SAFEGUARDING OF CROPS FROM ANIMALS USING CNN

A Mini Project Report Submitted In partial fulfillment of the requirements for the award of the degree of

Bachelor of Technology in Information Technology

by

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CERTIFICATE

This is to certify that this is the bonafide record of the mini project entitled **"safeguarding of crops from animals using CNN"**, submitted by **Sandyana Pasunuri (18N31A12C8)** of B.Tech in the partial fulfillment of the requirements for the degree of Bachelor of Technology in Information Technology during the year 2020-2021. The results embodied in this mini project report have not been submitted to any other university or institute for the award of any degree or diploma.

Internal Guide	**Head of the Department**
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External Examiner

DECLARATION

We hereby declare that the mini project titled **"Safeguarding of crops from animals using CNN"** submitted to Malla Reddy College of Engineering and Technology (UGC Autonomous), affiliated to Jawaharlal Nehru Technological University Hyderabad (JNTUH) for the award of the degree of Bachelor of Technology in Information Technology is a result of original work carried-out in this project. It is further declared that the mini project report or any part thereof has not been previously submitted to any University or Institute for the award of degree or diploma.

Sandyana Pasunuri - 18N31A12C8

ABSTRACT

Crop damage due to animal intrusion is a critical problem faced by farmers in many parts of use wire fences or electric fences to prevent animals from entering the farmland which hurt animals by inflicting shock.

This project is an effective solution so that the economic losses incurred by our farmers are minimized and have good crop yield.

Electric fences are equipped with batteries that are charged by solar panels to inflict shock on animals that makes contact with it and also there is a possibility of fire hazard if plants or shrubs grow too close to fence. If the fence is not maintained properly, it creates electromagnetic interferences which affect telephone and radio transmissions. Electric fencing is lethal to both animal and human life though it is the most commonly used farm protection technique. Thorn fencing which is likewise a pervasive strategy followed has a similar impact as the previous. This project provides a smart solution to resolve this problem. In this framework, image is captured when an animal intrudes and then image is classified as domestic or wild animal using Convolution Neural Network (CNN) and deep learning technique. This classification helps in alerting the farmer by sending SMS in case of intrusion of wild animal. The smart farm protection system gives reliable security and safety to crops. This system guarantees the wellbeing of creatures while warding them off. It likewise diminishes the exertion made by man in securing the field.

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CHAPTER - 1

INTRODUCTION

1.1 PROBLEM DEFINITION:

In under developed countries the main source of income is mostly from crops. Good income can be earned from the crops if they are healthy. Crops face different climatic conditions. Due to the difference in climatic conditions and nutrient deficiency plants develop diseases. If these diseases are contagious then not only one plant but the whole crop would get damaged. Not only pests there might be some infections which could lead to crop damage which is still a major problem to be solved. Whereas in developing countries various technologies which can also be called as intelligent devices come into play like sensors, IOT devices etc. The pests that infect the plants are also evolving in such a way that it could be difficult to recognize the disease, because it may look like some other disease. Classifying the diseases based on the naked eye has become almost impossible. In such scenarios we require smart vision which could efficiently predict the disease and notify the farmer at earliest.

PROBLEM OVERVIEW:

Our aim for the project is to make use of TensorFlow and Keras libraries from python and use deep learning application on the image classification to identify which bird is destroying your crops. Deep learning is used to make a computer think or process the data using the images also. In general terminology, we can also say that deep learning consists of “neurons” and are interconnected with each other as in the human brain and process the information. It is mostly used for classifying the objects that means it can predict if a thing belongs to a particular class. Compared to Machine learning is more detail oriented, it processes the image it captures and analyses it by locating the disease or animal in the field which can reduce the human intrusion to minimum level.

We try to solve the problem of protecting crops from both diseases and animals in this paper using Convolutional neural network. Currently, most farmers use wire fences or electric fences to prevent animals from entering the farmland. Electric fences hurt animals by inflicting shock and are a possible fire hazard so it's helpful to agriculture fields. We use CNN for this purpose. Convolution Neural Network takes an image as an input. Accordingly, a filter is applied to the image in ConvNet. CNNs apply to image processing, natural language processing and other kinds of cognitive tasks. The output of ConvNet is a feature map which is input to max pooling. In max pooling the shape of the object in the image is preserved or it can also be said the shape is extracted. Lastly, there is a fully connected layer which combines output from all the layers and labels it according to the classes.

