Research Article

Smart Formland For Crop Prevention And Animal Intrusion Detection

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Abstract

In This World, Human Beings Cannot Live Without Food. The Foods Are Most Important Things And Are Comes From The Agriculture Land, Such As (Fruits, Vegetables, Etc…). Developing A System Is Necessary For Better Farming And Crop Cultivation. A System Is To Be Proposed Which Will Protect The Farmland From The Animals. The Animals Are A Special Challenge For Farmers Throughout The World. Animals Such As Deer, Wildboars, Cows, Elephant, And Many Others May Cause Serious To Crops.They Can Damage The Plants By Feeding On Plant Parts Or Simply By Running Over The Field And Trampling Over The Crops.The Modern Form Technology, Which Works On Neural Training, Based Computer Vision Algorithm To Recognize The Type Of Animal Using A Camera.These Solution Involve The Use Of Camera To Detect The Real-Time Animal Intrusion And Activate The Repellent To Protect From The Animals.If Any Animals Are Trying To Entire, The Form Field A Text Message Is Sent To The Farmer's Mobile And Alarm /Buzzer Is Ranged To Indicate The Entry Of Animal In The Form Field. This Research Offers Harmless And User-Friendly Farm Field For Better Agriculture.

Keyword: Neural Training, Animal Intrusion, Agriculture, Camera, Text Message, Computer Vision.

Introduction

Artificial Intelligence Refers To The Simulation Of Human Intelligence In Machines That Are Programmed To Think Like Humans And Their Action. The Term May Also Be Applied To Any Machine That Exhibits Traits Associated With Mind Such As Learning,Speech Recognition, Problem Solving, Translation Between Languages, Decision Making. In Video Surveillance, Video Analytics Uses Artificial Intelligence Methods To Identify Objects, Classify Them,And Determine Their Properties. Whenever People Receive New Information,Our Brains Attempt To Compare The Data To Similar Items In Order To Make Sense Of It.

The Artificial Intelligence Algorithms In Connection With Images Captured By Satellites And Drones,Ai Enabled Technologies Predict Weather Conditions,Analyze Crop Sustainability And Evaluate Farms. Super –Resolution Image Reconstruction Is Currently A Very Active Area Of Research,As It Offers The Promise Of Overcoming Some Of The Inherent Resolution Limitation Of Low-Cost Imaging Sensors(Eg.Cell Phones Or Surveillance Cameras) Allowing Better Utilization Of The Growing Capability Of High Resolution Displays. Such Resolution-Enhancing Technology May Also Prove To Be Essential In Medical Imaging And Satellite Imaging Where Diagnosis Or Analysis From Low Quality Images Can Be Extremely Difficult.Conventional Approaches To Generating A Super Resolution Image Normally Require As Input Multiple Low-Resolution Images Of The Scene, Which Are Aligned With Sub Pixel Accuracy.

Every Animal Or Group Of Animal Is Having A Specific Range Of Hearing Frequencies.The Irritating Frequency Is Estimated By A Specific Logic And Is Adjusted By Trial And Error Methodology.Irritating Frequency Generator Of Specific Loudness Is Designed With Some Intelligent Operations To Sense The Traffic Of Animals.This System Can Detect The Animal And Warm Them At Their Audible Frequency Spectrum.Basic Idea Is Every Animal Have Sense Of Unknown Threat.Animal Can Hear At Specific Frequencies. Any Attempt To Assess The Effects Of Sounds On Animals Must Consider Species Differences In Hearing Abilities. Although The Hearing Ranges Of Most Species Overlap To A Large Degree, Considerable Variation Occurs In High- And Low Frequency Hearing As Well As In Absolute Sensitivity. As A Result, A Sound That Is Easily Audible To One Species May Be Less Audible, Or Even Inaudible, To Another.
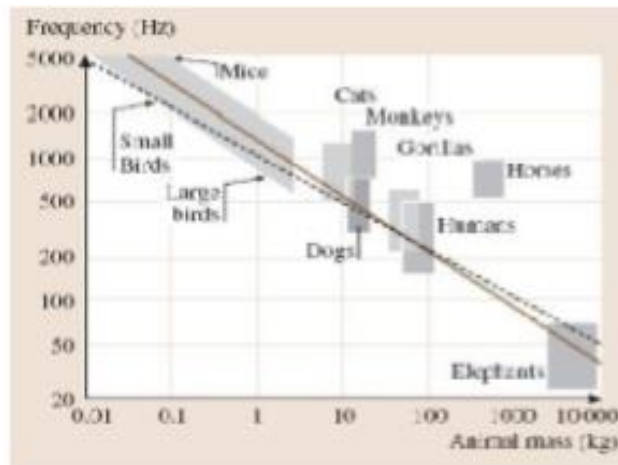
Figure 1 Relation Between Animal Mass And Hearing Frequency

