POTHOLE DETECTION USING YOLO V3

A UG PROJECT PHASE-1 REPORT

Submitted to

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD

In partial fulfillment of the requirements for the award of the degree of

BACHELOR OF TECHNOLOGY IN COMPUTER SCIENCE AND ENGINEERING

Submitted by

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2019– 2023

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CERTIFICATE OF COMPLETION

UG PROJECT PHASE -1

This is to certify that UG project phase-1 entitled **"POTHOLE DETECTION USING YOLO V3"** is being submitted by **SYED ASIMUDDIN (19UK1A0517)**, **MATTAPALLY AMRUSHA (19UK1A0508), KULLA ALEKYA (19UK1A0513), DOMMETI SAIKUMAR (19UK1A0540), MYDAM SWAPNA (19UK1A0542)** in partial fulfilment of the requirements for the award of the degree of **Bachelor of Technology** in **Computer Science and Engineering** to **Jawaharlal Nehru Technological University Hyderabad** during the academic year **2022-2023,** is a record of work carried out by them under the guidance and supervision.

Project Guide | **Head of the Department**

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1.INTRODUCTION

1.1 Overview

Potholes on roads constitute a serious problem for citizens acting as pedestrians furthermore as vehicular drivers. Government bodies which carries with it engineers and workers are responsible to detect damages on roads. Manually assessing every single a part of the road is very time- consuming, requires lots of manpower and hence it cannot be done efficiently. the tactic to repair this issue by automating the detection. The study focuses on collecting and analyzing the dataset of potholes to coach a convolutional neural network. the thing detection system tiny YOLOv3 is employed for detecting the potholes. the look of a system is identified which may be used for developing a mobile application for detection and presenting a visualized view of the potholes.

1.2 Purpose

To solve this problem, we are going to build a model using YOLOv3 which helps us in identifying the potholes. For instance, we will be giving a video feed to our model such that it will be in a position to identify potholes and store its images