1.2 EXISTING SYSTEM:

The Existing System available employs different types of hardware and sensors for detection of animals in the field. They are as follows:

I. **Physical barriers**: In this system farmers use bamboo sticks at the border of their fields or constructing brick walls.

II. **Human puppets**: In this system farmers erect human puppets in their fields.

III. **Electric fences**: In this system farmers build electric fences around their field which is illegal and very dangerous to animals.

The existing systems mainly provide the surveillance protection from wild animals, especially in such an application area. They also need to take actions based on the type of animal that tries to enter the area, as different methods are adopted to prevent different animals from entering such restricted areas. Also the farmers resort to the other methods by erecting human puppets and effigies in their farms, which is ineffective in warding off the wild animals, though is useful to some extent to ward off birds. The other commonly used methods by the farmers in order to prevent the crop vandalization by animals include building physical barriers, use of electric fences and manual surveillance and various such exhaustive and dangerous methods. They may be effective for one or two animals but they prove to be useless in case large number of animals. The solutions of the existing system are almost ineffective or very expensive.

1.3 PROPOSED SYSTEM:

In our proposed system, we are proposing a Deep Learning methodology for detection of animals and will achieve a greater accuracy when compared to conventional methods.

It does not sound the buzzer or send SMS in the presence of a human being or due to some random motion. It also enables the farmers to remotely monitor the field from any place, thus eliminating the need of physical presence of a person in the field. The major component of this system is a camera which continuously monitors the fields for any animal activities.

Crop damage due to animal intrusion is a critical problem faced by farmers in many parts of India, especially in areas near national parks and wildlife sanctuaries. Currently, most farmers use wire fences or electric fences to prevent animals from entering the farmland which hurt animals by inflicting shock.

This project is an effective solution so that the economic losses incurred by our farmers are minimized and have good crop yield.

ADVANTAGES OF THE SYSTEM:

- Effective, accurate and adaptive
- Requires no human supervision
- Economical
- Real time monitoring
- Causes no harm to animals and humans

This system is very effective in driving off the animals from the fields and keeping them away. It accurately determines the presence of animals in the fields and sounds the buzzer. It does not sound the buzzer due to the presence of a human being or due to some random motion. The ultrasonic buzzer is very effective against animals and causes no noise pollution. This system requires almost no human supervision, except for the task of switching the system on and off. The system is capable of turning the buzzers on automatically and warding off the animals thus protecting the fields from any damage.

This system is economical as compared to many of the existing solutions like electric fences, brick walls and manual supervision of the fields. Thus, it saves a lot of money of the farmer.

CHAPTER – 2

SYSTEM REQUIREMENTS

2.1 HARDWARE SPECIFICATIONS:

- **System** Intel CORE i5 7th GEN
- **Monitor** 14’ colour monitor
- **Mouse** Optical Mouse
- **RAM** 8GB

