COMPARATIVE ANALYSIS ON EXISTING ANIMAL INTRUSION DETECTION SYSTEM

T.Gophika[1], B.Ilakiya[2], R.Kishore[3], D.Marini[4]

[1]*Assistant Professor,* [2,3,4]*UG scholar,*
[1,2,3,4]*Department of ECE,* [1,2,3,4]*Easwari Engineering College.*
[1]*gophi487@gmail.com,* [2]*ilakiyabala1143@gmail.com,*
[3]*kishoreravi97@gmail.com,* [4]*dmariniraju@gmail.com*

Abstract: *The production of food is a basic necessity for the survival of humans. However when there are hindrances to the same, there is a chain disruption which may cause problems in the long run. Producing food maybe the ultimate requirement but protecting the farmland is also equally important. There are numerous reports of occurrences about animals attacking crops in various parts of the world. They can damage the plants by feeding on plant parts or simply by running over the field and trampling over the crops. This causes huge losses to farmers. Another aspect to consider is that crop protection from wild animals requires a particularly cautious approach. In other words, while protecting the crops, every farmer should be aware and take into consideration the fact that animals are living beings and need to be protected from any potential suffering. And therefore, this research paper gives the comparison study of the effectiveness of the existing methods to prevent the crops from being vandalized by animals.*

Keywords: **Ultrasonic, PIR, RFID, Raspberry Pi, Microcontroller**

1. INTRODUCTION

The problem of wild animal attacks on crop fields i.e. crop vandalization is becoming a very common phenomenon in the state of Himachal Pradesh, Punjab, Haryana and many other states. Wild animals like monkeys, estray animals especially cows and buffaloes, wild dogs, nilgais, bisons, elephants deer, wild pigs and even birds like parakeets cause a lot of damage to crops either by running over them or eating them and vandalizing them completely. This leads to poor yield of crops. These animals attack on fruit orchards and destroy the flowerings and fruits. In both cases, this leads to significant financial loss to the farmers and orchard owners. The problem is so pronounced that sometimes farmers decide to leave the area barren due to these animal attacks.

The problem of monkeys is especially more pronounced in the hill state of Himachal Pradesh. Groups of wild monkeys attack fields in the Una District mainly in the border areas of Himachal Pradesh and Punjab and cause a lot of financial loss to farmers. The scenario is same in District Shimla, which is famous for its apple orchards. Monkeys cause a lot of havoc in the apple orchards and ultimately lead to financial losses to owners. In District Kangra and Hamirpur, the problem of estray cows, buffaloes and wild pigs is more pronounced. Herds of cows attack the fields, destroy the crops and almost render the fields useless for the rest of the season.

There are many techniques used to overcome these problems since earlier days. Earlier methods were to use rotten egg smell sprays and pungent odours to scare away the animals. And there were also various kinds of fencing techniques, in practice, like electrical wire fences, fishing net fences to ward off the animals. As technology came in

reach even to the normal people, there were methods that used acoustic techniques in which sounds were played in random on detecting any animal movement using sensors. With the advancement in technology and need for efficiency there came the latest and reliable technique that uses microprocessor and detects the image while distinguishing between animal or human and automates a message to the land owner regarding its entry and also keeps a record of the video stored in a SD card.

2. EXISTING METHODOLOGIES

With the development in technology, there came the efficient methods to prevent the agricultural fields from animal attacks and also prevents the animals being attacked by human beings .The methods used to ward off animals since earlier days is discussed below:

A.   Agricultural fences
- Wire fences: constructed of metal wires woven together forming a physical barrier. The fences are effective, long lasting, and require relatively little maintenance. However, they are expensive and recommended only for the protection of high-value crops.
- Plastic fences: polypropylene fences are generally less expensive and easier to install and repair than other types. Additionally, these fences are widely acceptable and meet various regulations. Their disadvantage include their short lifespan (up to 10 years) and questionable effectiveness in areas with a higher possibility of wild animal crop damage.

Fig. 1 Wire fence and Plastic fence

- Electric fences: are constructed to inflict an electric shock to animals that come in contact with the fence, thus preventing animals from crossing the fence. These fences are long lasting and an effective crop protection measure. Costs vary depending on specific type and size of an area. Before purchasing electric fences, it's very important to make sure they are allowed for use in the specific area, and for protection against endangered animal species. Additionally, it's recommended that electric fences are marked with a warning sign to prevent any possible human contact.