Neural Networks Are Designed To Work Just As The Human Brain Does.In The Case Of Recognizing Handwriting Or Facial Recognition, The Brain Very Quickly Makes Some Decisions. Neural Training With Back Propagation Algorithm Has Designed To Recognize Various Animals Based On Shape, Texture, And Color.Neural Training Will Be Done Different Views (Front, Rear And Side View) Of Wild Animals Color,Shape And Pattern Features.Human Conflicts With Wild Animals Often Occur, Along With The Narrowing Of The Wild Animal Habitat Due To Industrial Interests.The Negative Impacts Of Human Wild Animal Conflict Is On Large Scale Slaughter Of Wild Animal.Prevention System For Indications Of Human Wild Animal Conflict Is Necessary(Figure 1).

In Proposed System By Implementing Modern Farm Technology Which Works On Bneural Training Based Computer Vision Algorithm To Recognize The Type Of Animal Using A Surveillance Camera.Researches Have Been Conducted To Find The Disturbing Frequency Of Various Wild Animals.These Solutions Involve The Use Of Cameras To Detect The Real-Time Animal Intrusion And Activate The Electronic Repellent To Protect Plants From The Animals. By Employing Based On The Type Of Animal Is Generated, Disturbing Frequency For The Animal Is Generated Through An Embedded Controller.

Related Works

Gopikanair.,Et Al.(2020),Proposed The Automatic Farming For Minimum Water Usage And Animal Protection Using Solar Fencing With Gsm[1].It Has Reported That The Aim Of This Paper Is To Design And Implementation Of Automatic Farming Protection From The Animal And Birds .An Solar Fence Is Used To Protect A Farm From The Animal /Birds.This Solar Fencing Transfer The Electric Pulses If Any Animal Touches The Solar Fence May Inflict An Short Pulse, It Is Just To Harm The Animal.So,The Animals Not Enter The Field, An Audio Generator Is Used

Which Emits Frequency. If Any Problems Happen To The Agriculture Land, A Text Message Is Sent To The Farmer's Mobile By Gsm. The System Is User-Friendly Farm Field For Better Agriculture.

Nagaraju Andavarapu., Et Al.(2017), Proposed The Wild-Animal Recognition In Agriculture Farms Using W-Cohogfor Agro Security [2], It Has Reported That The Aim Of The Paper Is Recognizing The Wild Animal In Agriculture Farms. The Images Are Captured From The Cameras Installed In The Agriculture Land. These Images Are Processed To Detect Whether Any Animal Exists In The Image. The Liblinear Classifier Is Used For Better Accuracy For High Dimensional Data. If Animal Present In Image, The Recognition Is Done Using W-Cohog,Cco-Occurrence Histograms Of Oriented Gradients And The Result Sent To Farmer. The System Has Better Accuracy.

Weiwei Zhang.Et Al,(2011) Proposed The Tiger To Panda Animal Head Detection". The Aim Of The Paper Is Animal Head Detection. The Detection Result Through Joint Detection Based On The Shape And Texture. These Are Improved By A New Oriented Gradient Features, Hoog-Haar Of Oriented Gradients To Effectively Capture The Texture Features And Shape Of Animal Head. Brute Force Detection And Deformable Detection Algorithm Used To Exploit The Shape And Texture Feature Simultaneously. Experiments On 14 379 Well-Labeled Animals Image Database Validate The Effectiveness Of Joint Learning Approach. Finally, The Animal Head Detector To Improve The Image Search Result Through Text Based Online Photo Search.

