IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 7.39 ⁜ Vol. 11, Issue 3, March 2022

DOI: 10.17148/IJARCCE.2022.11372

Automatic assessment of road conditions using photographs

Bharambe Pushkar Bhanudas[1], Bhojwani Tannu Ravikumar[2],

Deshpande Ambika Nandkishor[3], Jangid Ankit Rameshwar[4]

B.E., Computer, Shram Sadhana Bombay Trust's COET, Jalgaon, India[1-4]

Abstract: Roads are a major means of transportation and travelling hence it needs to be in proper conditions to reduce fatalities due to road accidents, decrease transportation delays due to surprising events, etc. The problem that we are trying to solve is to automate the analysis of road conditions using computer and cameras to generate data for maintenance and development of roads utilizing parameters such as potholes, cracks etc. The approach we are taking is to use still images of the roads to be surveyed or analyzed and then use image processing and computer vision for the required data. The data generated by the analysis and processing can then be used in various applications for development and maintenance of roads. This method of automating the process of surveying will drastically reduce the efforts, cost and time that was previously required manually.

I. INTRODUCTION

One of the most important issues in today fast paced world and which comes as a setback to our development and infrastructures is the bad conditions of the roads. The fast vehicle when not complemented with proper roads reduces the speed of transportation which is exactly opposite to what we need. Another problem with bad roads is the number of increasing accidents and mishaps. Hence to analyse the conditions of roads we need a system which can automatically determine it.

II. BACKGROUND

Ideally, we expect that the most preferred medium of travel and transportation, i.e., roads should be at their best condition possible so as to avoid accidents and delays. And that would happen only if the roads don't have potholes, cracks, uneven side ramps, etc. In reality, the conditions of roads vary due to various aspects such as the build quality of roads, weather, vehicle loads, etc. which leads to numerous problems like potholes, cracks, uneven surfaces. Not solving this problem will lead to delays in maintenance and development of roads leading to monetary and life losses. One of the solutions can be an automated approach based on images of the roads to determine the condition using various methods such as image processing and real-time computer vision which can then be used to determine the road conditions.

III. SCOPE

The proposed system has a very minimal footprint on the overall system and will work at the back-end of the existing system. It will accept an image in a particular format, process it, and classify the image as a bad road or a good road. Following are the functions which this system is expected to do:
. User/Application can upload image through Web-Application/Command Line Interface
. User/Application will be able to see the results for the uploaded image
. User/Application will be able to analyse the features extracted from the image

IV. OBJECTIVES

The proposed system is built to provide an automatic testing and analysis of road photographs provided by the users. The objectives are as follows:

- To ease out the reporting of bad conditions of road for Users
- To ease out the analysis of roads for the authorities
- To automate the reporting and analysis of roads for development and maintenance

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 7.39 ⁜ Vol. 11, Issue 3, March 2022

DOI: 10.17148/IJARCCE.2022.11372

V. SELECTION OF LIFE CYCLE MODEL

The software development life cycle selected for this project is Waterfall model.
Waterfall Model is best suited model for this project:

1. Because requirements are easily understandable and defined
2. We can define requirements in early stage of development
3. User involvement in all phases is not necessary
4. Limited user's participation

VI. ANALYSIS

Software Specification will provide a broad understanding of the requirement specification of this system. Also, understand features of this system along with the requirements. The product features are high level attributes of a software or product such as software performance, user-friendly interface, security portability, etc.
The user will be able to upload the images of roads to be analysed. The user will be able to view the results of submitted images. The user will be able to integrate this system with any other system easily. The software will operate in the following environment: Operating system should be Windows 7 or later/Linux/MacOS, any browser supporting HTML 5 and javascript, any system with atleast 2 GB RAM.
The proposed system has several options for users to interact with. Following are the user interfaces available:
. Web-application (GUI)
. Command Line Interface (Terminal based interface)