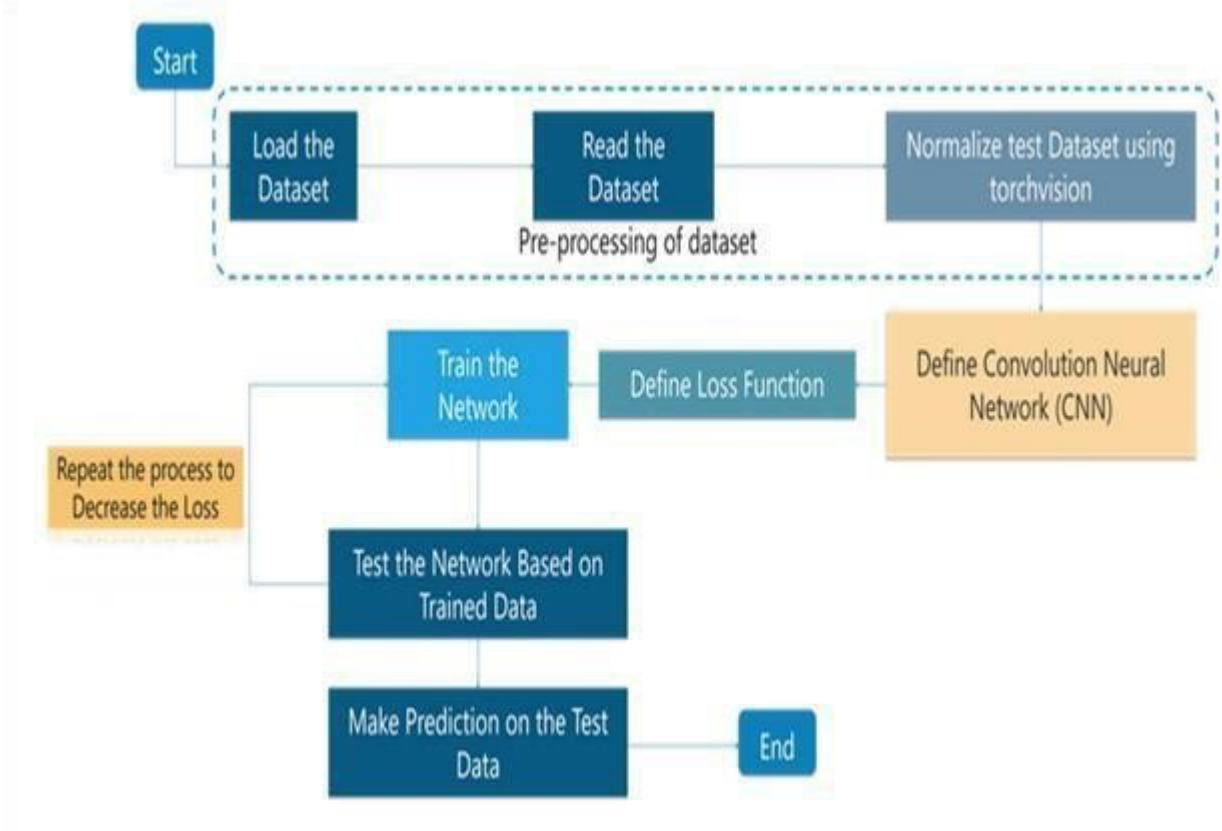
2.2 SOFTWARE SPECIFICATIONS:

- **Operating system** Windows 10
- **Coding Language** Python
- **Front- End** Python

CHAPTER-3

SYSTEM DESIGN

3.1 FLOWCHART:



This flowchart explains about the process of detecting wild animals by using convolution neural network (CNN).

3.2 ALGORITHM :

A convolutional neural network (CNN) is a specific type of artificial neural network that uses perceptions, a machine learning unit algorithm, for supervised learning, to analyse data. CNNs apply to image processing, natural language processing and other kinds of cognitive tasks. A convolutional neural network is also known as a ConvNet.

We need to do the recognition of animals or we need to classify if the wild animal is detected through camera we need to send some alert message to authorized person or farmer for that we required Twilio number, where we are buying free number from Twilio, and which gives you the API key and Auth token. By using both will be sending alert message to the farmer. To do live recognition here we are using compute vision cv2 library.

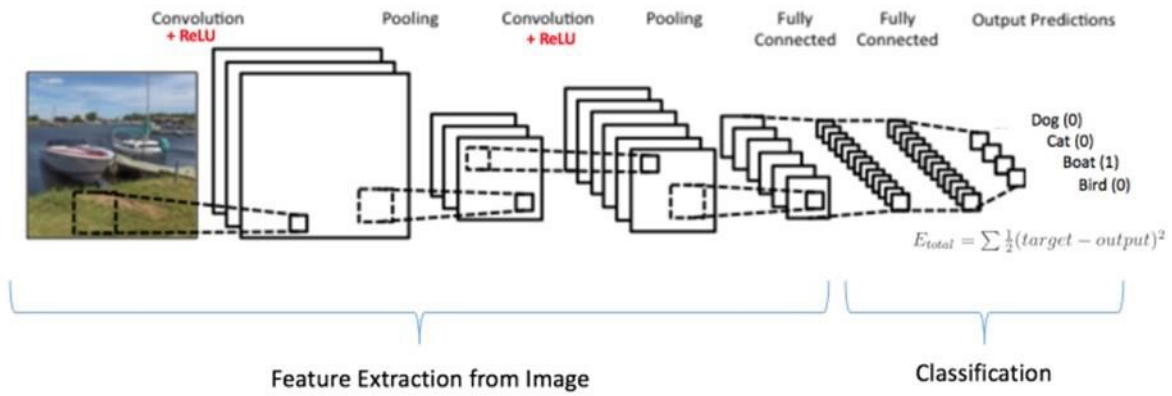


FIG. 4.1.1: Understanding of Convolutional Neural Network (CNN)