Vikram.Et Al,(2019) Proposed The Design And Implementation Of An Advanced Security System For Farm Protection From Wild Animals. The Aim Of The Paper Is Farm Protection From Wild Animals .Here Using Security System Include Image Processing Techniques To Capture The Animal Using Raspberry. The Image Processing Technique The Captured Image Of Animal Is Informed To Microprocessor To Create The Irritation Using Ultrasonic Sound. The Gsm Technology Used For, If The Animal Crosses Specified Limit The Message Will Be Sent To The Farmer. The System Will Not Harmful To Animal And Develop An Security System Of Agriculture Land And Avoid The Crop Losses.

Jayprakash D.Sonone.Et Al,(2014) Proposed The Frequency Identification And Used To Avoid Animal Accident. An Intelligent Electronics System Is Necessary To Avoid The Possibilities Of Animal Accident.The System Is Based On The Pir Sensor Using Arm7. To Detect The Traffic Motion Which Are Travelling Along The Road, The Pir Sensor Used By The System .At The Same Time, Motion Can Be Recognized By The Processor And It Generate The Frequency Sound Using Audio Amplifier. Due To The Audio Signal,The Animal Run Away From The Road.

Proposed Work

Existing System Contains The Manual Way Of Repelling The Entry Animals In The Crop Field. In Order To Make Smart Farm Technology Without Manual Intervention.Implementation Cbir Technologyto Detect, Recognise Or Identify The Object Intrusion In The Crop Using Computer Vision Algorithm. Based On The Object Detection, The Animal Repellent Module Is Activated. Animal Repellent Module - Activating The Animal Disturbance Frequency Based On The Training Sets To Repel The Animals From Entering The Crop Field. To Achieve The Recognition Pattern, Prior Training Of The Objects Done Using Neural Training. Based On The Neural Training, The Object Recognition Done And Feature Such As Colour, Structure Or Shape, Pattern Has Been Extracted And Trained Using Ai Neural Training. By Installing The Surveillance Camera In Crop Field, Object Entry Is Detected Using Cbir Technology As Mentioned Above, By Employing Based On The Type Of Animal Is Generated, Disturbing Frequency For The Animal Is Generated Through An Embedded Controller. Once The Intrusion Detection And Repellent Module Has Been Activated, The System Alerts The Farmer With Notification About The Incident Through Iot As Shown In Figure 2.
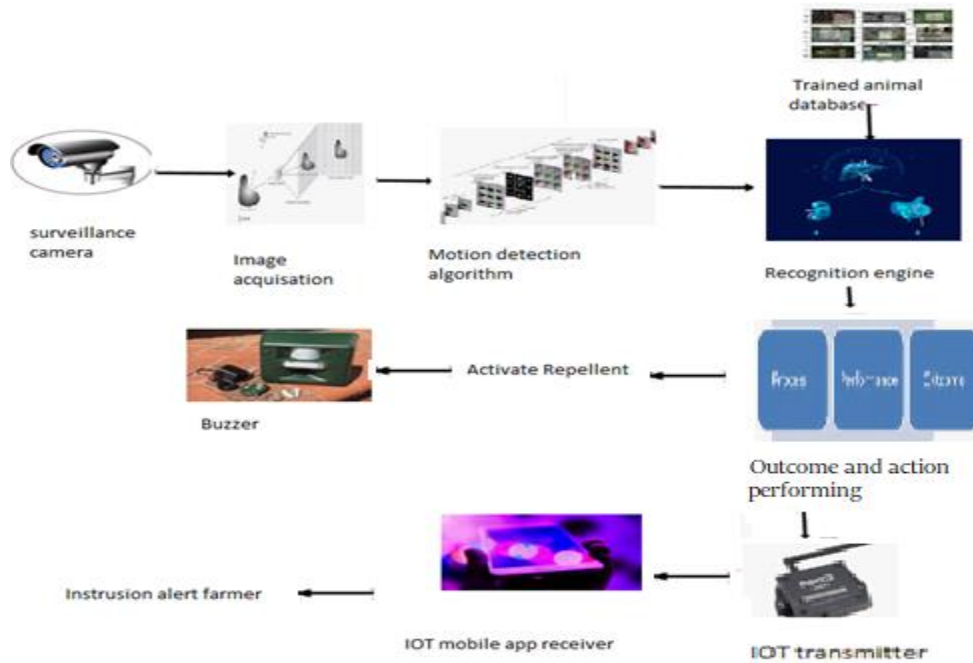
Figure 2 Architecturediagram