Fig.2 Electric fences

B.   Natural repellents

Some farmers prefer using natural protection measures instead of mechanical or chemical protective practices. There are various ways to protect crops from wild animals, including:

- Smoke: in some areas farmers burn elephant dung or other materials that smolder and create heavy smoke.
- Fish or garlic natural emulsion; repels rabbits and deer.
- Beehive fencing: for instance, elephants are repelled by the sound of honey bees; this practice is beneficial as it serves as an extra source of income.
- Chilli peppers: the chemical Capsaicin makes chili peppers hot; an excellent repellent against elephants, monkeys, squirrels, and some other wild animals; farmers who plant chilli peppers will also benefit from an extra source of income.
- Lavender, soybean, peas, and beans are excellent repellents against rabbits and are also an additional source of income.
- Egg based repellent: homemade repellent against deer.
- Castor oil: natural repellent that keeps away burrowing animals such as moles.

C.   Electronic repellents

These are effective, long lasting, and eco-friendly method for crop protection that repels animals without harming them. Farmers use one of the following two types of electronic repellents:

- Ultrasonic electronic repellent: silent to humans, high-frequency sound waves repel wild animals.
- Sonic electronic repellent: audible noise that scares animals.

D.   Acoustic technique

This uses the sounds of the predators to scare the animals. It uses the PIR sensor to detect the movements and it uses a SD card and a speaker to play the sound of a roaring tiger, fire crackers, etc,.

Fig. 3 Acoustic system

E.　Electronic surveillance system

This system will enable the farmers to protect their fields and　orchards effectively, without any human intervention, by warding off the animals with automatically controlled ultrasonic animal repellent buzzers, electronic fireworks and even hooters. It will also enable them to remotely monitor their fields from any place, thus eliminating the need of physical presence of a person in the fields.

F.　Microcontroller based system

In this method, fencing wire is used as a sensor. When animals come in contact with this open cable the circuit will be grounded and we get initial input signal that indicates presence of animals at fencing. The system is activated, immediately buzzer will be on, at the time of night flash light will be on and message will be sent to the farmer. Power supply will be given by solar panel or from regulated power supply.
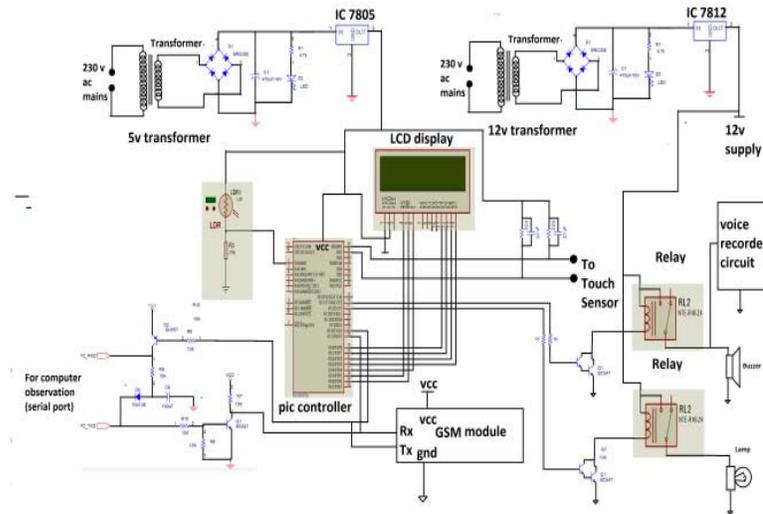

