ANIMAL DETECTION AND ALERTING SYSTEM FOR RURAL AREAS

1. INTRODUCTION

1.1 OVERVIEW:

Efficient and continuous monitoring of wild animals is very essential. Due to industrialization and growth in the population there is a lot of destruction of the habitat of the wild animals. As a result many of the wild animals are in turn entering the habitat of the people thereby causing danger to the lives of people as well as themselves. Nowadays we are seeing a rapid increase in the cases of wild animals entering the habitat of humans and causing terror. To overcome this problem continuous monitoring of the wild animals in their habitat is very essential.

1.2 PURPOSE :

Our project is aimed at continuous monitoring and detecting the entry of animals into the habitat of the humans. This system prevents or reduces the number of animal-vehicle collisions. This system is specifically aimed at large animals that cause injury, property damage and death. Animal detection system detects the entry of animals into the habitat and warn the nearby villagers with voice alert and a notification will be sent to the authorities through message.

2. LITERATURE SURVEY

2.1 EXISTING PROBLEM :

One serious problem that all the developed nations are facing today is death and injuries due to road accidents. The collision of an animal with the vehicle on the highway is one such big issue, which leads to such road accidents. The main reason for this is that the animals are losing their habitat. It occurs when growing human populations overlap with established wildlife territory, creating competition for space and resources.

Due to this problem animals are entering the habitat of people. This is causing fright in the lives of people. When animals enter the habitat of people, the people start attacking the animals in order to save themselves. This is in turn resulting in the death of innocent animals. In few cases the animals attack the humans due to terror and as a result many people are being injured and in few cases it is even causing death.

To overcome these problems it would be useful if we could monitor the animals in their habitat and alert the forest department if any disturbance is occured in their habitat. This helps to save the lives of many people as well as the animals.

2.2 PROPOSED SOLUTION :

The solution to these problems could be monitoring the animals in their habitat itself without causing any disturbance to their environment. Every movement of the animals is monitored from time to time. In case the animals move out of their habitat then voice alert will be given to the people in that region so that immediate action could be taken to save the lives of the people in the nearby villages. The forest department are alerted with notifications through message, so that they could save the people with in the regional limit. In this way, we could save the people as well as animals.

3. THEORETICAL ANALYSIS

3.1 BLOCK DIAGRAM :

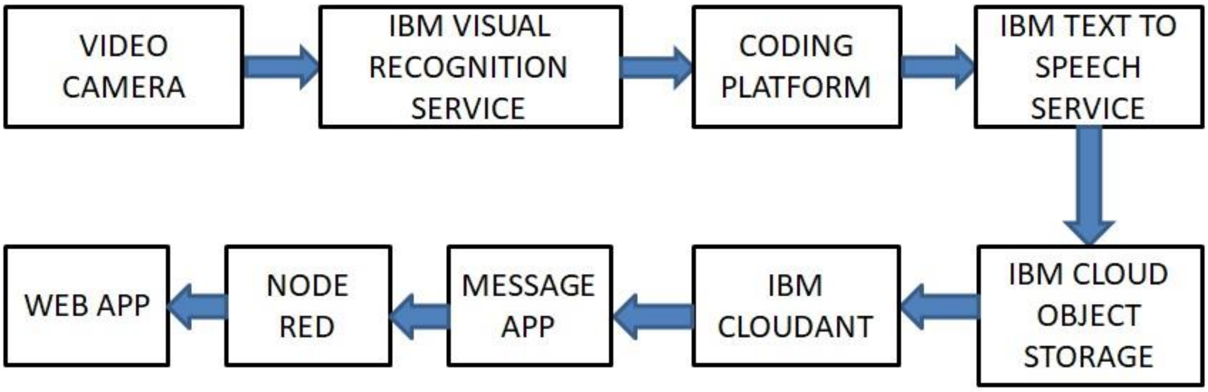


Fig : Block diagram depicting the process

3.2 SOFTWARE DESIGNING :

Our solution is mainly based on IBM Cloud and Python programming.

IBM Cloud :

IBM cloud computing is a set of cloud computing services for business offered by the information technology company IBM. IBM Cloud includes infrastructure as a service (IaaS), software as a service (SaaS) and platform as a service (PaaS) offered through public, private and hybrid cloud delivery models, in addition to the components that make up those clouds.

IBM Watson Visual Recognition Service :

Watson Visual Recognition makes it easy to extract thousands of labels from your organization’s images and detect for specific content out-of-the-box. You can also build custom models to detect for specific content in images inside your applications.

IBM Watson Text to Speech Service :

With Watson Text-to-Speech, you can generate human-like audio from written text. Improve the customer experience and engagement by interacting with users in multiple languages and tones.

Node-Red :

Node-RED is a programming tool for wiring together hardware devices, APIs and online services in new and interesting ways. It provides a browser-based editor that makes it easy to wire together flows using the wide range of nodes in the palette that can be deployed to its runtime in a single-click.

