Krushi Rakshak – An AI-Powered Smart Crop Protection System for Farmers

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Abstract- Crop damage caused by wild animals is a major challenge for farmers, especially in rural areas located near forests. Frequent intrusion of animals such as monkeys, wild boars, elephants, and deer results in severe agricultural losses and increases conflict between humans and wildlife. This paper presents *Krushi Rakshak*, an AI-powered smart crop protection system designed to detect, identify, and deter animals entering farmland.

The proposed system uses a camera to capture live images from the field. A Machine Learning model processes the images in real time to detect and recognize the type of animal present. Based on the identified animal, the system automatically activates a suitable sound alert through a controller and speaker system. The sound is selected according to the animal type so that it can safely drive the animal away without causing harm.

Krushi Rakshak is designed as a low-cost, farmer-friendly, and automated solution that works continuously without human monitoring. The system reduces crop loss, saves labour, and provides an eco-friendly approach to crop protection.

Keywords: Artificial Intelligence, Machine Learning, Crop Protection, Animal Detection, Smart Farming, Wildlife Intrusion, Precision Agriculture.

I. INTRODUCTION

Agriculture is the main livelihood for millions of farmers, but those living near forests often suffer crop damage due to wild animal intrusion. Traditional protection methods such as fencing, scarecrows, and manual guarding are costly and inefficient. Krushi Rakshak addresses this problem by using Artificial Intelligence and Machine Learning to automatically detect animals and provide a low-cost, smart, and effective crop protection system.

II. PROBLEM STATEMENT

Frequent intrusion of wild animals into agricultural fields causes severe crop damage, financial loss to farmers, and increased human–wildlife conflict, especially in forest-adjacent rural areas.

III. OBJECTIVES

The main objectives of Krushi Rakshak are:

- To detect animals entering agricultural fields in real time.
- To identify the type of animal using Machine Learning.
- To activate appropriate sound alerts based on the detected animal.
- To reduce crop damage and financial loss to farmers.
- To provide a low-cost and easy-to-use system suitable for rural areas.

IV. PROPOSED SOLUTION – KRUSHI RAKSHAK

Krushi Rakshak is an AI-powered smart crop protection system that automatically detects, identifies, and recognizes animals entering farmland and activates suitable sound alerts to protect crops. Krushi Rakshak provides real-time animal detection and automatically recognizes the type of animal using Machine Learning. Based on the identified animal, the system activates a suitable sound response to drive it away. The design is low-cost, farmer-friendly, and capable of operating continuously without human supervision.

V. WORKING PRINCIPLE

The working of Krushi Rakshak follows the sequence:
Capture → Detect → Identify → Respond → Protect

- A camera installed in the field captures live images or video.
- The Machine Learning model processes the images and detects the presence of an animal.
- The system identifies the type of animal entering the field.
- A controller activates a specific sound alert according to the animal detected.
- The animal is frightened and moves away, thereby protecting the crop.

VI. SYSTEM COMPONENTS

The Krushi Rakshak system consists of the following components:

- Camera Module: Captures live images and video from the agricultural field
- Microcontroller / Processor: Controls and coordinates the overall system operation
- Machine Learning Model: Detects the presence of animals and Identifies the type of animal
- Speaker / Buzzer: Produces sound alerts and Scares animals away from the field
- Power Supply: Provides electrical power to all system components
- Storage Module: Stores animal image datasets, system data and records

VII. AI AND MACHINE LEARNING FEATURE

The intelligence of Krushi Rakshak is based on Machine Learning.

AI Features

- Pre-trained model using an animal image dataset
- Detects and recognizes multiple animals
- Real-time image processing
- Smart decision-based response system
- Fully automatic operation without human monitoring

The model is trained using images of commonly occurring farm-invading animals such as monkeys, wild boars, elephants, deer, and cattle. After identifying the animal, the system selects a suitable sound pattern that is most effective in driving away that specific animal.

VIII. METHODOLOGY

The methodology adopted in this project involves several stages. First, an image dataset of different animals is collected and used to train the Machine Learning model. The trained model is then integrated with a camera and controller to enable real-time detection. Different sound responses are programmed for different animals based on their type. The complete system is then tested in a field-like environment, and observations are made regarding the response time and effectiveness of the animal deterrence mechanism.

IX. APPLICATIONS

The system can be used in:

- Agricultural fields near forests
- Farms growing vegetables, fruits, and grains
- Plantation areas
- Rural farms facing regular animal intrusion
- Smart agriculture and precision farming systems

X. FUTURE SCOPE

The Krushi Rakshak system can be further improved by:

- Adding solar power for uninterrupted operation.
- Sending mobile alerts to farmers through GSM or IoT.

XI. CONCLUSION

Krushi Rakshak is an innovative and practical solution for protecting crops from wild animal intrusion. By combining Artificial Intelligence, Machine Learning, and smart sound-based deterrence, the system provides real-time and automated crop protection. The project reduces farmer losses, saves time and labour, and promotes a safer and eco-friendly approach to agriculture. Due to its low cost and simple operation, Krushi Rakshak has the potential to be widely adopted in rural and forest-adjacent farming regions.

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