RoadVision

A computer vision based solution for pothole severity estimation

BY TEAM
APEXCODERS

INTRODUCTION

- The current pothole inspection techniques are highly labor-intensive and manual.

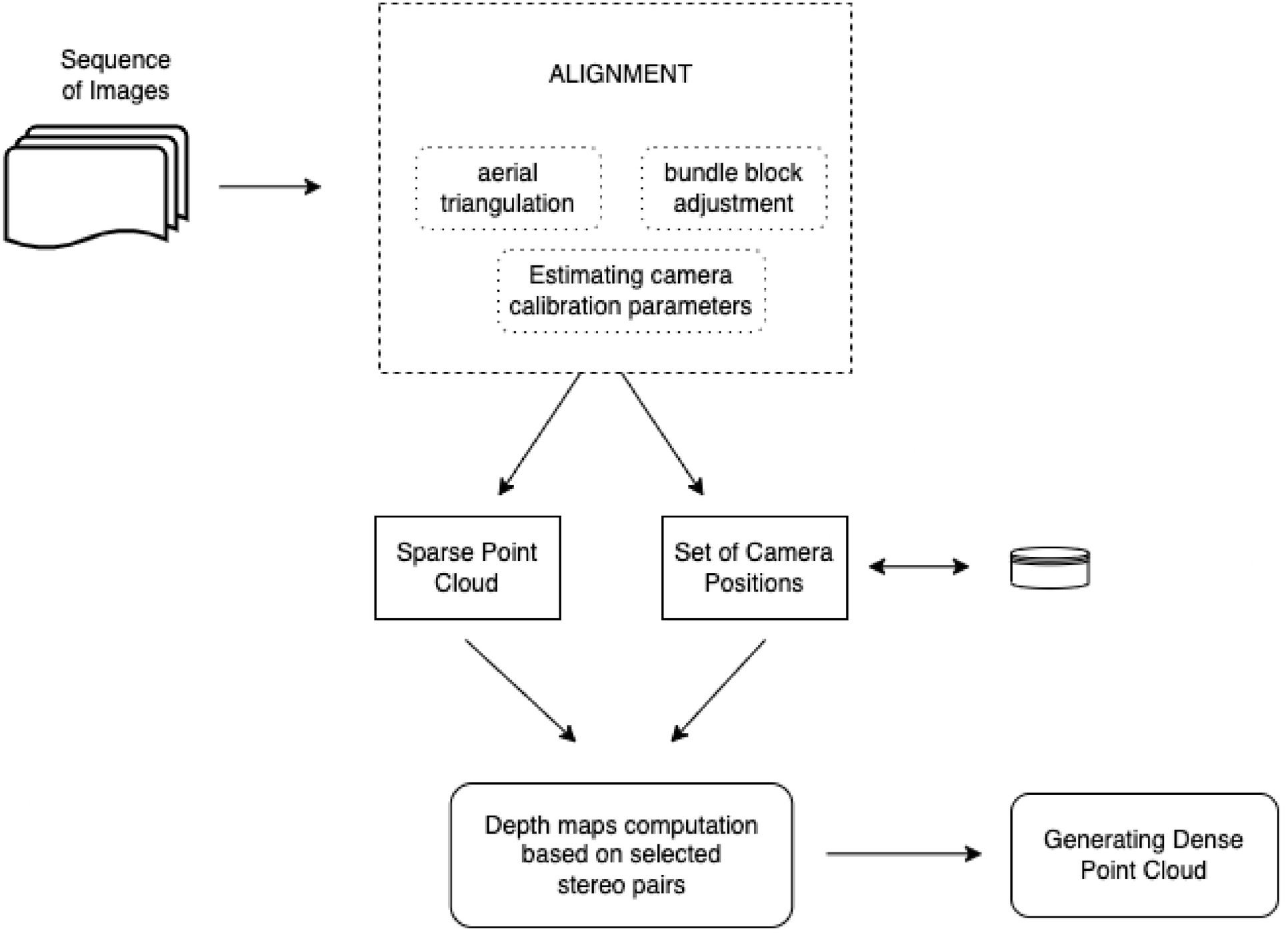
- Our solution is two-fold -
    a. Assessing the road quality using pothole detection and segmentation.
    b. Extracting the physical properties of identified potential potholes by performing 3D Reconstruction to estimate their severity.