Web App :

A web application (or web app) is an application software that runs on a web server, unlike computer-based software programs that are stored locally on the Operating System (OS) of the device. Web applications are accessed by the user through a web browser with an active internet connection. These applications are programmed using a client–server modeled structure—the user ("client") is provided services through an off-site server that is hosted by a third-party.

4. EXPERIMENTAL INVESTIGATIONS

In order to do this project Python programming language is used as it is an open source and is easy to understand. All the rural and urban areas near to the forest are surrounded by cameras. Live video streaming is provided to the forest department.

For every second an image will be taken in the camera. By using Watson Visual Recognition service two classes are created to distinguish between humans and animals. After the image is taken by the camera it is sent to the Visual Recognition service and the results are obtained. If the class of the image obtained is animal then voice alert is given to the villagers that an animal is detected within the region.

The image of the detected animal is then stored in IBM Cloud object storage. The details of that image is then stored in Cloudant DB. Whenever an animal is detected the authorities are sent notifications to their mobiles by using messaging application. A Node-RED flow is created to get the latest image of the detected animal. The url obtained from Node-RED is then used to obtain the image in UI.

5. FLOWCHART

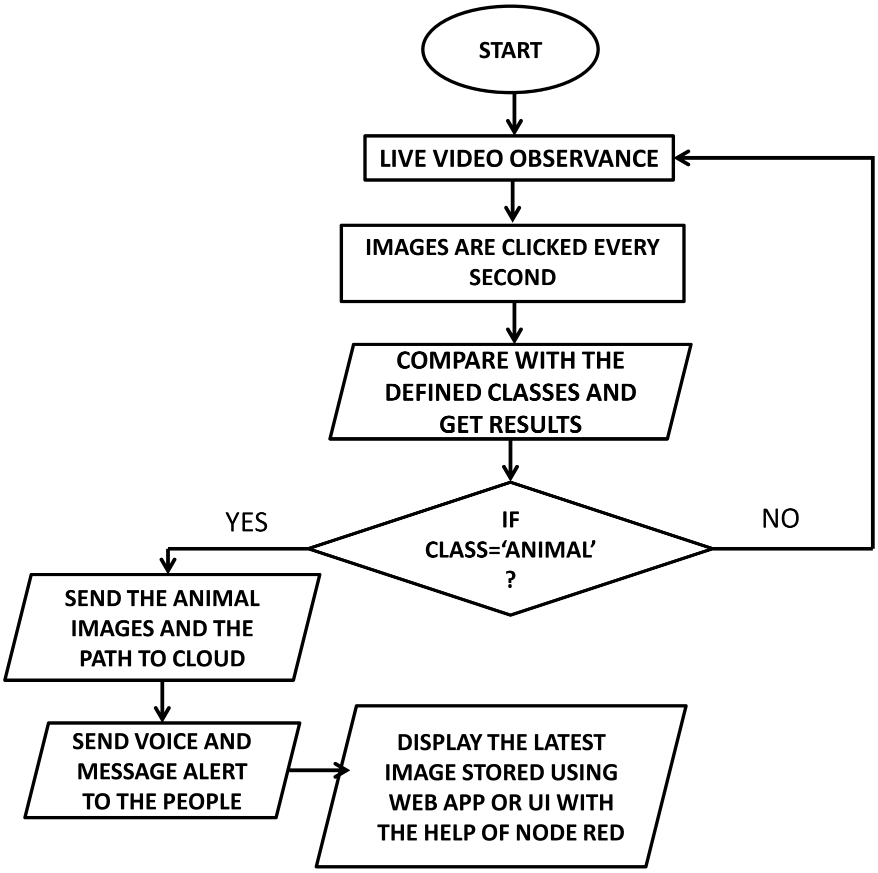

START
LIVE VIDEO OBSERVANCE
IMAGES ARE CLICKED EVERY SECOND
COMPARE WITH THE DEFINED CLASSES AND GET RESULTS
IF CLASS='ANIMAL' ?
YES
NO
SEND THE ANIMAL IMAGES AND THE PATH TO CLOUD
SEND VOICE AND MESSAGE ALERT TO THE PEOPLE
DISPLAY THE LATEST IMAGE STORED USING WEB APP OR UI WITH THE HELP OF NODE RED

Fig: Flowchart depicting the process

6. RESULT

As there is an increase in the number of cases of animals entering and causing disturbance to human lives, the proposed solution proves to reduce the problem to the best. It proves to be very useful for places near dense forests as it is very difficult for the forest department to monitor the forest manually. By employing this we could get alerts instantly and hence the lives of many people as well as the animals could be saved. It can be used to monitor the habitat of wild animals even during nights.