2. LITERATURE SURVEY

2.1 Existing problem

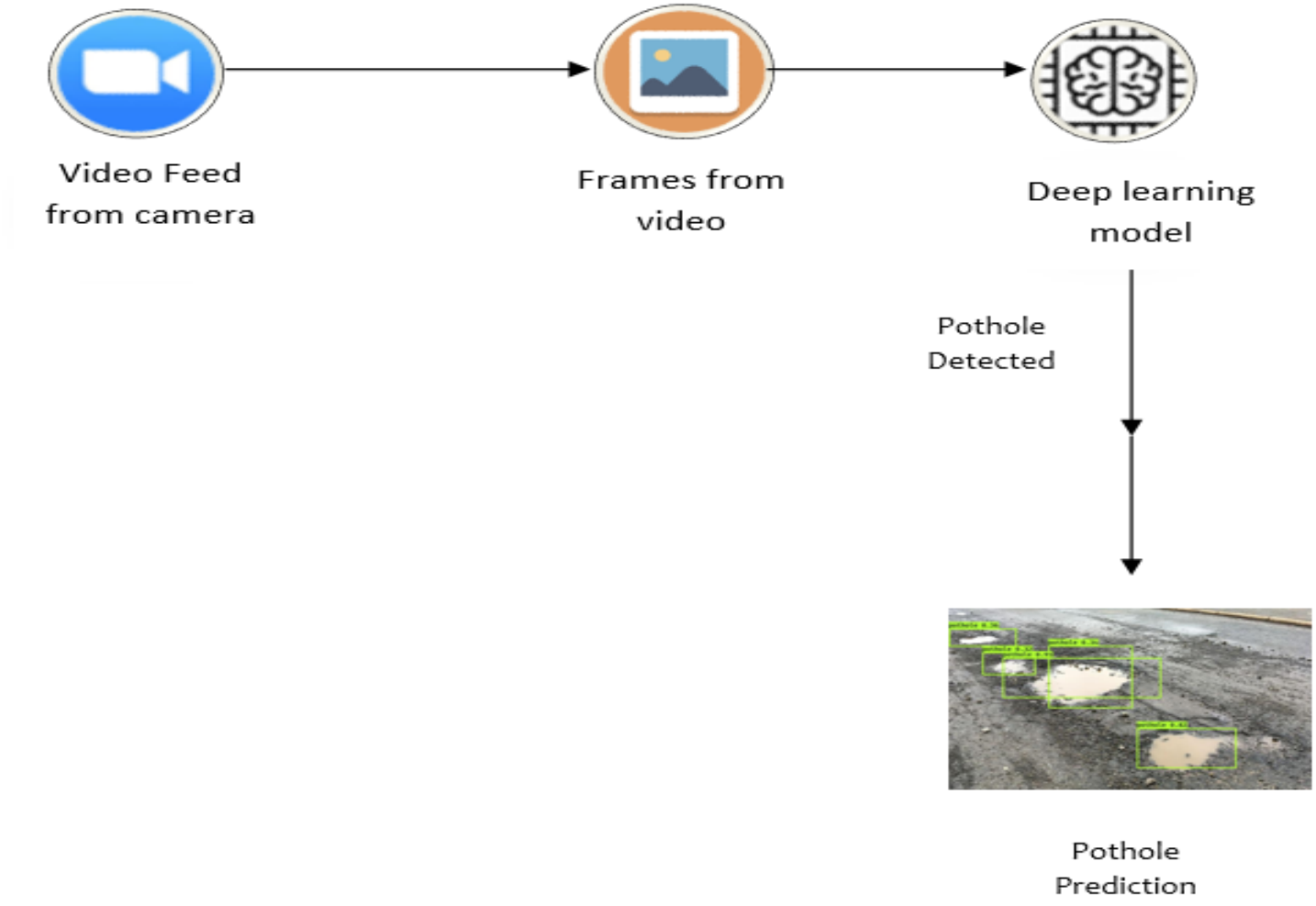
In countries like India road maintenance is a challenging task. Year after year, the accident rates are increasing due to the up-surging potholes count. As the road maintenance process is done manually in most places, it consumes enormous time, requires human labour, and subject to human errors. Thus, there is a growing need for a cost-effective automated identification of potholes.

2.2 Proposed solution

The thing detection system tiny YOLOv3 is employed for detecting the potholes. the look of a system is identified which may be used for developing a mobile application for detection and presenting a visualized view of the potholes.

3.THEORITICAL ANALYSIS

3.1 Block diagram



3.2 Hardware / Software designing

To complete this project, you must require the following software's, concepts, and packages

- Python IDE (IDLE / Spyder / PyCharm) (Python 3.7)
- Microsoft's Visual Object Tagging Tool (VoTT)
- Python Packages need to be installed