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IMPLEMENTATION

pseudo Code :

```
!unzip /content/drive/MyDrive/dataset.zip

%pylab inline import
matplotlib.pyplot as plt import
matplotlib.image as nping
img=nping.imread('/content/Trainingset/Wild animal/OIP-
3aF2OpzGKcdI6FHil50qQHaFj.jpeg')

imgplot=plt.imshow(img)
plt.show()
img=nping.imread('/content/Trainingset/Human/1 (1001).jpg') imgplot=plt.imshow(img)
plt.show()

import tensorflow
from tensorflow.keras.preprocessing.image import ImageDataGenerator from
tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense,Conv2D,Flatten,Dropout,MaxPooling2D,Activati
on
from tensorflow.keras.preprocessing import image
import matplotlib.pyplot as plt import
matplotlib.image as nping

img_width,img_height=150,150
train_datagen=r"/content/Trainingset"
validation_datagen=r"/content/Testset"
import tensorflow.keras.backend as k if
k.image_data_format()=='channels_first':
input_shape=(3,img_width,img_height)
else:
  input_shape=(img_width,img_height,3)

train_datagen = ImageDataGenerator(rescale = 1./255,
shear_range = 0.2, zoom_range
= 0.2, horizontal_flip = True)

train_set = train_datagen.flow_from_directory('/content/Trainingset',
                                              target_size = (64, 64),
                                              batch_size = 32,
class_mode = 'binary')
#Test images
```

```
test_datagen = ImageDataGenerator(rescale = 1./255)


test_set = test_datagen.flow_from_directory('/content/Testset',
                                            target_size = (64, 64),
batch_size = 32,                                        class_mode
= 'binary')

plt.figure(figsize=(12,12)) for i in
range(0,15):   plt.subplot(5,3,i+1)
for X_batch,Y_batch in train_set:
image=X_batch[0]
plt.imshow(image)     break
plt.tight_layout()
plt.show()

model=Sequential()
model.add(Conv2D(64,(3,3),input_shape=input_shape))
model.add(Activation('relu'))
model.add(MaxPooling2D(pool_size=(2,2)))
model.add(Flatten()) model.add(Dense(64))
model.add(Activation('relu'))
model.add(Dense(1))
model.add(Activation('sigmoid'))
model.summary()

#Building CNN
#1. initializing CNN import
tensorflow as tf
cnn = tf.keras.models.Sequential()
#2. Convolution
cnn.add(tf.keras.layers.Conv2D(filters=32, kernel_size=3, activation='relu', input_shape=[64,
64, 3]))

#3. Pooling
cnn.add(tf.keras.layers.MaxPool2D(pool_size=2, strides=2))

#4. 2nd convolution layer
cnn.add(tf.keras.layers.Conv2D(filters=32,              kernel_size=3,              activation='relu'))
cnn.add(tf.keras.layers.MaxPool2D(pool_size=2, strides=2))

#5. Flattening
cnn.add(tf.keras.layers.Flatten())

#6. Full connection
cnn.add(tf.keras.layers.Dense(units=128, activation='relu'))
```

```
#7. Output layer
cnn.add(tf.keras.layers.Dense(units=1, activation='sigmoid'))

#Training CNN #CompilingCNN
cnn.compile(optimizer = 'adam', loss = 'binary_crossentropy', metrics = ['accuracy'])

cnn.fit(x = train_set, validation_data = test_set, epochs = 25)
#results          result          =
cnn.predict(test_set)
k2 = np.argmax(result, axis = 1)


#Making one prediction import
numpy as np
from keras.preprocessing import image
test_image = image.load_img('/content/Testset/wildanimal/OIP--
J8rTRPzHNg0b0dWPYdzwHaE7.jpeg', target_size = (64, 64))
test_image = image.img_to_array(test_image) test_image =
np.expand_dims(test_image, axis = 0) result = cnn.predict(test_image)
train_set.class_indices if result[0][0] == 1:
  prediction = 'wild animal' else:
   prediction = 'human' print("prediction:",prediction)
img=nping.imread('/content/Testset/wildanimal/OIP--
J8rTRPzHNg0b0dWPYdzwHaE7.jpeg')
imgplot=plt.imshow(img) plt.show()

if prediction == "wild animal":  from
twilio.rest import Client

# Your Account SID from twilio.com/console
  account_sid = "AC4286c279f8fd6380ee4bdffd0b337e2e"
# Your Auth Token from twilio.com/console   auth_token
= "47a3676810517ff278db4c8815847455"

  client = Client(account_sid, auth_token)

  message = client.messages.create(
to="+918897929782",
from_="+19196705517",     body="wild
animal detected in your field")
  call = client.calls.create(
                      twiml='<Response><Say>Wild animal detected in
your crop </Say></Response>',
                      to='+918897929782',
                      from_='+19196705517')
  print(message.sid)
  print(call.sid)
```

```
<!DOCTYPE html>
<html>
<head>
<link rel="stylesheet" href="css.css">
</head>
<body>
<header>
        <nav>
           <div class="row">
              <div class="main-nav js--mani-nav">
                 <h1 text-align="center"><marquee>PROTECT CROPS, PROTECT OUR
LIVES</marquee></h1>
              </div>
              <img src="croplogo.jpg" class="logo">
               <ul class="main-nav js--main-nav">
                 <li><a href="home.html">HOME</a></li>
                 <li><a
href="https://www.twilio.com/console/phonenumbers/verified">REGISTER</a></li>
              </ul>
              <a class="mobile-nav-icon js--nav-icon"><i class="ion-naviconround"></i></a>
           </div>
        </nav>
        <div class="hero-text-box">
           <h1> SAFEGUARDING CROPS<br>FROM ANIMALS. </h1>
        </div>

</header>
</body>
</html>
```