7. ADVANTAGES AND DISADVANTAGES

ADVANTAGES :

- Used to alert villagers when they are in danger
- Can detect all the images even in the night time also
- Also detect the images of animals even in different postures also
- Makes some sound alerts when animal is detected
- It can provide rapid results
- The system can be installed without major construction

DISADVANTAGES :

- Can’t detect the image properly if the animal is running
- Detection of animal in the night time must be developed for better results
- Animals which are very far cant be detected
- There will be some disturbances if the device stops working
- It requires intense individual effort
- The speed of animals can't be monitored or detected

8. APPLICATIONS

The design process can be used in various applications like:

- Smart home – Used to detect or capture the images of a person who came to a home.
- Preventing animal vehicle collision on roads
- Preventing wild animal encroachment in the rural areas

9. CONCLUSION

In this report the process of identification or detection of animals is deliberated. There is a lot of impact of wildlife on the rural areas in such a way that the pests of the wildlife causes loss in the production of agriculture and some sectors of livestock. It often leads to the property damage and may leads to death of people. In rural areas the security is very less which may bump into several problems that cause the loss of economy. In order to avoid this issue we came over several aspects of animal detection in rural areas. In this project a system is designed for alerting people when an animal is detected. This design along with the alerting system can help the people in rural areas to be alert and safe even in the night time.

The output of this design is a captured image of animal in which when the camera detects an animal then it will alerts the people of the village with a sound alerting system. This leads to decrease in the damage that will be done by wild animals and also protects the people from the danger. Once a large animal is detected the alerts are activated and it will urge the people to be safe.

10. FUTURE SCOPE

In the complete process of design we used IBM cloud storage device in which we can also send some notifications to the villagers if the animal is detected. Also detection of animals in the night time can be developed and this may be extended to capture the images in the far regions also, so that it helps to detect the animals in advance thereby protecting the people from danger.

The entire process is based on a software technology where as if we use this along with hardware and some sensors we can get an efficient output and also we can reduce the animal and vehicle collisions. We can use a geofencing module to track the location of the animal and whether it is present in the regional limit not. With this module we can know that at which distance the animal is located from the area.

11. BIBLIOGRAPHY

1. https://ieeexplore.ieee.org/document/7792584

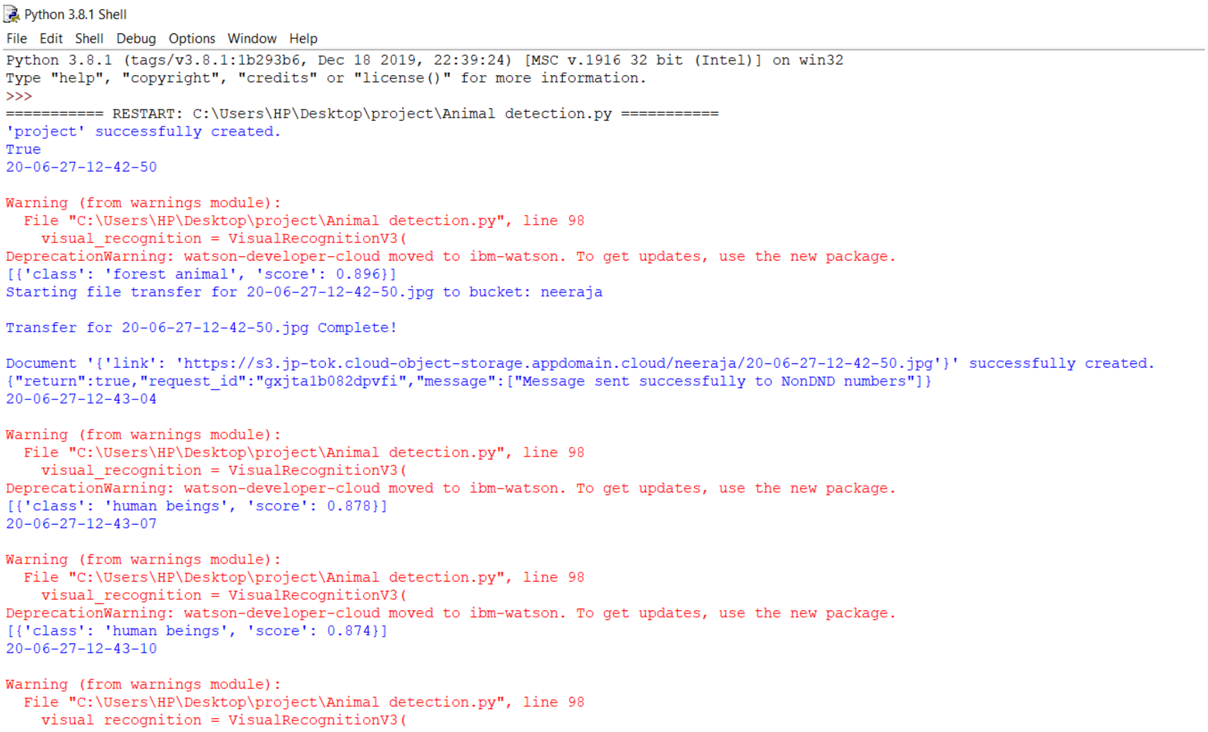
2.https://en.wikipedia.org/wiki/Human%E2%80%93wildlife_conflict

