

# Artificial Intelligent System to detect Pit holes using HSV in Open CV

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**Abstract** - 70% of street accidents are because of terrible street conditions and potholes on streets. Semi towns, Municipalities in many locations of India are so remote that not all states are in a condition to use more man power where advanced technologies can be adopted to identify the issues. To maintain good road quality it ought to be checked ceaselessly and fixed as the need might arise. One of the serious issues in emerging nations is to recognize the pot openings and fixing them in time. India is the huge country on the planet that doesn't have appropriate upkeep of the street, more than 65% of the voyagers use street transportation. Because of this pinnacle utilization of street transports, there are numerous potential outcomes of potholes on streets which lead to mishaps. Other significant purposes behind mishaps are because of the head on head crashes. Potholes are an inescapable deterrent that each driver in India faces basically during the downpours, To take care of this issue, different strategies have been carried out going from manual answering to specialists to the utilization of vibration-based sensors that have a few disadvantages, for example, the high arrangement cost, risk while recognition, or no arrangement for night vision. Consequently, we have thought of a task that could end up being useful to individuals most helpfully. The principal thought is to distinguish and tell the potholes potentially without human mediation. To accomplish our objective we are involving currently being used cameras to recognize the issues. Pictures catches utilizing excellent sensors are in JPG format, those are to be changed over into HSV format to compare in Raspberry Pi utilizing Principal Component Analysis (PCA).

obstacles like potholes and protuberances. Potholes are fundamentally areas of street surface that have cracked, eroded, or in the long run framed an opening.

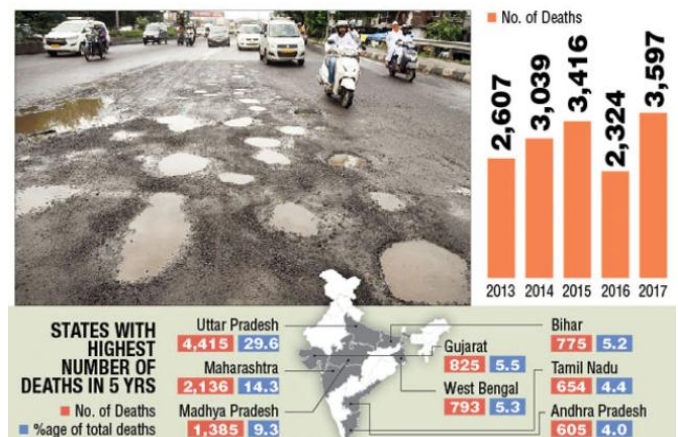


Image1.1(Paper clipping that shows the death rate in the country)

Potholes lead to unbalance while driving, which can ultimately prompt a mishap. As per the report of Global Road Safety, delivered by the World Health Organization (WHO), India reports for in excess of 3,00,000 passing on account of street mishaps. These mishaps can be expected to over speeding, tanked and driving, bouncing traffic lights, and furthermore because of mounds, speed-breakers, and potholes.

## 2. PREVAILING METHOD

Mid-level countries use physical surveillance method During pandemic the consideration on streets was right around nothing and traditional strategy bombed in verifying the pit openings even in significant urban areas like Mumbai, Delhi etc., pothole is frequently distinguished physically by street overseers of the civil enterprise during intermittent field overviews generally once in 90-120 days. Albeit this ordinary technique can assist with gaining a precise assessment of potholes, yet it is a sluggish and improper strategy in semi towns and towns as the labor is exceptionally less. Time taken to actually recognize the pot openings and repair them takes additional time and by then the pit openings causes more harm or breakage in streets.