home.html:

```
<html>
<head>
<link rel="stylesheet" href="css.css">
</head>
<body>
<header>
<table border="5" bgcolor="white" align="center" width="70%" height="80%"> <tr>
<td><h2 align="center">Elephants</h2><br>
<img src="elephant1.jpg" alt="image not found" align="center"><br><h3 class="tm-
colorprimary  tm-article-title-1">
<p>Elephants are not only being squeezed into smaller and smaller areas but farmers plant
crops that  elephants like to eat. As a result, elephants frequently raid and destroy crops, they
can be dangerous to protect crops from them.
</p>
</td>
<td><h2 align="center">Tigers</h2><br>
```

```
<img src="tiger.jpg" alt="Site logo" align="center"><br> <h3 class="tm-color-primary  tm-article-title-1">
<p>The tiger is the largest extant cat species and a member of the genus Panthera. It is most recognisable for its dark vertical stripes on orange-brown fur with a lighter underside. It is an apex predator, primarily preying on ungulates such as deer and wild boar.</p> </td>
<td>
<h2 align="center">Wild boar</h2><br><img src="wildpig.jpg" alt="Site logo"><br><h3 class="tm-color-primary  tm-article-title-1">  <p>The wild boar, also
known as the "wild swine","wild pig",The occurrence of  crop damage by wild boars
raised dramatically in the last decades, implying an increase in  social conflicts,
expenditures for compensation and a risk to natural ecosystems. </p> </td>
</tr>
</table>
</header>
</body>
</html>
```