3.http://www.ijfcc.org/papers/7-T024.pdf

4.https://en.wikipedia.org/wiki/IBM_cloud_computing

OUTPUT:

Output in the shell:



```
Python 3.8.1 (tags/v3.8.1:1b293b6, Dec 18 2019, 22:39:24) [MSC v.1916 32 bit (Intel)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
=========== RESTART: C:\Users\HP\Desktop\project\Animal detection.py ===========
'project' successfully created.
True
20-06-27-12-42-50

Warning (from warnings module):
  File "C:\Users\HP\Desktop\project\Animal detection.py", line 98
    visual_recognition = VisualRecognitionV3(
DeprecationWarning: watson-developer-cloud moved to ibm-watson. To get updates, use the new package.
[{'class': 'forest animal', 'score': 0.896}]
Starting file transfer for 20-06-27-12-42-50.jpg to bucket: neeraja

Transfer for 20-06-27-12-42-50.jpg Complete!

Document '{'link': 'https://s3.jp-tok.cloud-object-storage.appdomain.cloud/neeraja/20-06-27-12-42-50.jpg'}' successfully created.
{"return":true,"request_id":"gxjta1b082dpvfi","message":["Message sent successfully to NonDND numbers"]}
20-06-27-12-43-04

Warning (from warnings module):
  File "C:\Users\HP\Desktop\project\Animal detection.py", line 98
    visual_recognition = VisualRecognitionV3(
DeprecationWarning: watson-developer-cloud moved to ibm-watson. To get updates, use the new package.
[{'class': 'human beings', 'score': 0.878}]
20-06-27-12-43-07

Warning (from warnings module):
  File "C:\Users\HP\Desktop\project\Animal detection.py", line 98
    visual_recognition = VisualRecognitionV3(
DeprecationWarning: watson-developer-cloud moved to ibm-watson. To get updates, use the new package.
[{'class': 'human beings', 'score': 0.874}]
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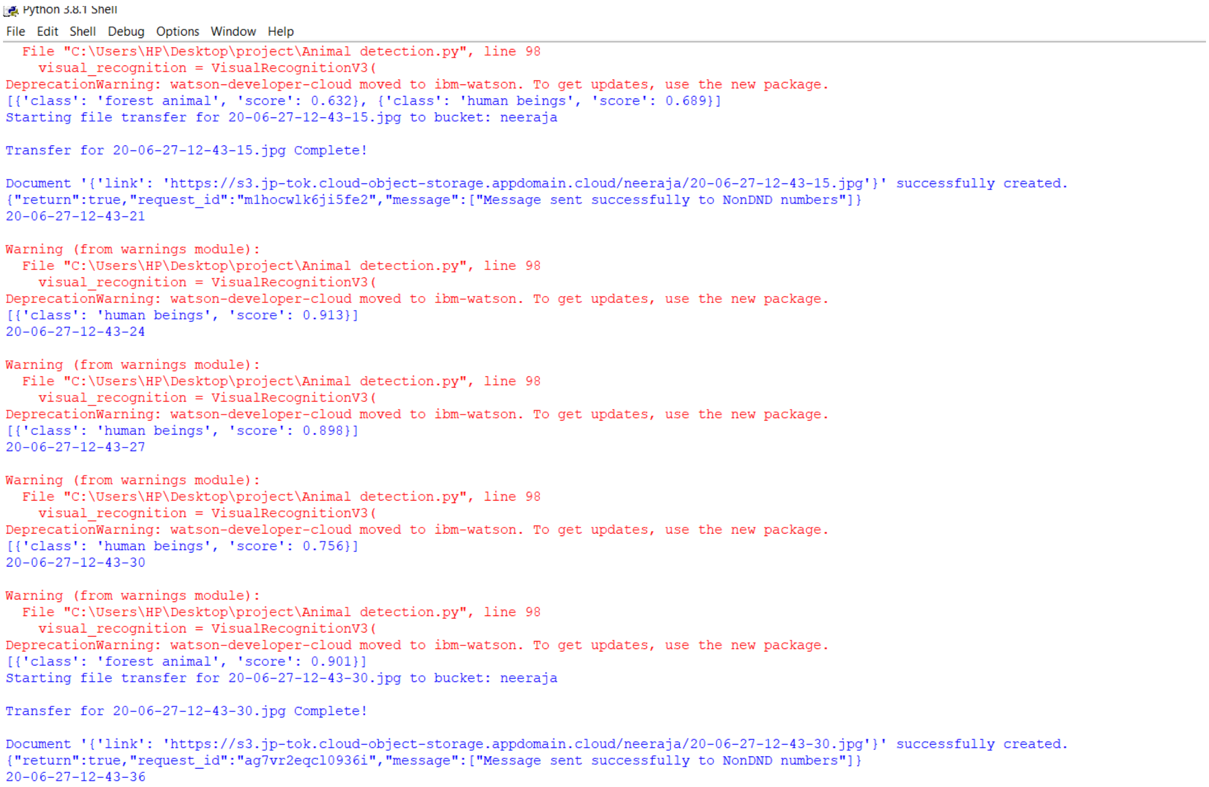
Warning (from warnings module):
  File "C:\Users\HP\Desktop\project\Animal detection.py", line 98
    visual_recognition = VisualRecognitionV3(
```



```