POTHOLE SEGMENTATION

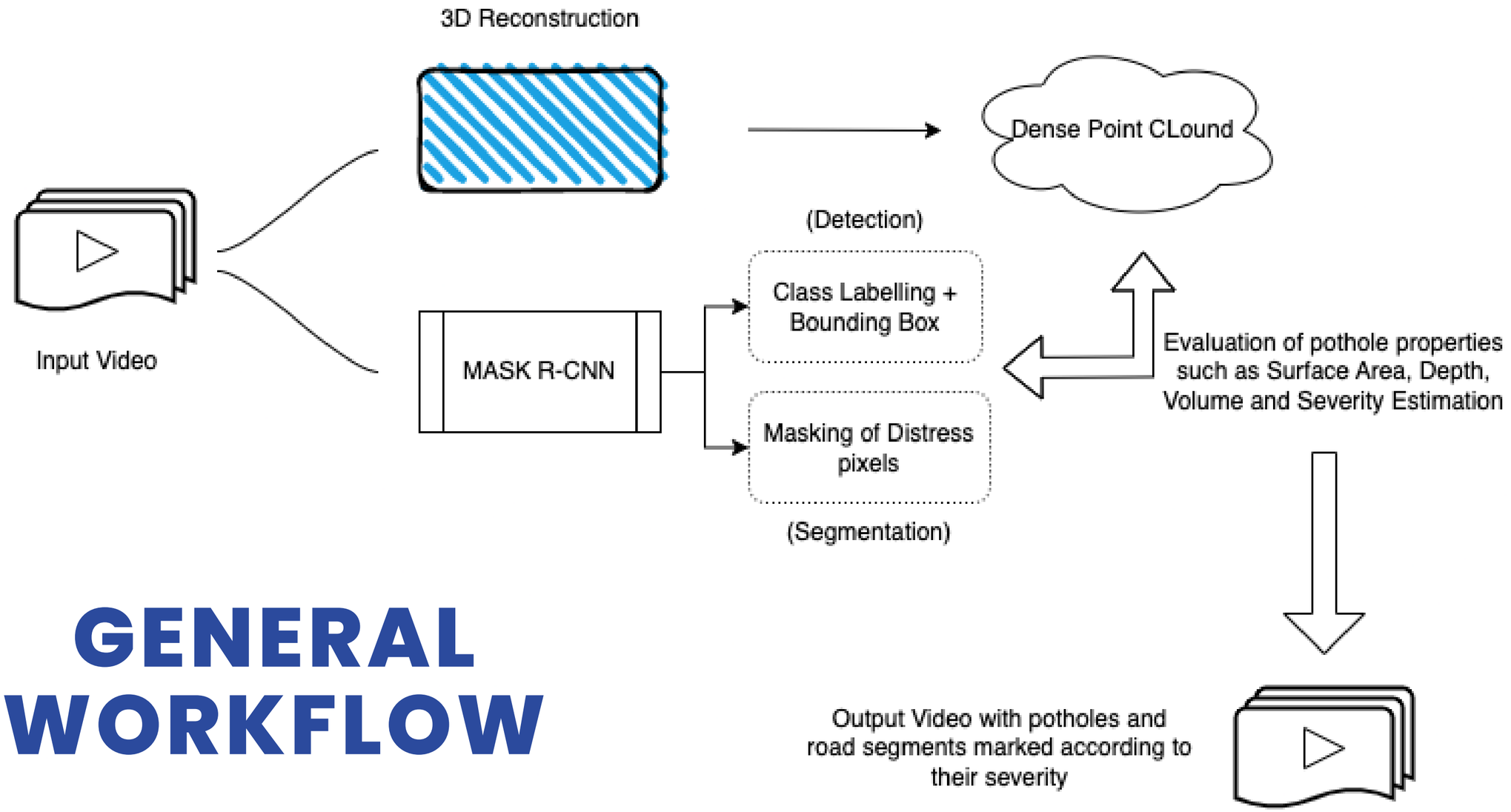
- Mask R-CNN architecture is used which works on top of Faster R-CNN
- The Model was trained on an aggregation of 5 datasets.
- We are able to gain the region and shape of the potholes with an accuracy of 82% which outperforms the YOLO (v5 and v7) models.

3D RECONSTRUCTION

- We have used the Agisoft Metashape software for creating 3D point clouds which executes the following steps: -
  - Alignment
  - Sparse point cloud construction.
  - Dense data point cloud construction.
  - 3D Mesh construction
- We have used python scripts to interact with the tool to automate the process of getting 3D spatial data.


Sequence
of Images
ALIGNMENT
aerial
triangulation
bundle block
adjustment
Estimating camera
calibration parameters
Sparse Point
Cloud
Set of Camera
Positions
Depth maps computation
based on selected
stereo pairs
Generating Dense
Point Cloud

GENERAL WORKFLOW



RELEVANCE AND FUTURE SCOPE

- Our solution is capable to be deployed on an edge(eg. NVIDIA Jetson Nano) and thus acts as a stand-alone automated project. In addition, it is highly cost-effective and computationally optimized, and is, therefore, a great alternative to LIDAR-related technologies.

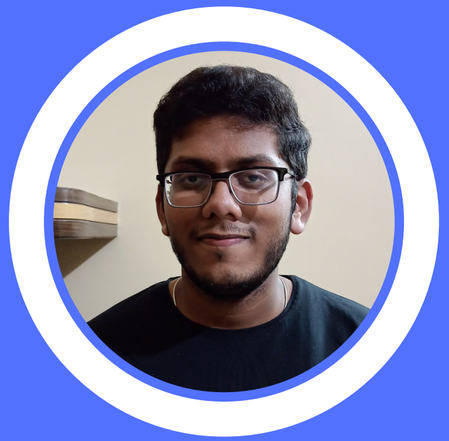
- This project can easily be scaled to be used with thermal and satellite imagery which is seldom used by city planners.

- It can also be integrated with Navigation apps (eg. Google maps, Waze, etc.) for better pathfinding, and also help in accident prevention.

LINKS

1. Report Link
2. Colab Notebook Link
3. GitHub Repo Link

TEAM APEXCODERS



SHIVANKAR PILLIGUNDLA

SRINIVAS MANDA

HARDIK KHANDELWAL

KARANJIT SAHA

NETRADEEPAK CHICHWADKAR

ABHINAV MAHAJAN

THANK YOU