With an enormous number of street segments should have been reviewed regularly, the robotisation of the pothole

**Key Words:** RGB, Principal Component Analysis, Open CV, Raspberry Pi, Image analysis, Pit holes.

## 1.INTRODUCTION

In spite of the fact that India is doing incredibly well in specific fields, we significantly need streets. Streets are the predominant method for transportation in India today. Nonetheless, streets here are limited and clogged with low quality and are not fittingly kept up with. This street condition is a supporting variable for gridlock and various street mishaps. Subsequently, these circumstances gave me motivation to make a compelling framework to make transportation more protected and sound in my country. Streets make up to most of method for transportation utilized starting today in India, standard support of these streets is essential as they are loaded up with startling

location turns into a squeezing need for transportation offices. The least complex strategy may be to gather photographs of street harm and perils taken by the members and to transfer them to a focal server. In any case, this requires solid investment and connection from the clients as well as manual picture investigation. We accept that a computerized approach for recognizing potholes with practically zero human cooperation is really encouraging. This would guarantee more thorough overview information with fewer mistakes brought about by human variables than created by the simple excitement of members. In addition, the useful asphalt looking over process essentially prompts monetary increase. It is on the grounds that, assuming the recovery interaction is performed ideal, asphalt rebuilding cost can be saved by up to 76 - 82%.

### 2.1 ULTRA SCAN METHOD

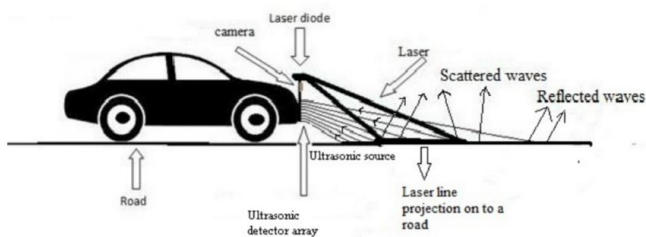


Image 2.1(Existing method of scanning the pot holes with ultra scan)

In 2015-19 Ultrasonic sensor sign method of pothole detection was in use. It will give the reach from the street and the laser sign will give a line projection out and about. Assessing the got signals from the ultrasonic collector and the laser signal, we are educated regarding the shortfall of any pothole. Here, the ultrasonic sensor module and laser module distinguish the pothole and measure the reach and greatest profundity of the pothole and caution the driver of its presence. By utilizing a variety of indicators, we get improved yield i.e., we can get the profile of the pothole. We get many signs back from the street or pothole. Assessing these got signals, the profile of the pothole acquired. But this is a costly method which cannot be used in semi towns.

Ultrasonic sensors are utilized to recognize potholes and mounds. They likewise measure their profundity and level individually. The proposed framework catches the geological area directions of potholes and mounds utilizing GPS beneficiary. The detected information incorporates pothole profundity, level of protuberance and geographic area, which is put away in the database (cloud). This fills in as a significant wellspring of data to the Government specialists and to vehicle drivers. An android application is utilized to caution drivers so that prudent measures can be taken to sidestep mishaps.

### 3. PROPOSED METHOD

Artificial Intelligent System to detect Pit holes using HSV in Open CV is a pothole-maintenance system with a pothole detector that uses an Artificial intelligence. Pothole data, like size, area and appearance, is gathered by the pothole-location framework utilizing the camera. The gathered information is put away in the pothole data set, and the pothole-support server involves it for shrewd pothole upkeep. We grew new programming for the pothole-upkeep server in view of our past pothole data set framework. This product gives different snippets of data about potholes, for example, their video cuts, pictures, locales, scope, longitude, type of asphalt, area, shape, size, and remarks. The pothole's area is pictured on a computerized map utilizing the gathered GPS information. Accordingly, clients can without much of a stretch see the appropriation of potholes.

#### 3.1 USING REGULAR TRAFFIC CAMERA

Traffic black-box camera on signal systems and camera frameworks can be utilized to recognize the pot openings. The proposed framework is mounted on the front windshield of a vehicle and can identify a pothole continuously. A pothole-identification calculation is introduced on an implanted board in the black-box camera. This calculation gathers data with respect to the size of potholes and their area, and this data is put away in the black box and afterward communicated to a pothole-the board server.



Image 3.1(High Quality Image capturing cameras)

#### 3.2 USING CAR SENSORS & CAMERAS

The area of the vehicle is followed utilizing GPS. The camera catches the picture of the street persistently through Open CV, and the caught pictures then are contrasted and the prepared informational index of potholes. On the off chance that the picture coordinates with the dataset, it sends an email to the civil specialists alongside the picture and the area of the pothole. Object location is additionally utilized in modern cycles to recognize items. Observing a particular item through visual assessment is an essential undertaking that is engaged with different modern cycles like arranging, stock administration, machining, quality administration, bundling, and so on. To prepare the dataset, we began by cloning Tensor flow Object Detection archive on GITHUB.