Real Time Intelligent Vision Module

The Detection Of Unauthorized Entry, Detection Of Cessation Of Occupancy Of An Area To Extinguish Lighting, And Detection Of A Moving Object, Which Triggers A Camera To Record Subsequent Events. Real Time Vision Module For Motion Detection By A Fixed Camera Compares The Current Image With A Reference Image And Simply Counts The Number Of Different Pixels.

**Surveillance Camera**

Figure 3 Surveillance Camera

A Surveillance Camera Is Used In Surveillance To Monitor Public Or Private Areas That Need To Be Monitored For Security Reasons. Modern Security Cameras Use Closed-Circuit Television Technology, Which Employs Video Cameras That Transmit Signals To A Specific Limited Set Of Monitors As Shown In Figure 3.

 Image Feature Extraction

Image Feature Extraction Is A Method Of Detecting And Extracting The Region Of Interest (Roi)

Object In A Digital Image Using Edge And Boundary Detection Mechanisms.

Image Acquisition
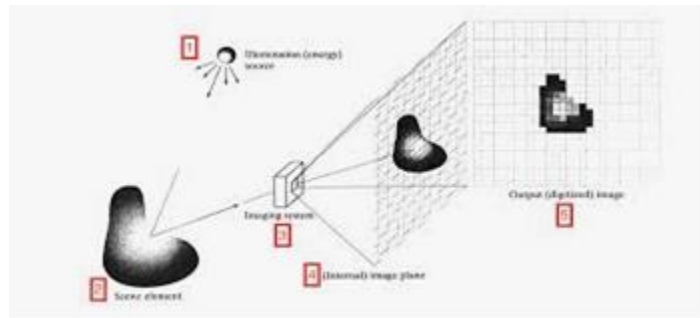
Figure 4 Image Acquisition

In Image Processing, It Is Defined As The Action Of Retrieving An Image From Some Source, Usually A Hardware-Based Source For Processing. In Image Processing A Color Histogram Is A Representation Of The Distribution Of Colors In Image. For Digital Images, A Color Histogram Represents The Number Of Pixels That Have Colors In Each Of A Fixed List Of Color Ranges, That Span The Image's Color Space The Set Of All Possible Colors As Shown In Figure 4.
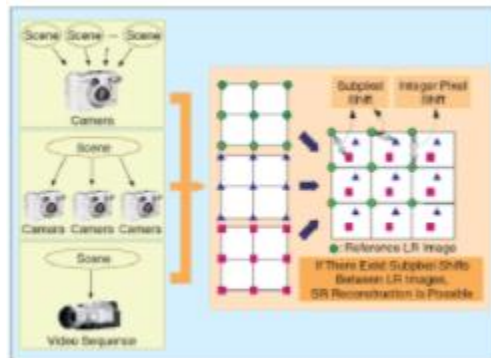
Figure 5 Image Acquisition Methods

The Image Acquisition Process Consists Of Three Steps:-

      1. Optical System Which Focuses The Energy

      2. Energy Reflected From The Object Of Interest

      3. A Sensor Which Measure The Amount Of Energy

In Order To Capture An Image A Camera Requires Some Sort Of Measurable Energy. The Energy Ofinterest In This Context Is Light Or More Generally Electromagnetic Waves. An Em Waves Can Be Described As Mass Less Entity, A Photon, Whose Electric And Magnetic Field Varies Sinusoidal, Hence The Name Waves As Shown In Figure 5. A Photon Can Be Described In Three Different Ways:

      1. A Photon Can Be Described By Its Energy E (Measured In Ev)

      2. A Photon Can Be Described By Its Frequency F (H)

                                2

  3.A Photon Can Be Described By Its Wave Length λ(M)

Λ(M
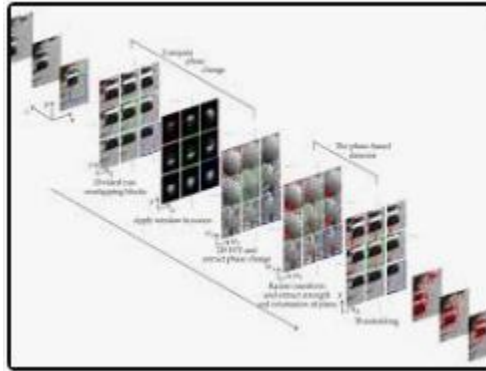
Motion Detection Algorithm

Figure 6 Motion Detection Algorithm

Motiondetection Is The Process Of Detecting A Change In The Position Of An Object Relative To Its Surroundings Or A Change In The Surroundings Relative To An Object. It Can Be Achieved By Either Mechanical Or Electronic Methods As Shown In Figure 6.Motion Detection Algorithm- One Of The Most Common Approaches Is To Compare The Current Frame With The Previous One.

$\vec{x}^{(t)}$=Value Of A Pixel At Time T In Rgb Color Space

Bayesian Decision R-If Pixel Is Background (Bg) Or Foreground (Fg)

$$R = \frac{p\left(BG \mid \vec{x}^{(t)}\right)}{p\left(FG \mid \vec{x}^{(t)}\right)} = \frac{p\left(\vec{x}^{(t)} \mid BG\right)p(BG)}{p\left(\vec{x}^{(t)} \mid FG\right)p(FG)}$$

Initially Set P(Fg)=P(Bg),Therefore If $p\left(\vec{x}^{(t)} \mid BG\right) > c_{thr}$ Decide Background

$$p\left(\vec{x}^{(t)} \mid FG\right) = c_{FG}$$

$p\left(\vec{x}^{(t)} \mid BG\right)$=Background Model

$\hat{p}(\vec{x} \mid \mathcal{X}, BG)$=Estimated Model,Based On The Training Set X

Ai-Powered Physical Intrusion Vigilant Module

Intrusion Vigilant Module Is A Intrusion Detection Technique That Allows Us To Identify And Locate Objects/Animals In Real Time Video. With This Kind Of Identification And Localization, Object Detection Can Be Used To Count Objects In A Scene And Determine And Track Their Precise Locations, All While Accurately Labelling Them.

Recognition Engine
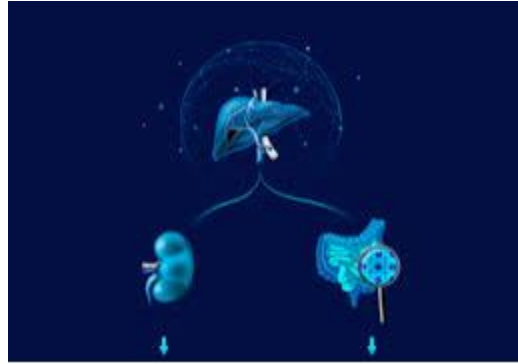
Figure 7 Recognition Engine

The Figure 7 Shows, Image Recognition Tools Can Recognize, Analyze, And Interpret Images. They Are More Efficient. It Will Save You Time And Money. Image Recognition Tools Can Sort Through Countless Images And Quickly Return Data That's Uniquely Applicable To Your Business.