4.EXPERIMENTAL INVESTIGATIONS

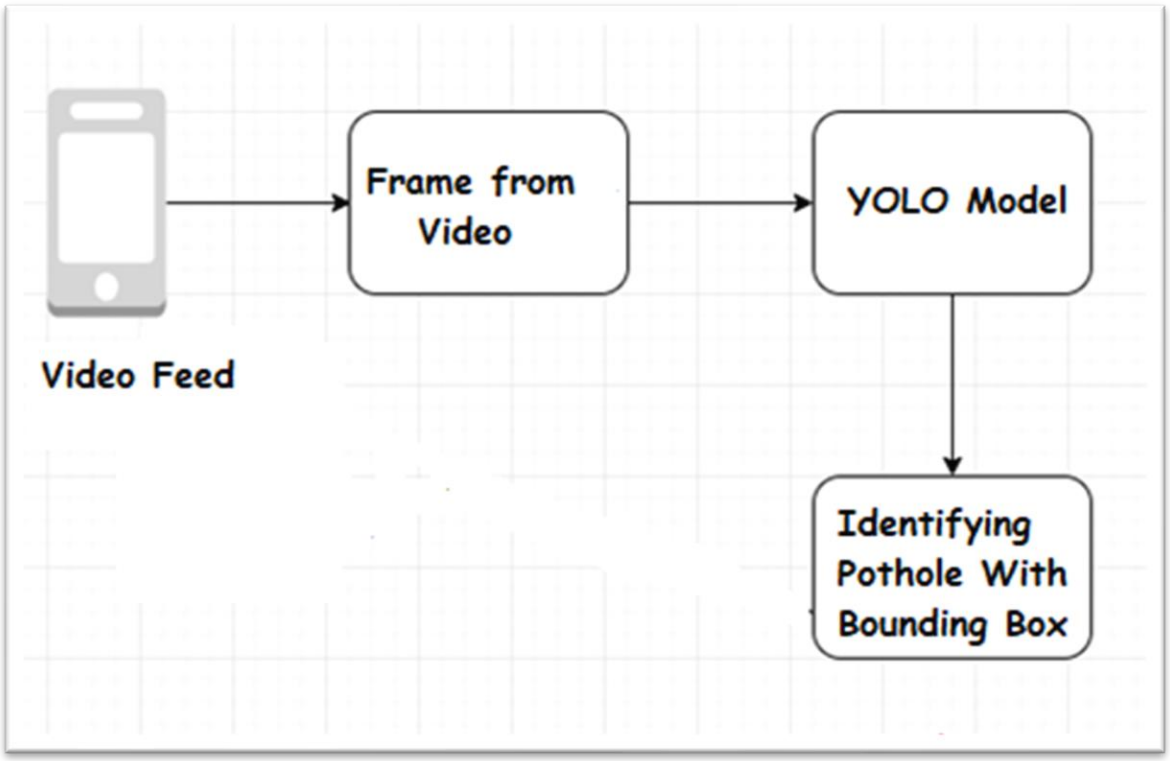
1 YOLO-based Convolutional Neural Network family of models for object detection and the most recent variation called YOLOv3.