Fig. 4 Block diagram of Microcontroller based system

G.　Intrusion detection system

This method uses the Passive Infrared Sensors (PIR) to detect any motion of human body. It also uses RFID tags to differentiate between the authorized person and the intruders, if the person is an authorized one then no action is taken by the system. It also provides a system to ward off the animals automatically. The basic working principle is, if fewer numbers of sensors are able to detect the motion then itdenotes an animal smaller in height, such as a wild boar, deer etc., it turns on the rotten egg spray unit, which helps to keep away the pigs. Similarly if more than half or all of the employed PIR sensors have gone high it is naturally because of a huge animal such as the elephant, it initiates the electronic firecrackers to turn ON, the loud noise which in turn helps to ward off the bigger animals.
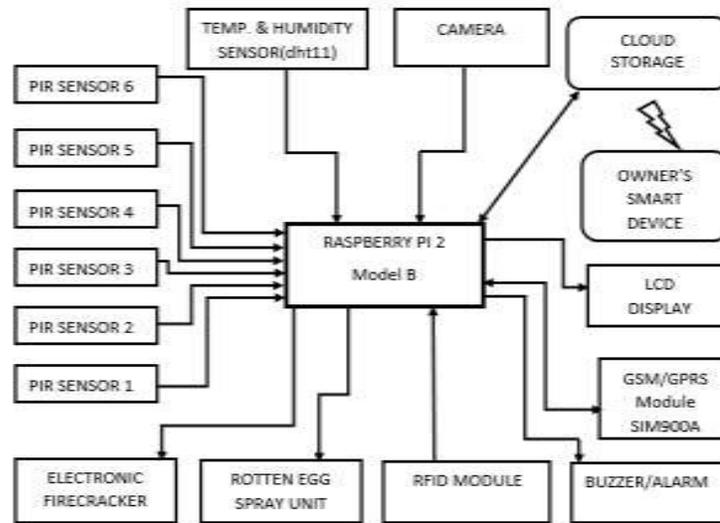
Fig. 5 Block diagram of Intrusion detection system using Raspberry Pi

3. COMPARATIVE ANALYIS

The comparison of the various existing methods to ward off animals from the agricultural fields is being studied in the tabulation below:

METHODS	METHODOLOGY USED	MERITS	DEMERITS	COST
FENCES	Wheatstone bridge principle in electrical fences	• Easier Installation • Easy Maintenance • More Durable and Longer Lasting	• Damage during storms, thunder and lightning • Risk of dangerous shocks	Approximately Rs.5000 per meter
ARITIFICIAL REPELLENTS	Odour based chemical and sound based electronic repellents	• Low cost • Easy availability	• Do not work in most cases • Results in crop disease	Variable
ACOUSTIC SYSTEM	Makes use of the sounds of predators to scare the animals	• Affordable • Easy installation	• Less reliable • Requires maintenance	Approximately Rs.1500 per system
MICROCONTROLLER BASED SYSTEM	On any kind of intrusion, activate buzzer and intimates the farmer with a message	• Reliable • Faster Performance Speed • Efficient	• Requires maintenance • High cost • Prone to damages during rains and thunder	Approximately Rs.4000 per device
INTRUSION DETECTION SYSTEM USING RASPBERRY PI	Provides a system, in addition to the above methods, to ward off animals automatically	• High Efficiency • Fully Automated • Solar powered	• High cost • Requires Maintenance	Approximately Rs.8000 per device

Fig. 5 Comparison table of the existing methods

4. CONCLUSION

The need to protect the crops from being vandalised by wild animals is becoming mandatory since food is the elixir of life. Though the methods used in earlier days like fences and repellents were cost effective, they does not provide expected results. However the methods devised in recent days were found to be more useful and solves the problem for which it has been employed to a maximum extent. And therefore, employment of these modules all over the agricultural fields can reduce the losses made by the animals to the farmers and helps in producing good yield.

REFERENCES

[1] Prof. Abhinav V. Deshpande, "Design and Implementation of an Intelligent Security System for Farm Protection from Wild Animals", IJSR, Paper ID: NOV161327
[2] Vikram.B, Revathi.B,Shanmugapriya.R,Sowmiya.S,Pragadeeswaran.G," Animal Detection System in Farm Areas", IJARCCE ISSN (Online) 2278-1021, Vol. 6, Issue 3.

[3] S. R. Chourey ,P. A. AmaleN. B. Bhawarkar, "IOT Based Wireless Sensor Network for Prevention of Crops from Wild Animals",IJECSCSE, , ISSN: 2277-9477.

[4] Nagaraju Andavarapu1* and Valli Kumari Vatsavayi2, "Wild-Animal Recognition in Agriculture Farms Using W-COHOG for Agro-Security", IJCIR -ISSN 0973-1873 Volume 13, Number 9 (2017), pp. 2247-2257

[5] Pooja G and Mohmad Umair Bagali, "A Smart Farmland Using Raspberry Pi Crop Vandalisation Prevention and Intrusion Detection System" , IJARIIE-ISSN (O)-2395-4396 , Vol-1 Issue-5 2016

[6] Nagaraju Andavarapu1* and Valli Kumari Vatsavayi2, "Wild-Animal Recognition in Agriculture Farms Using W-COHOG for Agro-Security", IJCIR -ISSN 0973-1873 Volume 13, Number 9 (2017), pp. 2247-2257