Animal Repellent Module

Based On Animal Category The Repellent Module Will Form The Disturbing Sound. Repellents May Be In The Form Of A High Frequency Sound That Is Not Audible To Human Ears. Human Beings Can Hear Sound In The Range Of 20 Hz To 20 Khz. Sound Of Any Frequency Above 20 Khz Is Termed As Ultrasonic Sound. Several Animals Like Cats, Dogs, Insects, Mosquitoes Have The Feature Of Being Able To Hear This Ultrasonic Sound. This Is Important To Animals Using Sound Communication Because It Is Physically Difficult For An Animal To Produce A Loud Sound With A Wavelength Much Larger Than Itself. For This Reason, Small Animals Tend To Communicate With High-Frequency Sounds, And Only Large Animals Use Low-Frequency Sound Signals. Aquatic Animals Require Higher-Frequency Signals Than Do Similarly Sized Terrestrial Animals.The Sound Frequency Produces A Stress On The Animals And Repels Them Away. Based On Animal Category The Repellent Module Will Form The Disturbing Sound. Repellents May Be In The Fo0072m Of A High/Low Frequency Sound Depending On The Type Of Animal That Is Not Audible To Human Ears.

Buzzer

Figure8animal Repellent Buzzer

A Buzzer Is An Audio Signalling Device. Typical Uses Of Buzzers Include Alarm Device.

The Critter Gitter Emits A Startling Audible High-Pitched Sound And Flashes Small Red Lights. The Sudden Sound And Light Frightens The Animals Away. The Unit Then Automatically Resets To Guard Against The Next Intrusion. The Critter Gitter Is A Great Deterrent For Bear, Deer, Skunks, Moose, Raccoons & Wolves As Shown In Figure 8.

Intrusion Alert Module

This Module Is A Device Is Often Integrated As A Component Of A System That Automatically Performs A Task Or Alerts A User Of Motion In An Area. After The Identification Of The Animal, Activation Of Repellent, The System Alerts The Farmer About The Incident.This Module Can Be Used To Trigger A Notification In Farmer Smartphone Based On Events Occurring On System Using Iot. The Internetofthings Describes The Network Of Physical Objects That Are Embedded With Sensors, Software, And Other Technologies For The Purpose Of Connecting And Exchanging Data With Other Devices And Systems Over The Internet.
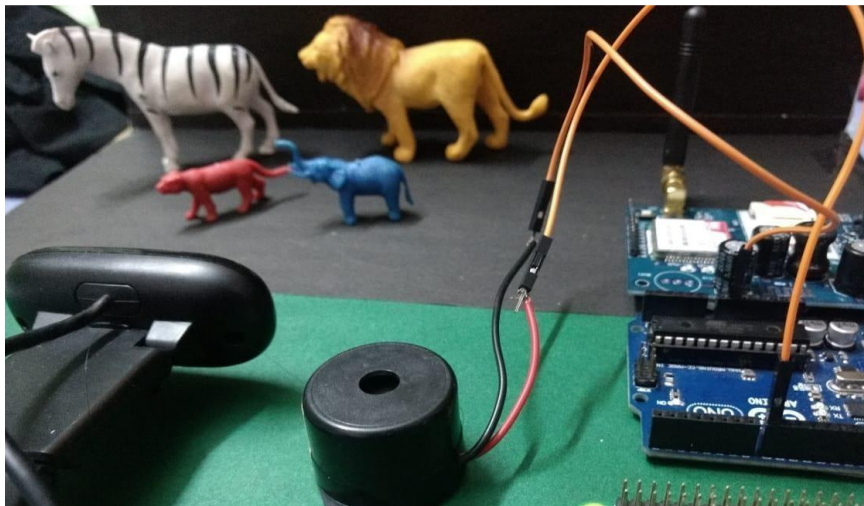
Iot Transmitter

Figure 9 Iot Transmitter

The Figure 9 Shows, Inductive Output Tube (**Iot**) Is A Variety Of Linear-Beam Vacuum Tube, Similar To A Klystron, Used As A Power Amplifier For High Frequency Radio Waves. It Evolved In The 1980s To Meet Increasing Efficiency Requirements For High-Power Rf Amplifiers In Radio Transmitters.

System Result

Figure 10 System Model

The Experimental Results Are Obtained For Particular Animals Like Elephants, Cheetah And Other Animals. A Pre Trained Neural Model With Different Animal Models(Toys) Will Be Stored As Feature Vector File. After Training A Live Camera Feed Was Monitored 24x7 And Will Be Assigned For Motion Testing, So Whenever A Motion Takes Place In The Feed The Camera Will Start To Compare The Captured Video And Segregate It In Image Clips. The Image Clips Will Be Compared To Database By Means Of Shape, Pattern And Color To Recognize The Type Of Animal. 2d Correlation Algorithm Is Used To Match The Similarity Index Between The Trained And Captured Images. Based On The Matching Index If The Confidence Is Greater Then 80% Then A Stored Frequency Will Be Routed To The Connected Buzzer As Shown In Figure 10.