The API Is an Open-Source System based on TENSORFLOW, making it simple to build, train, and convey object recognition models.

### 3.3 METHODOLOGY

Here we are using Tensor Flow Object Detection API requires utilizing the particular catalog structure gave in its GitHub vault. It likewise requires a few extra Python bundles, explicit augmentations to the PATH and PYTHONPATH factors, and a couple of additional arrangement orders to get everything set up to run or prepare an article recognition model. This part of the instructional exercise goes over the full set up required. It is genuinely fastidious, yet adhere to the directions intently, on the grounds that inappropriate arrangement can cause clumsy blunders not too far off.

For complete pre-handling the picture we are catching the picture and trimming it utilizing picture examination. The picture is in RGB design naturally and it must be switched over completely to Gray scale transformation to approve the Threshold. Extraction of information by contrasting with the data set has with been finished utilizing the line division strategy. The picture can contrast and the past picture and ROI choice should be possible from it. Overflow identification assuming that pot opening should be possible by utilizing raspberry Pi by horizontal and vertical length checking of the picture exhaustively. Change check and Trajectory following should be possible utilizing Open CV from which the separation can be done.

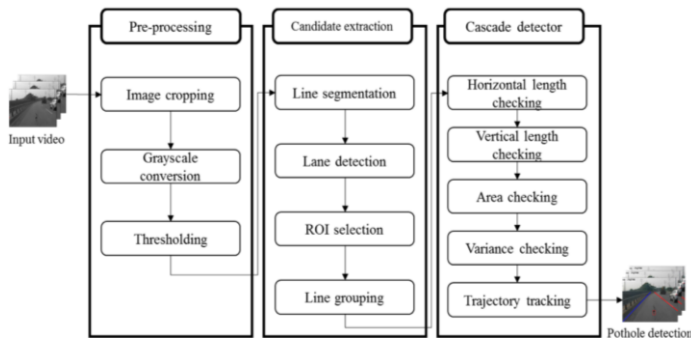


Image 3.2

(Methodology of Cascading the image)

Tensor Flow gives a few item location models (pre-prepared classifiers with explicit brain network structures) in its model zoo. A few models, (for example, the SSD-Mobile Net model) have an engineering that takes into consideration quicker location however with less precision, while certain models, (for example, the Faster-RCNN model) give more slow recognition yet with more exactness. I at first began with the SSD-MobileNet-V1 model; however it didn't do an excellent occupation distinguishing the cards in my pictures. I re-prepared my indicator on the Faster-RCNN-Inception-V2 model, and the recognition worked significantly better,

however with an observably more slow speed. We can also check the functionality over ANAKONDA virtual Environment.

### 4 CONFIGURING DATA SETS

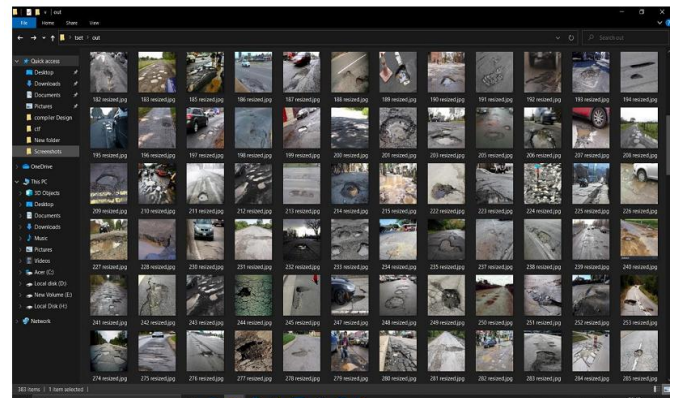


Image 4

(Co relating and naming mutypole pot holes)

Data sets are to be first generated so that the project can really analyze with actually is a pot hole or a speed breaker. So various images of the roads are to be first taken & labeled correctly so that OpenCV can make out the difference. A folder has to be created in C: and name it "tensorflow1". This functioning index will contain the full TensorFlow article discovery system, as well as your preparation pictures, preparing information, prepared classifier, setup documents, and all the other things required for the item location classifier.