Css.css

```
header {
   background-image: -webkit-linear-gradient(rgba(0, 0, 0, 0.7), rgba(0, 0, 0, 0.7)),
url(bg.jpg);
   background-image: linear-gradient(rgba(0, 0, 0, 0.7), rgba(0, 0, 0, 0.7)), url(bg.jpg);
background-size: cover;     background-position: center;     height: 100vh;
   background-attachment: fixed;
}

.hero-text-box {
          color:#fff;
   text-align:  center;
position:     absolute;
width:          1140px;
top:  50%;          left:
50%;
   -webkit-transform: translate(-50%, -50%);     -
ms-transform: translate(-50%, -50%);     transform:
translate(-50%, -50%);
}

.logo {     height:
100px;      width:
auto;
   float: left;     margin-
top: 20px;
}

.logo-black       {
display:     none;
```

```
height:      50px;
width: auto;
   float: left;
margin: 5px 0;
}

/* Main navi */
.main-nav {
        color:#fff;     list-
style: none;     margin-top:
55px;
}

.main-nav li {    display:
inline-block;     margin-
left: 40px;
}

.main-nav li a:link, .main-nav li a:visited
{     padding: 8px 0;     color: #fff;     text-
decoration: none;     text-transform:
uppercase;     font-size: 90%;     border-
bottom: 2px solid transparent;     -webkit-
transition: border-bottom 0.2s;
transition: border-bottom 0.2s;
}

.main-nav   li   a:hover,   .main-nav   li
a:active {     border-bottom: 2px solid
#e67e22;
}


/* Mobile navi */ .mobile-nav-icon
{
   float: right;     margin-
top: 30px;     cursor:
pointer;     display: none;
}

.mobile-nav-icon i {
font-size: 200%;     color:
#fff;
}


/* Sticky navi */
.sticky {
```

```
position: fixed;
top: 0;
   left: 0;
   width: 100%;     background-color: rgba(255,
255, 255, 0.98);     box-shadow: 0 2px 2px
#efefef;     z-index: 9999;
}

.sticky .main-nav { margin-top: 18px; }

.sticky .main-nav li a:link,
.sticky .main-nav li a:visited {
padding: 16px 0;     color:
#555;
}

.sticky .logo { display: none; }
.sticky .logo-black { display: block; }
```

CHAPTER-5

RESULTS

FIG 5.1: Web page of index page

This web page indicates the starting index page of the project which is used for farmer to register