  File "C:\Users\HP\Desktop\project\Animal detection.py", line 98
    visual_recognition = VisualRecognitionV3(
DeprecationWarning: watson-developer-cloud moved to ibm-watson. To get updates, use the new package.
[{'class': 'forest animal', 'score': 0.632}, {'class': 'human beings', 'score': 0.689}]
Starting file transfer for 20-06-27-12-43-15.jpg to bucket: neeraja

Transfer for 20-06-27-12-43-15.jpg Complete!

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  File "C:\Users\HP\Desktop\project\Animal detection.py", line 98
    visual_recognition = VisualRecognitionV3(
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Warning (from warnings module):
  File "C:\Users\HP\Desktop\project\Animal detection.py", line 98
    visual_recognition = VisualRecognitionV3(
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Warning (from warnings module):
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DeprecationWarning: watson-developer-cloud moved to ibm-watson. To get updates, use the new package.
[{'class': 'forest animal', 'score': 0.901}]
Starting file transfer for 20-06-27-12-43-30.jpg to bucket: neeraja

Transfer for 20-06-27-12-43-30.jpg Complete!

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20-06-27-12-43-36
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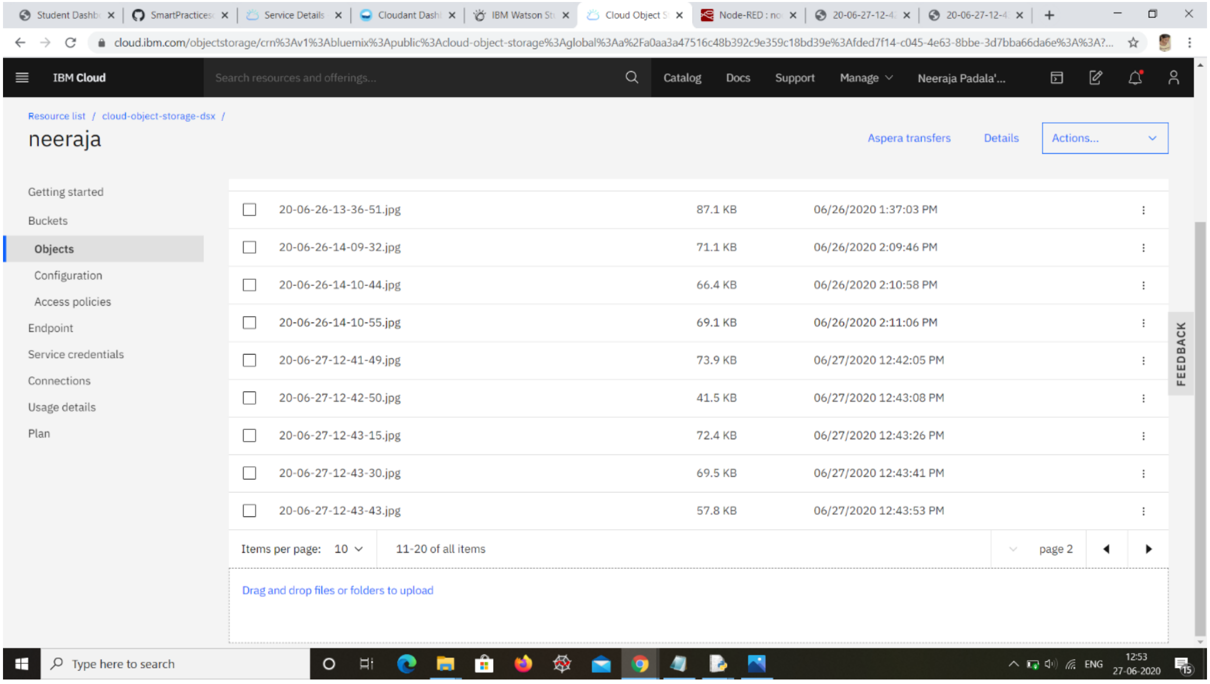
Images stored in the bucket:



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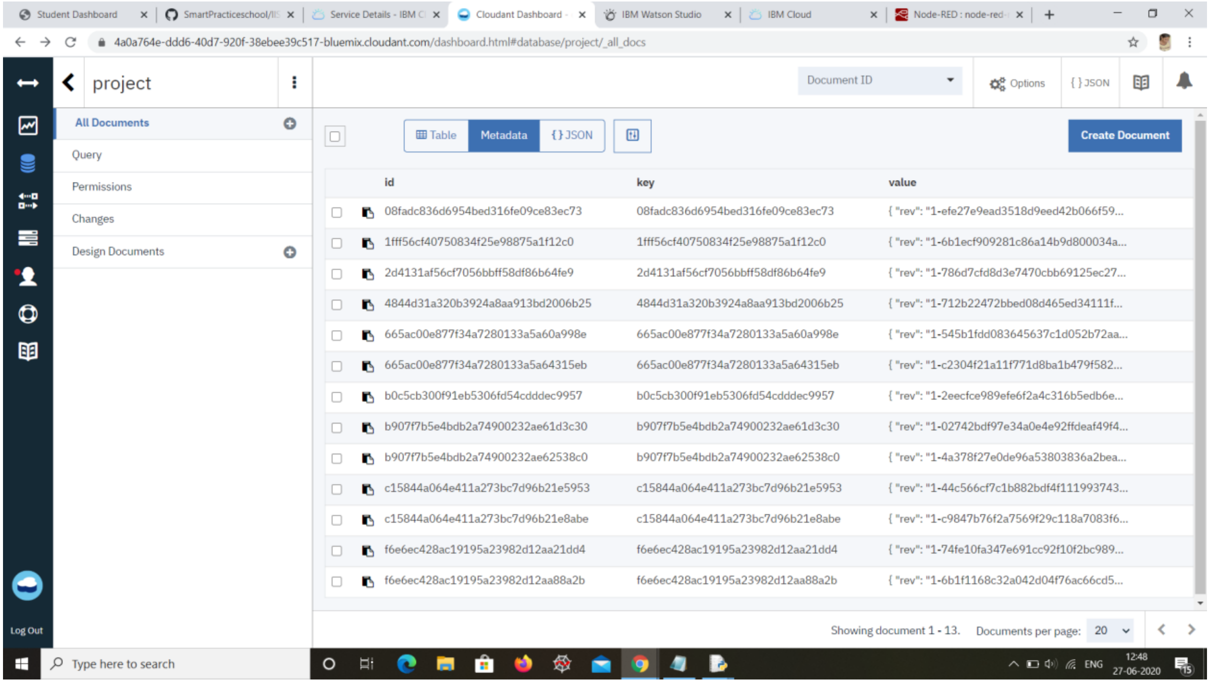
□	20-06-27-12-42-50.jpg	41.5 KB	06/27/2020 12:43:08 PM
□	20-06-27-12-43-15.jpg	72.4 KB	06/27/2020 12:43:26 PM
□	20-06-27-12-43-30.jpg	69.5 KB	06/27/2020 12:43:41 PM
□	20-06-27-12-43-43.jpg	57.8 KB	06/27/2020 12:43:53 PM

Items per page: 10 11-20 of all items page 2

Drag and drop files or folders to upload

Images stored in Cloudant db:



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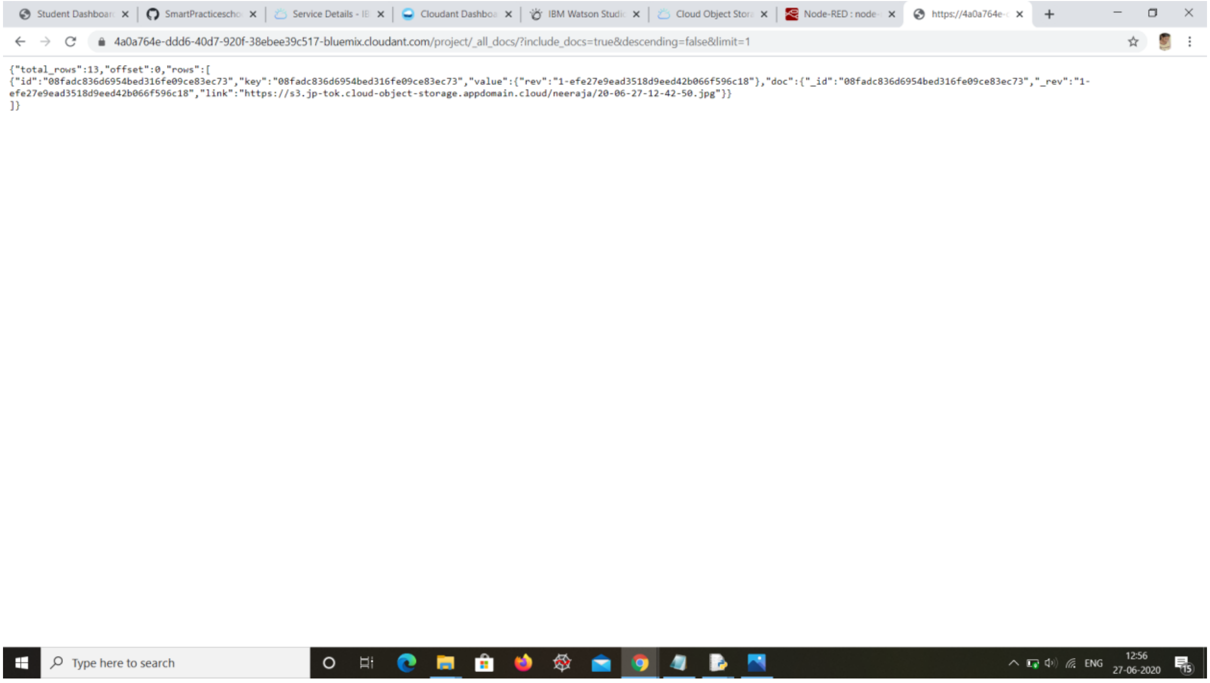
Recent image in Cloudant:



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]}