We have to compile the Protobuf files, which are used by TensorFlow to configure model and training parameters. Every .proto file in the \object\_detection\protos directory must be called out individually by the command. In the Anaconda Command Prompt, change directories to the \models \ research directory: (tensorflow1) C:\> cd C:\tensorflow1\models\research. The label map tells the trainer what each object is by defining a mapping of class names to class ID numbers. C:\ tensorflow1 \models \research \object\_detection \training folder.

#### 4.1 USING RASPBERRY PI

We chose Raspberry Pi for Image Processing as it is utilized in different strategies, The Raspberry Pi is a fundamental inserted framework and being a minimal expense a solitary load up PC used to lessen the intricacy of frameworks continuously applications. This stage is primarily founded on python. Raspberry pi comprise of Camera space Interface (CSI) to communicate the raspberry pi camera. Here, the Dark and Low differentiation pictures caught by utilizing the Raspberry Pi camera module are upgraded to recognize the specific locale of picture. This idea is utilized in the ongoing utilization of MAV,



The MAVs are fundamentally used to catch pictures and recordings through the Raspberry pi camera module. In light of its Visa estimated (little) and less weight in the plan. In any case, the picture caught by MAVs will comprise of undesirable things because of climatic circumstances; consequently it is important to eliminate commotion present in the MAVs pictures. Once we obtain the Pothole pictures dataset from Kaggle we had utilized Label Img which is an open instrument for naming pictures. Tensor-Flow gives a few article discovery models (pre-prepared classifiers with explicit brain network structures) in its model zoo, we have to properly utilize faster\_rcnn\_inception\_v2\_coco\_2018\_01\_28.

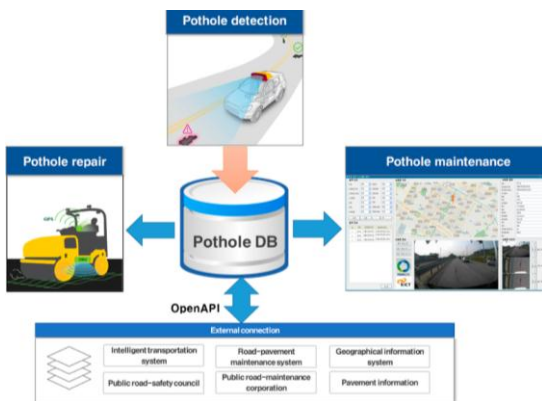


Image 4.1  
(Pot hole Database analysis)

Configuration is to be built such that the computer with 16GB RAM for like 11 hours. The additional time preparing the dataset brings about high exactness.

## 5. OUTPUTS

### 5.1 Sample Code For SMTP Mailing

"""The first step is to create an SMTP object, each object is used for connection with one server."""

```
import geocoder import smtplib
from email.mime.text import MIMEText from
email.mime.base import MIMEBase
from email.mime.multipart import MIMEMultipart from
email.encoders import encode_base64
g = geocoder.ip('me') location=g.latlng
mail_content=("-----detected potholes ")
uurl =
"https://www.google.com/maps/search/?api=1&query=%s,
%s"%(location[0],location[1])
#https://www.google.com/maps/search/?api=1&query=47.
5951518,-
```

```
122.3316393&query_place_id=ChIJKxjxuaNqkFQR3CK601H
NNqY
```

```
html = ""
<html>
<body>
<h1>pot hole location </h1>
<a href="%s" title="click here to open in map">locate</a>
</body>
</html>
```

```
""" % uurl #htmlmsg=open('s.html').read()
#exec(open('s.html').read())
server = smtplib.SMTP('smtp.gmail.com', 587)
server.starttls()
msg =MIMEMultipart()
#Next, log in to the server
server.login("riyazahmmed48@gmail.com",
"lsduaxfcd235isvz")
```