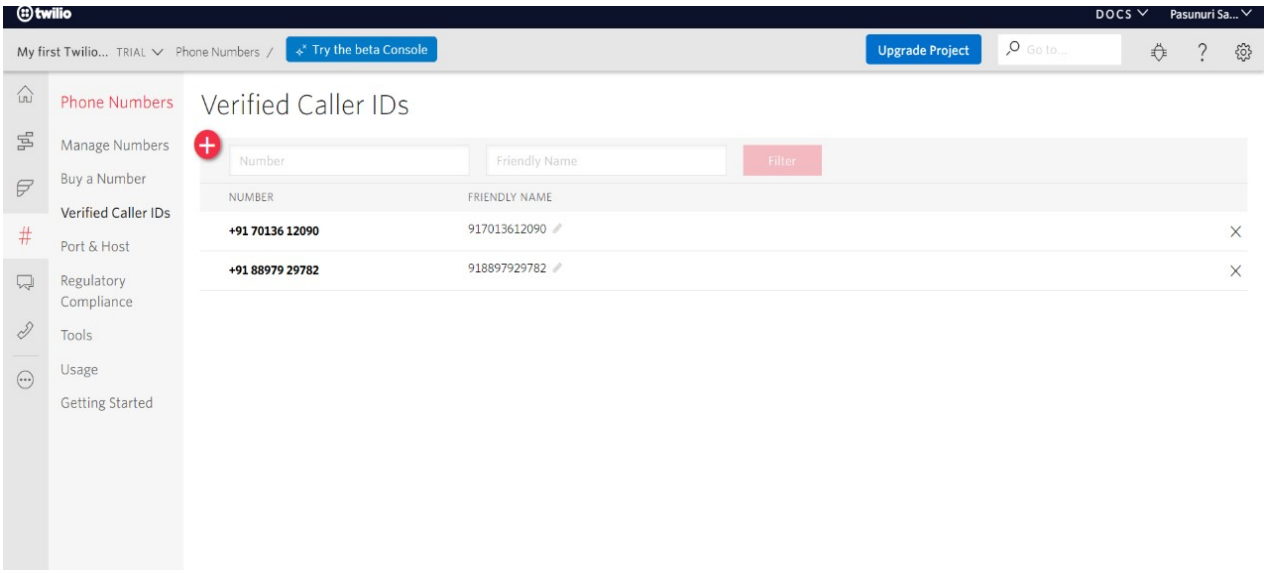

FIG 5.3: Twilio is used to send alert message

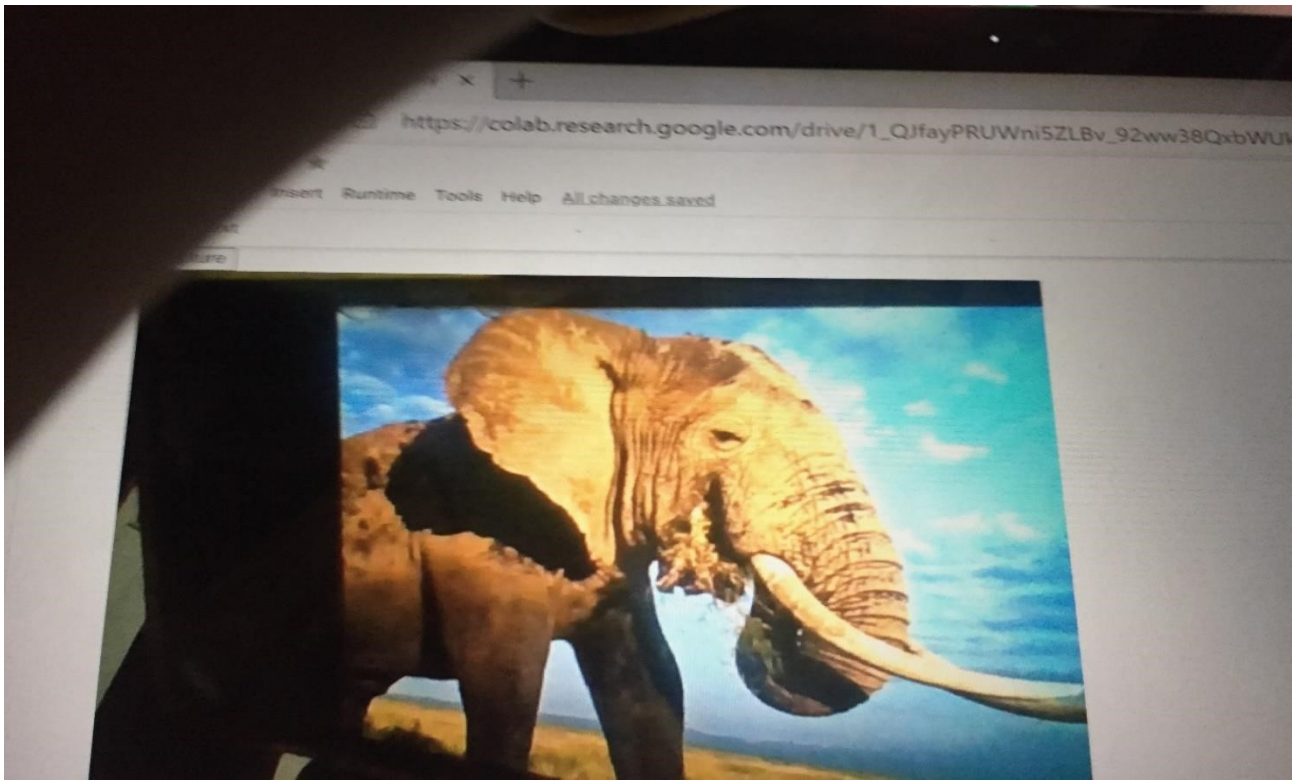

FIG 5.4: INPUT GIVEN WHEN CAMERA FRAME OPENS

• This is the input which would be given, if we give input as a wild animal then immediately it sends an alert message and call to the mobile number registered.

• If we give input as a human then it doesn't send us any message.

