agriculture system using automation. This Robot based plantation surveillance system makes use of wireless sensor networks that collects data from different sensors deployed at various nodes and sends it through the wireless protocol. In day-to-day life home security is very important factor. It is trending issue in 21st century.

Security is primary concern everywhere and for everyone. Every person wants his home, industry, banks etc. to be secured. This project describes a security system that can monitor an industry, farm & home. This is a useful and simple security system. Security is major concern now days and there are lot of technologies present today to keep your place secure and monitored. CCTV cameras are very useful to keep an eye on your house or office. Although prices of these types of cameras have been reduced significantly since their beginning but still IP cameras, which have ability to send and receive the date over the network, are very expensive. And for True Surveillance, a camera must have ability to send its feed over the internet so that it can be watched from anywhere in the world.

## 2. Literature Survey

The purpose of this literature survey is to study the farm surveillance techniques and its drawbacks. To know more about the alternative solutions that are implemented instead of our proposed model related literature review and to get the knowledge about the different technologies that are implemented to design a system.

[1] In recent times, the need for an effective border surveillance system has become increasingly critical to maintain peace and security in a region. This paper presents a novel approach to designing a smart border surveillance system that leverages wireless sensor nodes to detect and identify intrusions, while also distinguishing between animals and humans. The proposed system aims to act as a deterrent, preventing potential breaches and ensuring prompt response to any detected threats. By incorporating advanced features such as intrusion detection and automated alert generation, the system enhances the overall effectiveness of border security. [2] Conventional surveillance systems often struggle to effectively identify and respond to incidents in a timely manner when monitored by a single individual. This paper addresses the limitations of such systems by proposing an intelligent video surveillance system based on embedded modules. The system incorporates advanced algorithms for intruder detection, fire detection, loitering detection, and fall detection, all of which contribute to improved incident recognition. Additionally, an algorithm and optimization method are applied to ensure real-time processing. The implemented system demonstrates promising performance, achieving an accuracy of 88.51% for intruder detection, 92.63% for fire detection, 80% for loitering detection, and 93.54% for fall detection. [3] Smart city surveillance systems are the battery-operated light weight Internet of Things (IoT) devices. In such devices, automatic face recognition requires a low powered memory efficient visual computing system. For these real time applications in smart cities, efficient visual recognition systems are need of the hour. In this manuscript, efficient fast subspace decomposition over Chi Square transformation is proposed for IoT based on smart city surveillance systems. The proposed technique extracts the features for visual recognition using local binary pattern histogram. The redundant features are discarded by applying the fast subspace decomposition over the Gaussian distributed Local Binary Pattern (LBP) features. This redundancy is major contributor to memory and time consumption for battery based surveillance systems. The proposed technique is suitable for all visual recognition applications deployed in IoT based surveillance devices due to higher dimension reduction.

[4] Video surveillance systems have become essential for maintaining security and organization in various public and private areas. However, the reliance on traditional client/server architectures for face and object recognition tasks poses challenges in terms of resource allocation and maintenance. This work presents a novel distributed protocol that leverages the computational capabilities of surveillance devices, such as cameras, to perform face recognition tasks locally. The protocol enables cameras to offload recognition tasks to a centralized server only when their hardware limitations prevent local processing. By distributing the computational load, the proposed protocol optimizes resource utilization and reduces the burden on the centralized server. [5] This paper presents a smart surveillance system designed to address the challenge of crop theft by identifying individuals or animals in agricultural fields. Conventional surveillance systems often fail to accurately identify individuals, posing limitations for farm supervisors. To overcome this problem, we propose a system that utilizes codebook-based object detection and distinguishes between humans and noise using the Adaboost algorithm. Additionally, the system transmits image information to the supervisor in real-time. However, due to the low resolution of images, it is difficult to differentiate between authorized individuals and suspicious ones. To mitigate unnecessary alarms, we incorporate smart card technology into the system.

### Summary of the Literature survey

The outcome for the literature survey are as follows:

1. Use of available technology in a good combination can build a cost efficient and best performing electronic system for our use.
2. Some of the surveys have dealt with an machine learning systems which gives thebest accuracy but drains a battery faster.
3. Raspberry-pi microprocessor along with the camera module can be used for the continuous video monitoring in various applications.
4. Availability of algorithms which can detect motion of human and animals by processing the frame captured by the camera.
5. Different camera modules with different resolutions are available in the market with different compatibility with different microprocessors.
6. A good microprocessor should be used for better processing of the captured camera frames.

## 3. Methodology

The proposed prototype model is set upon a well-known microprocessor Raspberry pi. An efficient model of raspberry pi 4B is used for the processing of the input and the output tasks. The prototype robot is equipped with raspberry pi camera module, a buzzer module and a driver section which drives the camera section along the designed path. The prototype is supplied with required power supply using a rechargeable battery.

The camera module plays a key role in the prototype robot, it is used to continuously capture the frames and feeding it to the raspberry pi microprocessor as input. The frames are captured with some negotiable delays between two consecutive captures. Every captured frame is processed for the detection of presence of wild animal like elephant, cattle such as cow, and human in it.