#Send the mail

```
#msg = r"C:\Python37\Projects\Face
Recognition\Pothole.jpg"
```

```
img1=r"C:\Python37\models-
master\research\object_detection\project\images\Pothole1
0.jpg" with open(img1, 'rb') as f:
```

```
# set attachment mime and file name, the image type is png
msg.attach(MIMEText(mail_content, 'plain'))
msg.attach(MIMEText(html, 'html'))
#msg.attach(MIMEText(htmlmsg,'html'))
```

```
mime = MIMEBase('image', 'png', filename='img1.png') #
add required header data:
```

```
mime.add_header('Content-Disposition', 'attachment',
filename='img1.png') mime.add_header('X-Attachment-Id',
'0')
```

```
mime.add_header('Content-ID', '<0>')
```

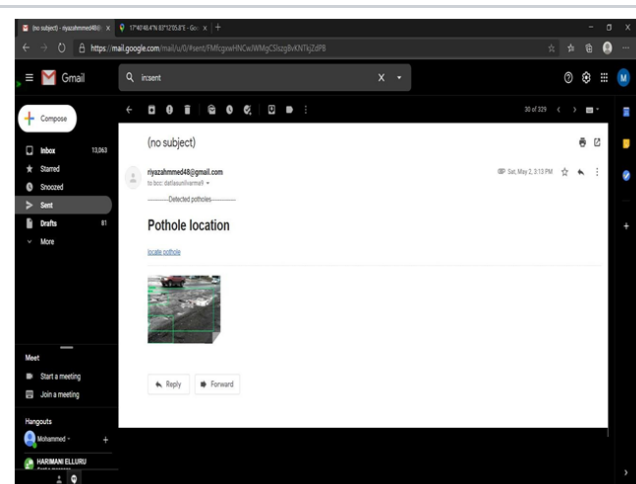
```
# read attachment file content into the MIMEBase object
mime.set_payload(f.read())
```

```
# encode with base64w2q encode_base64(mime)
```

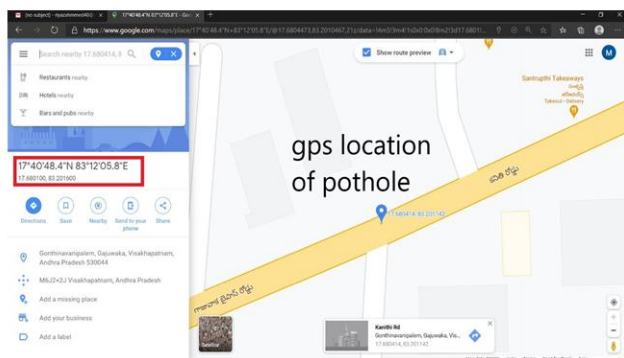
```
# add MIMEBase object to MIMEMultipart object
msg.attach(mime)
```

```
server.sendmail("riyazahmmed48@gmail.com",
"venky.chilamkurthi@gmail.com"
```

```
,msg.as_string()) print(g.latlng)
```



Once the pot hole is detected the image & location of the pot hole will be sent via mail to the concern authorities as embedded in the SMTP. Attachment of the image & the location will also be sent so that the authorities can easily make out the correct position & current condition of the road.



## 6. CONCLUSION

Our aim in adopting Artificial Intelligent System to detect Pit holes using HSV in Open CV using the model is to distinguish potholes on the streets and tell them with no human impedance. No manual intercession is expected to detect and report the potholes. It very well may be recognized naturally with the assistance of AI, in this way our pothole recognition framework helps the general public in advancing street security and lessens the challenges in distinguishing the pothole and furthermore diminishes the use of human power and thus saves time. Along these lines, by filling the pothole mishaps which happen out and about might be decreased. The picture caught and the geographic area that is longitude and scope of the pothole distinguished will be shipped off the concerned government specialists' reporting mailing systems. The specialists can see the picture and assuming they click on the connection sent through email, they can look at the area of the pothole recognized in the Google maps.

## 7. FUTURE ENHANCEMENTS

This project, Artificial Intelligent System to detect Pit holes using HSV in Open CV can be utilized for mishap zone examination, distinguishing the weighty traffic zones, obscured turns in the streets, creature crossing zones, risk bends and mishap control. This will be advantageous to such an extent that it will all the while show the current elements of Google endlessly map the gathered potholes. It will likewise help is as an investigation report for street life conditions and quality at which the streets are assembled.

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## BIOGRAPHIES



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