2 How to train a YOLO model in windows environment.

3 How to annotate images using Microsoft's Visual Object Tagging Tool (VoTT).

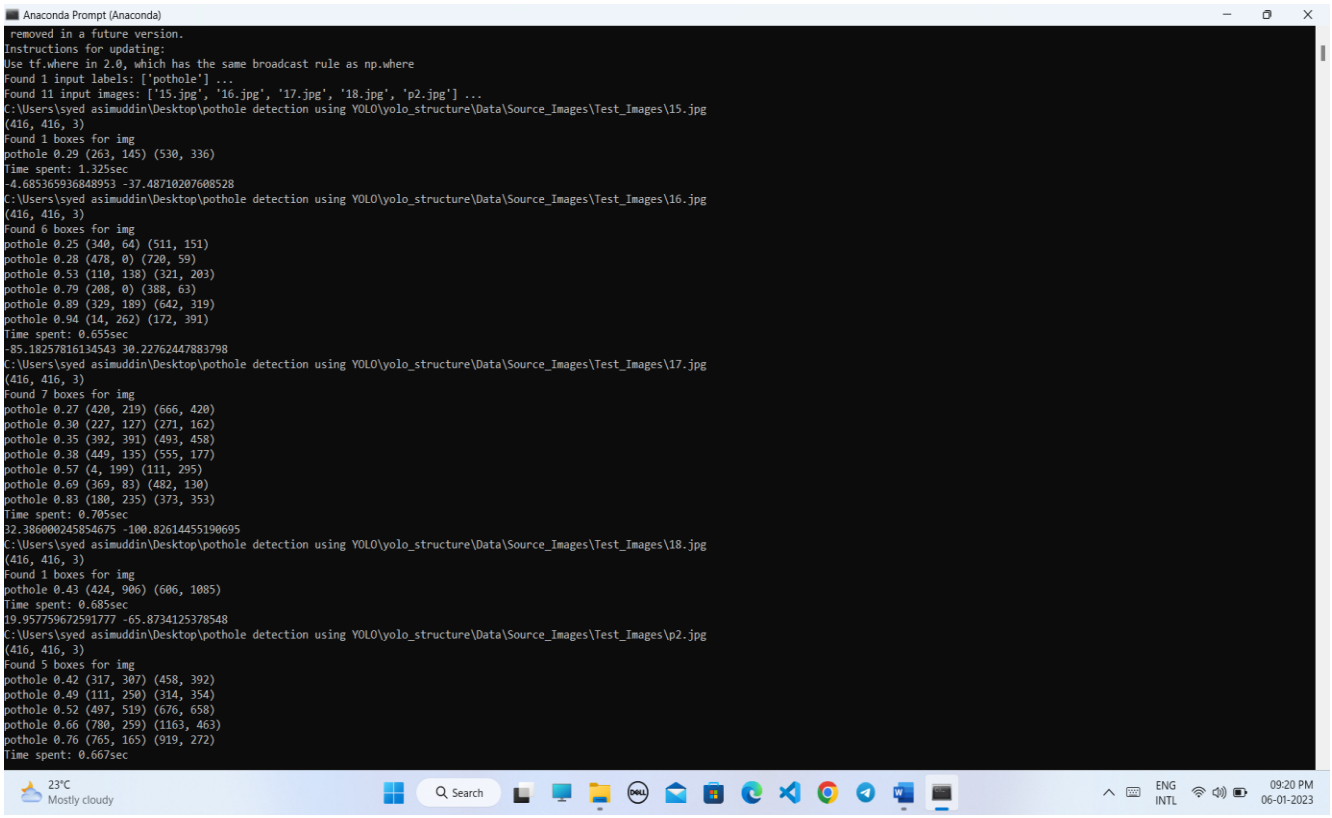
5.FLOWCHART

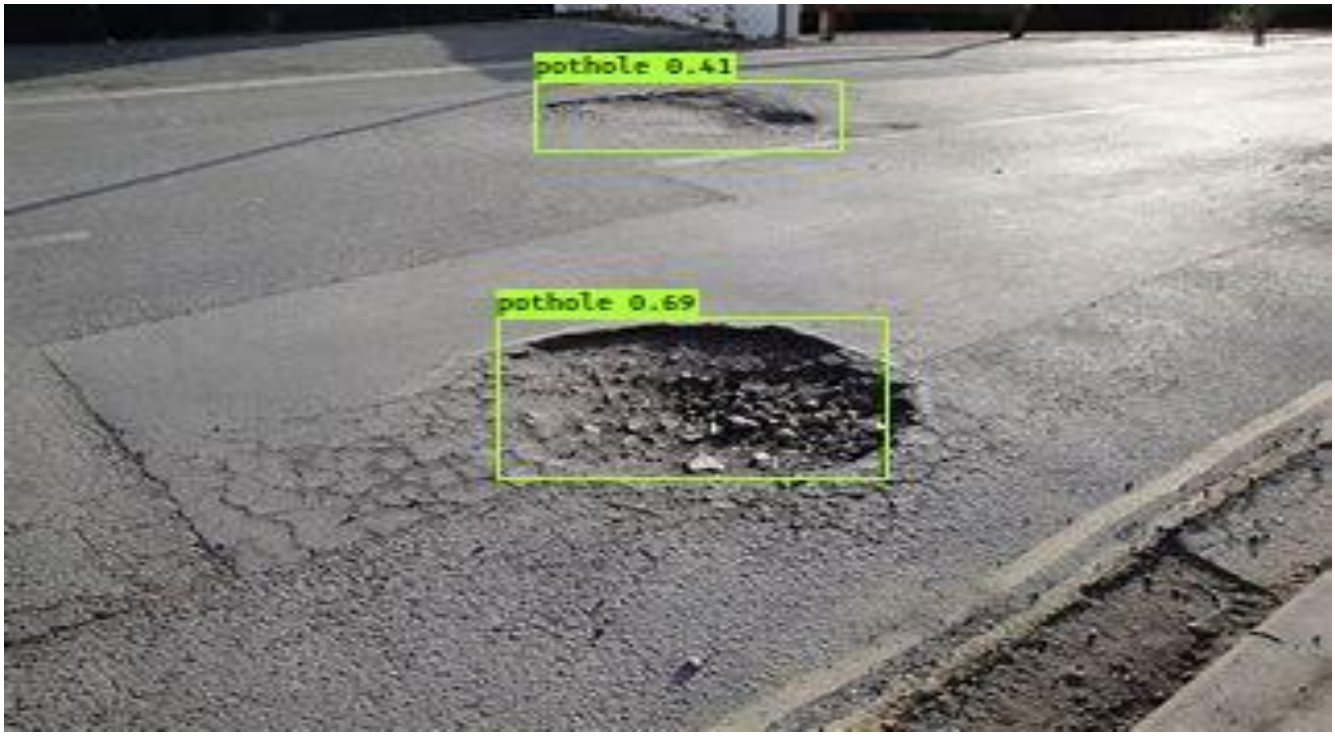
Diagram showing the control flow of the solution