Comparision Chat
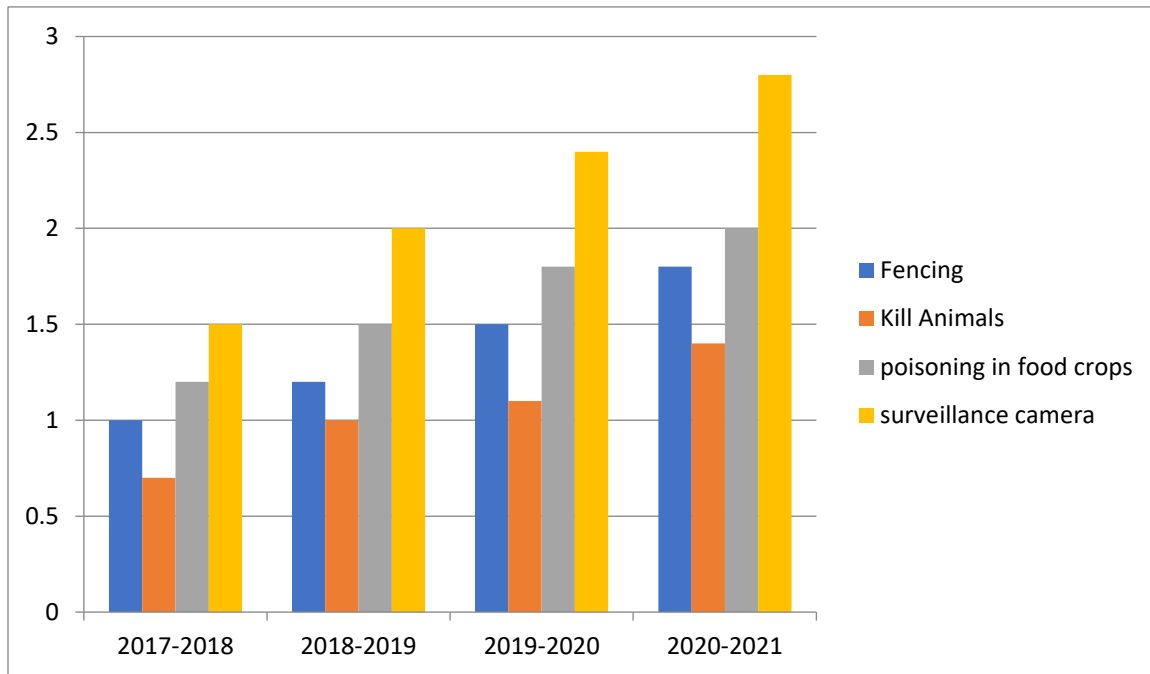
Figure11 Overcome Crop Damage Problem

 From The Figure 11,Comparison Chart The Number Of Animal Repel Away From The Crop Land Using Fencing, Killing The Problem Animal, Using Poisoning Agents In Food Crop And Camera. In The Camera System The Animals Are Repel Using Disturbance Frequency Activated By Repellent Buzzer. It Is Never Harm The Animals And It Gives The High Accuracy For Crop Prevention From The Animals.

Conclusion

Animals Give High Risk To Farmers For Cultivating Crops.Animals Are A Special Challenge For Farmers Throughout The World. Animals Such As Deer, Wild Boars, Rabbits, Moles, Elephants, Monkeys, And Many Others May Cause Serious Damage To Crops. They Can Damage The Plants By Feeding On Plant Parts Or Simply By Running Over Thefield. This Proposed System Will Protect The Farm From The Animal. This Is Low Cost System For Better Agriculture. The Proposed Method Yields 94% Of Accuracy In Test Case Scenario. In Future It Will Be Developed To Deploy In Real Time Forest Scenarios.

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