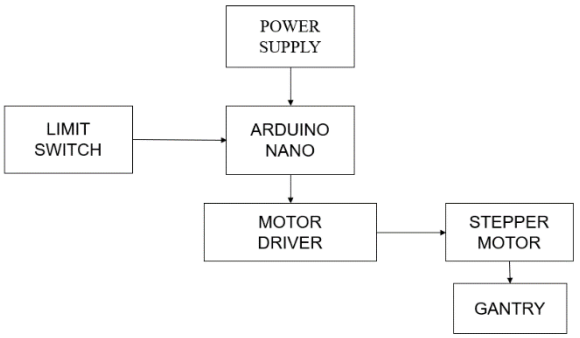


Fig 1. Block diagram of Driver section

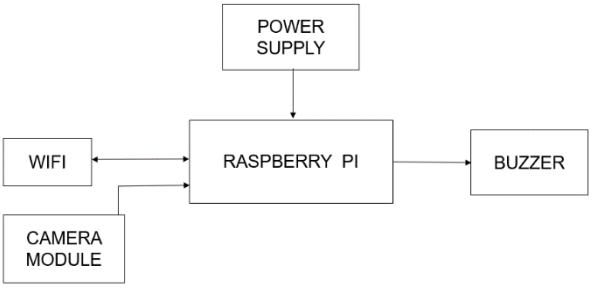


Fig 2. Block diagram of robot section

If these specified objects are detected in the frame, the microprocessor sends the sample of the frame to the owner through internet and a primary alert system is excited for its function.

A buzzer module is used on the robot as a primary alert system at the spot. The buzzer produces varied sounds that can actually be sensed by the animal and get distracted along its path towards the fence or farmland. The camera module is fixed on to the gantry fixed with v slotted wheels for its movement. The whole system is divided into two sections namely motor driver section and the camera movement section. The motor driver section is fitted with a NEMA17 stepper motor which is set for 200 steps. The motor's D shaft is fit with 16 teeth pully to which the teeth belt is attached. The teeth belt connects the moving section, driver section and the idler pully at the other end. The motor is driven by the TB6600 motor driver. The moving camera part starts to monitor the visuals that are being captured in the frame. If the object of interest is detected then the buzzer goes high and continues its state until the object of interest is not found in the frame. The frame captured with the object specified is stored on the raspberry pi computer and is sent to the telegram bot over the internet.

Methodology works as follows:

1. It monitors the part of the perimeter of the fence continuously.
2. When the object of interest specified in the program is detected in the captured frame, initially the buzzer goes high producing the sound as a distraction for the threat.
3. The frame which in which the object is detected is sent to the registered user in the program using telegram bot API through internet.
4. The system resets every 60 seconds to ensure not all the frames that continuously contain the object of interest is sent to the user.

**Results and Discussions**

In the project we have designed a prototype that is installed at certain height above the ground on the fence poles along the boundary of the farmland. The surveillance section is driven all along the designed path and continuously captures the frames. It gives the alarm for the frames which contains the human, cattle and elephant. The buzzer sets ON until these three objects gets out of the frame. The use of OpenCV library has given good detection capabilities to the system.
The system can be relied upon for the surveillance of the interested area of land.

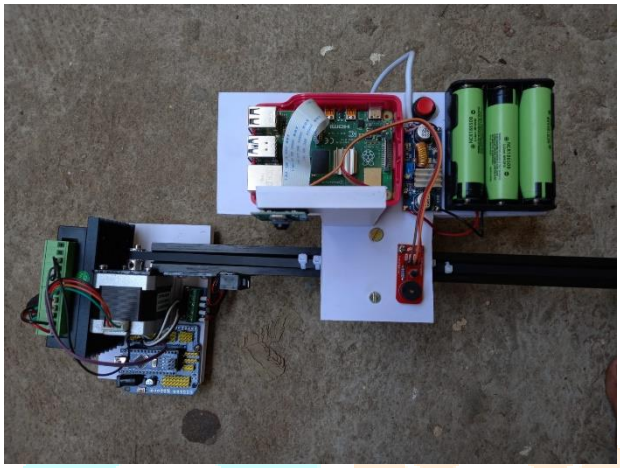

Fig 3. Proposed Model of "Farm Surveillance robot"

**Result Analysis**

| Result Table | | | | |
|---|---|---|---|---|
| Object | **Total Trials** | **Success Rate** | **Failure Rate** | **Result** |
| Human | 50 | 47 | 3 | 94% |
| Cattle | 50 | 45 | 5 | 90% |
| Elephant (Pictorial) | 50 | 42 | 8 | 84% |

**5. Conclusion**

This system has an advantage of easy movement moving on a metal support unlike normal robots which do move on the ground and prone to many obstacles. The robot makes sure that the surveillance and capturing can be done all over the perimeter unlike previously developed systems that are fixed at prone places only. The robot has a camera module which captures the frames when the threat is detected, this frame is used as evidence of the threat. This system provides a primary alert at the spot using a buzzer module which have the higher probability of distracting the threat causing factors.

It also provides an efficient surveillance function for the farm land and plantation. This system is relied since the footages are directly obtained by the owner. It reduces the hassles of frequent human monitoring and dependency around the farm. Night time surveillance is achieved with the help of this system and reduces the threat of life by wild animals and other factors to the owner who tends to patrol at night.

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