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Smartathon Pitch Deck

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2D Multi-Model platform for intelligent data acquisition and analysis

Application on road damage and potholes identification

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PROBLEMS NOWADAYS

Potholes are a major issue for road maintenance agencies, causing damage to vehicles and posing a safety risk to drivers and passengers. **To efficiently repair potholes,** it is important to accurately identify and classify them according to their severity.

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Solution

- Using a low-cost dashcam equipped with GPS
- Falcoeye, the AI platform that will be used to extract pothole data and GIS information
- 3D GIS Visualization dashboard

Benefits:

LOW COST

low-cost dash-cam can be easily deployed on a large scale, making it an affordable solution for road maintenance agencies

MULTIPLE WORKFLOW

Using ensable of AI workflows give more accurate and more holistic estimate of the distribution of road damages

3D MODELING & RENDERING

The 3D environment allows for immersive and digital view of the roads and set the ground for a digital twin experience

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Dash-Cam

Capture the Footage

A dash-cam will be mounted on a vehicle to capture video footage of the road as the vehicle travels

Get Geographical Info

The dash-cam will be equipped with GPS to provide accurate geographical information for each frame of the video

Share-Riding Drivers

The dash-cams can be provided to share-riding drivers to cover most of the city as part of their daily job. This will ensure coverage of highways, as well as living areas

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What Is Falcoeye?

Falcoeye is the platform that we have developed to host the pothole detection workflows and provide the user interface for uploading dash-cam videos and extracting pothole data, including classification, abundance, and shape, along with GIS information.

Falcoeye Platform

The platform can scale automatically on a Kubernetes cluster

Developers can build new workflows and aggregation techniques

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Visualization & Analysis

We have also implemented a 3D dashboard with a GIS map and filters. The data extracted from Falcoeye is reprojected on the GIS map:

- This allows for a better understanding of the distribution of potholes in a given area and can aid in prioritizing repairs.
- The 3D application enables the user to filter the data by pothole type, size, and severity, allowing for more targeted analysis of the data.
- The user can also navigate in the map using a 3D model and see the potholes in the context of the road.

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CASE STUDY

- Built multiple AI workflows based on EfficientNet for the extraction and aggregation of the data

- Classify the road damage into 4 categories
  - **Longitudinal Crack**
  - **Transverse Crack**
  - **Alligator Crack**
  - **Pothole**

70mai True 2.7K 1944P M500 (120$)

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Riyadh-Dammam Intercity

Data:

4 hours of driving video at average speed of 120 km/h

Resolution: 2592X1944

Frame Rate: 30 f/s

Model:

Model type: EfficientNet

Model size: ~4 Million Parameters

Sample rate: 6/s (1 every 5 frames)

Device: Nvidia A100

Time: 5 hours

Findings:

26992 Longitudinal Crack

4675 Transverse Crack

1002 Alligator Crack

316 Pothole

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Future Work

Extract detailed information per detection such as shape, size, direction, and depth

- Parametric pothole mesher
- Displacement depth map
  1. Using deep learning
  2. Stereo view (pair of dash-cams)

AR/VR experience of detections

Thank You For Your Attention

In conclusion, the proposed pothole detection and severity classification system using a low-cost dash-cam with GPS and a set of pothole detection workflows served on Falcoeye, combined with a 3D application for data visualization and analysis

The system has the potential to significantly improve road safety and reduce the cost of road maintenance for agencies.