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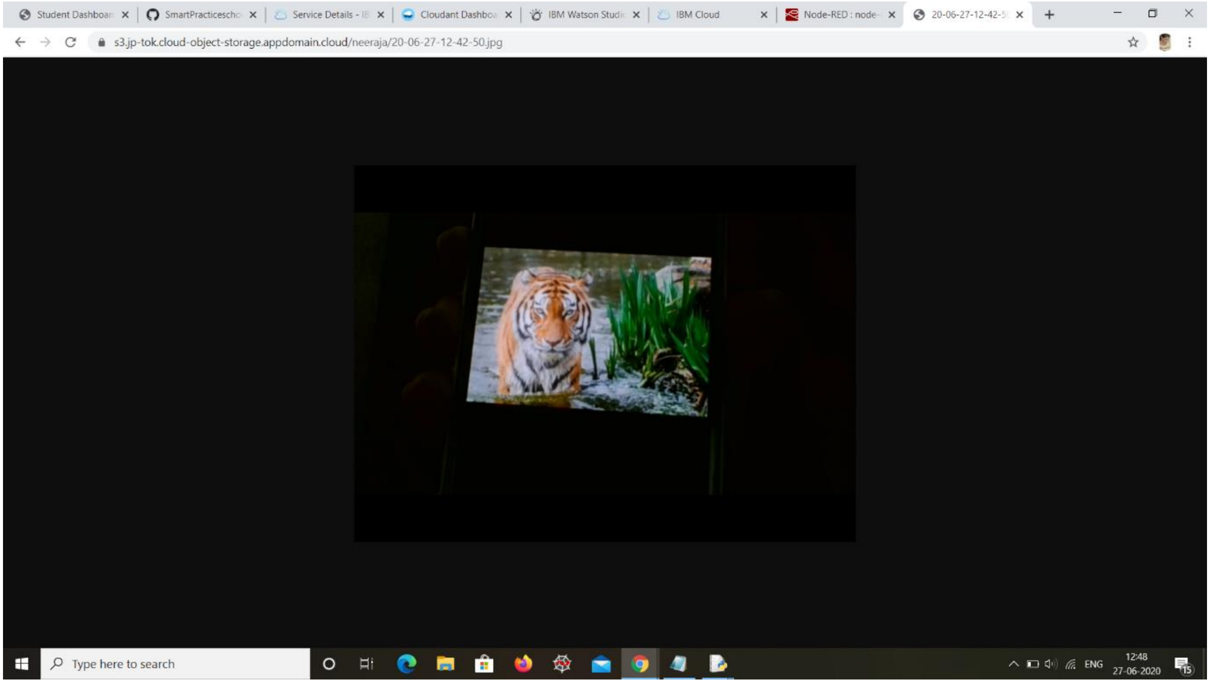
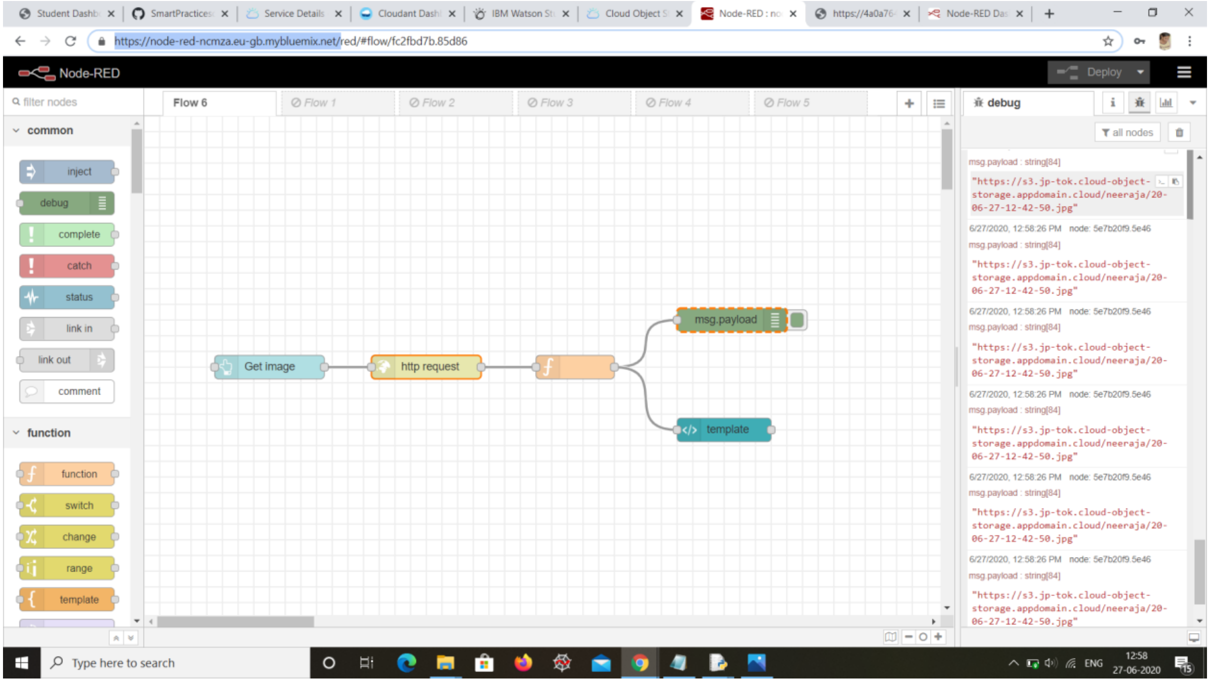
Recent Image:



Output of node red:



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msg.payload : string[84]
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msg.payload : string[84]
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6/27/2020, 12:58:26 PM   node: 5e7b20f9.5e46
msg.payload : string[84]
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6/27/2020, 12:58:26 PM   node: 5e7b20f9.5e46
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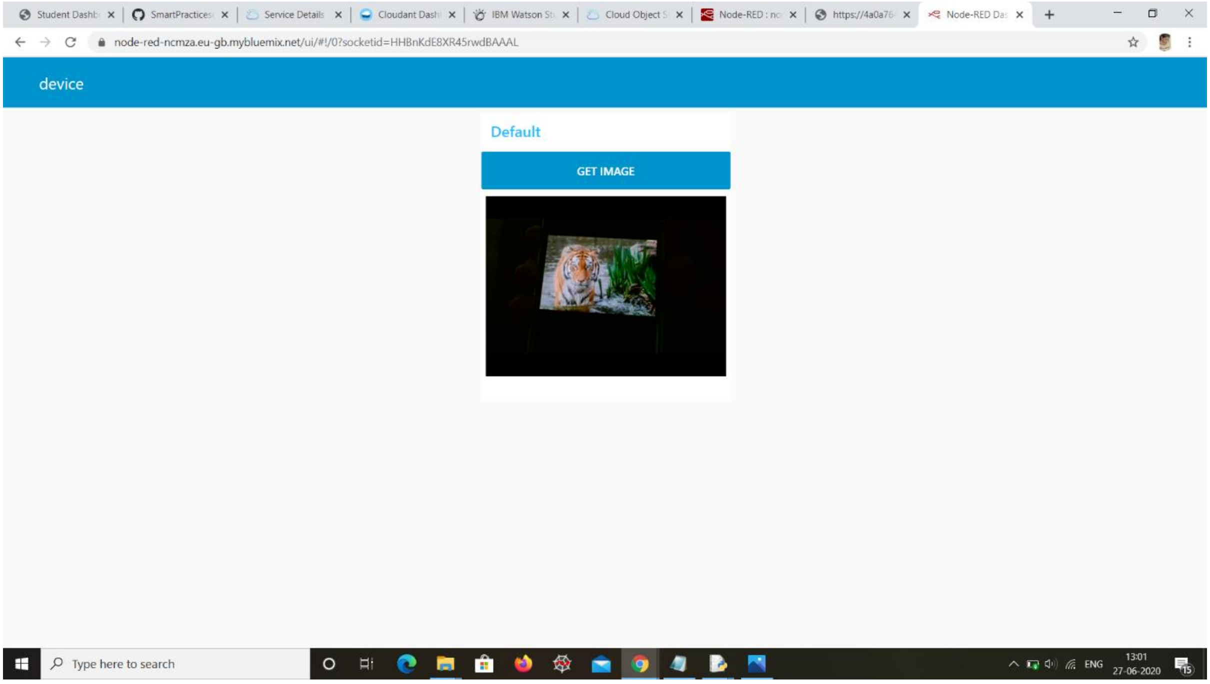
Output of UI:



node-red-ncmza.eu-gb.mybluemix.net/ui/#!/0?socketid=HHBnKdE8XR45rwdBAAAL

APPENDIX

A.Source code

https://github.com/SmartPracticeschool/llSPS-INT-2992-Animal-detection-and-alerting-system-for-rural-areas

VIDEO DRIVE LINK:

https://drive.google.com/drive/folders/111gugj4ji87HWO8Rhkyvw8ilrI3lWUN9