6.RESULT

OUTPUT SCREENSHOTS





Detection_Results - Excel

image	image_path	xmin	ymin	xmax	ymax	label	confidence	x_size	y_size
15.jpg	C:\Users\s	263	145	530	336	0	0.288774	800	600
16.jpg	C:\Users\s	340	64	511	151	0	0.25034	730	430
16.jpg	C:\Users\s	478	0	720	59	0	0.281345	730	430
16.jpg	C:\Users\s	110	138	321	203	0	0.52928	730	430
16.jpg	C:\Users\s	208	0	388	63	0	0.790009	730	430
16.jpg	C:\Users\s	329	189	642	319	0	0.887783	730	430
16.jpg	C:\Users\s	14	262	172	391	0	0.944429	730	430
17.jpg	C:\Users\s	420	219	666	420	0	0.268685	667	458
17.jpg	C:\Users\s	227	127	271	162	0	0.296622	667	458
17.jpg	C:\Users\s	392	391	493	458	0	0.354037	667	458
17.jpg	C:\Users\s	449	135	555	177	0	0.379009	667	458
17.jpg	C:\Users\s	4	199	111	295	0	0.573864	667	458
17.jpg	C:\Users\s	369	83	482	130	0	0.688918	667	458
17.jpg	C:\Users\s	180	235	373	353	0	0.830638	667	458
18.jpg	C:\Users\s	424	906	606	1085	0	0.428472	992	1473
p2.jpg	C:\Users\s	317	307	458	392	0	0.418481	1200	667
p2.jpg	C:\Users\s	111	250	314	354	0	0.490597	1200	667
p2.jpg	C:\Users\s	497	519	676	658	0	0.517961	1200	667
p2.jpg	C:\Users\s	780	259	1163	463	0	0.656559	1200	667
p2.jpg	C:\Users\s	765	165	919	272	0	0.755862	1200	667
WhatsApp	C:\Users\s	249	110	341	142	0	0.359345	390	260
WhatsApp	C:\Users\s	73	103	179	137	0	0.388462	390	260
WhatsApp	C:\Users\s	182	94	248	123	0	0.509232	390	260
WhatsApp	C:\Users\s	68	159	200	235	0	0.924073	390	260
WhatsApp	C:\Users\s	205	98	295	137	0	0.427028	375	250
WhatsApp	C:\Users\s	150	110	262	193	0	0.542395	375	250