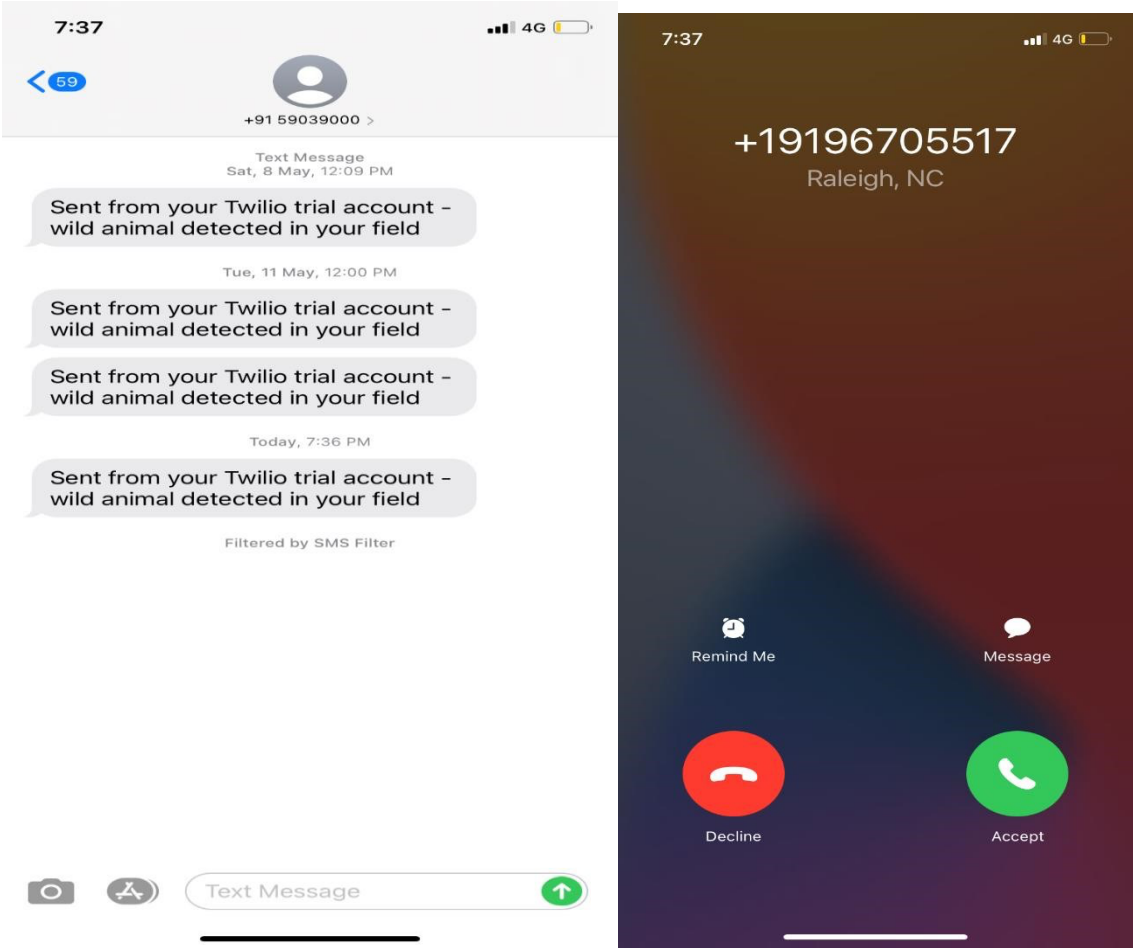

FIG 5.5: OUTPUT RECEIVED TO FRAMER MOBILE IN THE FORM SMS AND CALL

• This image shows the sample alert message received when an wild animal is detected.

CHAPTER – 6

CONCLUSION

This project will help farmers to save them from significant financial losses and will save them from the unproductive efforts that they endure for the protect their fields. This system is very adaptive in nature, and it is not limited to the detection of only particular type of animals. This system is economical as compared to many of other. It is totally harmless and doesn't injure animals in any way. The main goal is achieving better crop yields thus leading to economic well-being. Prototype of a smart farm protection system been developed which distinguishes the animals and can be used toward them off.

Nowadays the issue of farm vandalization by wild creatures has turned into a major social issue. It requires dire consideration as no viable solution exists till date for this issue. As our project plans to address this issue it carries a great social significance. This project is exceptionally viable in driving off the animals from the fields and keeps them away. It precisely detects the animals in the fields and sends an SMS to the number. Thus the crops will be saved and no animals will be harmed.

FUTURE SCOPE

In the future, there will be very large scope, this project can be made based on Image processing in which wild animal and fire can be detected by cameras and if it comes towards farm then system will be directly activated through wireless networks. Wild animals can also be detected by using wireless networks such as laser wireless sensors and by sensing this laser or sensor's security system will be activated.

We can design a IOT based application to provide an image and video feed to farmer on any smart device and farmer will be notified when there is an intrusion in the farm by animal along with additional information of humidity and temperature.

When intrusions occur the cameras employed are turned ON which capture an image and start recording the video for some time which will be stored on the SD card as well as stored on cloud i.e. dropbox, the land owner can then view the video on any smart device.

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