VII. CODING/IMPLEMENTATION

Most of the new correct models demand many GPUs for preparation accompanying a large tiny-array amount, and achievement this accompanying individual GPU form the preparation indeed slow and unrealistic. YOLOv4 addresses this issue by making an object detector that maybe prepared on a alone GPU accompanying a tinier tiny-assortment length. This makes it likely to train a excellent fast and correct object indicator accompanying a distinct 1080 Ti or 2080 Ti GPU.YOLO v4 achieves newfangled results at a actual time for action or event speed on the MS COCO data set accompanying 43.5 % AP running at 65 FPS on a Tesla V100. To achieve these results, they connect few facial characteristics to a degree Weighted-Residual-Connections (WRC), Cross-Stage-Partial connections(CSP), Cross tiny-Batch Normalization (CmBN), Self-opposing-preparation (SAT)and Mish-incitement, Mosaic dossier improving, Drop Block regularization, and CIoU loss. These are refer to as worldwide countenance cause they endure work well alone from the calculating dream tasks, datasets and models. We will discuss these features later. The algorithm divides the image into equally sized boxes and calculates the confidence for every box. Also, the algorithm calculates the center of the box, its width and height i.e. x and y coordinates for the center and width and height in w and h respectively. Following is the pseudo-code for the same.

```
for output in layer OutPuts :
for detection in output :
if confidence > 0 . 5 :
Calculate center x ;
Calculate center y ;
Calculate width ;
Calculate height ;
Calculate x ;
Calculate y ;
Append x , y ,w, h to boxes [ ]
Append confidence to confidences [ ]
Append class id to class ids
```

VIII. TESTING

Testing is the process of judging a structure or allure component(s) accompanying the intent to find either it answer the particularized necessities a suggestion of correction. In plain dispute, testing is killing a whole so that label some break, mistakes, or missing necessities in a suggestion of correction the real necessities. Software Testing is a process of proving and ratifying either the program is performing right accompanying no bugs. It is the process of resolving or operating

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 7.39 ⁜ Vol. 11, Issue 3, March 2022

DOI: 10.17148/IJARCCE.2022.11372

program for the purpose of judgment bugs. It again helps to identify the defects / aws / wrongs that grant permission perform in the use rule, that needs expected fixed. Testing not only way repairing the bug in the rule, but more to check either the program is functioning in accordance with the given qualifications and experiment approaches.

Black Box Testing:

Black Box testing also known as Behavioural Testing, is a software testing method in which the internal structure/design/implementation of the item being tested is not known to the tester. These tests can be functional or non-functional, though usually functional.
This method is named so because the software program, in the eyes of the tester, is like a black box; inside which one cannot see. This method attempts to find errors in the following categories:
. Incorrect or missing functions
. Interface errors
. Errors in data structures or external database access
. Behaviour or performance errors
. Initialization and termination errors

White Box Testing:

White Box Testing is as known or named at another time or place Clear Box Testing, Open Box Testing, Glass Box Testing, Transparent Box Testing, Code-Based Testing or Structural Testing. It is a spreadsheet experiment means at which point the within form, design, exercise of the article being proven is popular to the experimental. The exploratory picks inputs to exercise courses through the rule and decides the appropriate outputs. Programming talent and exercise information is essential. White box experiment is experiment further the program that controls display and into the basic facts of a whole. This design is chosen so cause the operating system program, in analysis of the experimental, is like a silvery or obvious box; inside that individual distinctly sees.

Test Cases:

Test Case is the set of inputs along with the expected output and actual output some additional information.

Testcase ID 1:
Scenario - Image without any defects.
Input - Image
Expected output - No bounding box detected.
Actual output - No bounding box detected.
Result - Pass
Testcase ID 2:
Scenario - Image with single deformity.
Expected output - Single bounding box detected with defect probability.
Actual output - Single bounding box detected with defect probability.
Result - Pass
Testcase ID 3:
Scenario - Image with single deformity
Input - Image
Expected output - Single bounding box detected with defect probability.
Actual output - No bounding box detected.
Result - Failed
Testcase ID 4:
Scenario - Image with multiple deformities.
Input - Image
Expected output - Multiple bounding boxes detected with highest probability considered.
Actual output - Multiple bounding boxes with appropriate probability.
Result - Pass

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 7.39 ⁜ Vol. 11, Issue 3, March 2022

DOI: 10.17148/IJARCCE.2022.11372

IX. CONCLUSION

The project has achieved all the stages of incident. The project aims at building a order to fit into existent infrastructures to weaken the time necessary for study of avenue conditions. This scheme will considerably weaken the flow time of study and growth of roads. The system to analyze the drive environments has existed built that maybe surely integrated into some existent scheme. The future work may include construction an liberated platform available public accompanying individual API answers for every technical consumers. Other future everything include reconstructing the invention veracity and expanding the discovery physiognomy.

REFERENCES

[1] https://blog.roboflow.com/a-thorough-breakdown-of-yolov4/
[2] https://towardsdatascience.com/yolo-v4-optimal-speed-accuracy-for-object-detection-79896ed47b50
[3] https://medium.com/aiguys/yolo-v4-explained-in-full-detail-5200b77aa825
[4] Alexey Bochkovskiy, Chien-YaoWang, Hong-Yuan Mark Liao, ”YOLOv4: Optimal Speed and Accuracy of Object Detection” in arXiv:2004.10934 [cs.CV] (2020)