7.ADVANTAGES & DISADVANTAGES

ADVANTAGES	DISADVANTAGES
Detect Potholes on poor roads	Complex Procedure
prevents vehicle damage or physical harm to the vehicle occupants	Error detections
Prevents major accidents	Expensive

8.APPLICATIONS

Potholes can generate damage such as flat tire and wheel damage, impact and damage of lower vehicle, vehicle collision, and major accidents. Thus, accurately and quickly detecting potholes is one of the important tasks for determining proper strategies in ITS (Intelligent Transportation System) service and road management system

9.CONCLUSION

In this study, the application of three YOLO models for detecting the pothole spots on images from road surfaces is investigated. Given the set of 665 images dataset used to train the models in this study, the research findings provide admissible evidence that the YOLOv4-tiny model achieves the purpose of the pothole detection application because it has the highest mean average precision of 78.7%,

10.FUTURE SCOPE

Future Scope In future, we can implement image processing system to avoid pothole in embedded system car. We can implement image processing using thermal imaging, night vision camera to detect potholes in poor lighting conditions.

11.BIBILOGRAPHY

Model Building

1. Project Objectives &Pre-Requisites
2. Create Dataset
3. Annotate Images
4. Training YOLO v3 model
5. Testing the model

12.APPENDIX

SOURCE CODE

```
from PIL import Image
from os import path, makedirs
import os
import re
import pandas as pd
import sys
import argparse


def get_parent_dir(n=1):
    """ returns the n-th parent dicrectory of the current
    working directory """
    current_path = os.path.dirname(os.path.abspath(__file__))
    for k in range(n):
        current_path = os.path.dirname(current_path)
    return current_path


sys.path.append(os.path.join(get_parent_dir(1), "Utils"))
from Convert_Format import convert_vott_csv_to_yolo
```

```
Data_Folder = os.path.join(get_parent_dir(1), "Data")
VoTT_Folder = os.path.join(
    Data_Folder, "Source_Images", "Training_Images", "vott-csv-export"
)
VoTT_csv = os.path.join(VoTT_Folder, "Annotations-export.csv")
YOLO_filename = os.path.join(VoTT_Folder, "data_train.txt")

model_folder = os.path.join(Data_Folder, "Model_Weights")
classes_filename = os.path.join(model_folder, "data_classes.txt")

if __name__ == "__main__":
    # surpress any inhereted default values
    parser = argparse.ArgumentParser(argument_default=argparse.SUPPRESS)
    """
    Command line options
    """
    parser.add_argument(
        "--VoTT_Folder",
        type=str,
        default=VoTT_Folder,
        help="Absolute path to the exported files from the image tagging step with VoTT. Default is "
        + VoTT_Folder,
    )

    parser.add_argument(
        "--VoTT_csv",
        type=str,
        default=VoTT_csv,
        help="Absolute path to the *.csv file exported from VoTT. Default is "
        + VoTT_csv,
    )
    parser.add_argument(
        "--YOLO_filename",
        type=str,
        default=YOLO_filename,
        help="Absolute path to the file where the annotations in YOLO format should be saved. Default
is "
        + YOLO_filename,
    )

    FLAGS = parser.parse_args()

    # Prepare the dataset for YOLO
    multi_df = pd.read_csv(FLAGS.VoTT_csv)
    labels = multi_df["label"].unique()
    labeldict = dict(zip(labels, range(len(labels))))
    multi_df.drop_duplicates(subset=None, keep="first", inplace=True)
    train_path = FLAGS.VoTT_Folder
    convert_vott_csv_to_yolo(
```

```
    multi_df, labeldict, path=train_path, target_name=FLAGS.YOLO_filename
)

# Make classes file
file = open(classes_filename, "w")

# Sort Dict by Values
SortedLabelDict = sorted(labeldict.items(), key=lambda x: x[1])
for elem in SortedLabelDict:
    file.write(elem[0] + "\n")
file.close()
```