PROJECT TITLE

Training deep learning models for street surface analysis

Description of the company

Deutsche GigaNetz GmbH was founded in 2020 and has set itself the goal of building the next-generation fiber-optic network.

The young company is growing rapidly, now has around 500 employees across Germany and aims to grow to 1,000 in the next few years. It is one of the fastest growing companies in Hamburg.

In a highly competitive environment, Deutsche GigaNetz GmbH has asserted itself in a short time and offers high-speed Internet with giga bandwidths for companies and private households throughout Germany.

Initial situation

For the private-sector expansion of the fiber optic network, identifying and evaluating potential build-out areas is an essential part of the business model. Millions of data records are collected, analyzed and visualized for this purpose. Potential build-out areas are transferred to a portfolio from which the sales department can derive the next expansion projects in each case.

A key component of this process is surface analysis, for which new approaches are being sought as part of this project.

Problem

The identification and selection of suitable areas as well as the cost-benefit analysis for the build-out are associated with great effort. There is a lack of data sets that represent the roads and sidewalks as polygons. Roads and sidewalks are mainly available as lines, e.g. OSM, and are partly incomplete.

The existing datasets do not contain any or insufficient information on the surface covering of the roads and sidewalks. Corresponding data on roads and sidewalks, including surface coverings, must currently be purchased at high cost from external companies.

Aims of the project

The project aims to find new and creative approaches to classify surfaces and other objects. The goal is to develop a suitable method to combine existing digital resources and train an AI system accordingly.

Primarily, the segmentation of roads and sidewalks as well as the classification of the surface into the categories asphalt, pavement or unpaved is concerned. The objective is to train a deep learning

model for semantic segmentation of street surfaces using Google Street View maps. Semantic segmentation involves classifying each pixel in an image into specific categories, in this case, differentiating between various materials on the road surface. Google Street View provides a rich dataset of urban environments, making it an ideal source for training such models.

To achieve this, the process involves collecting and annotating a dataset of Google Street View images, where each pixel is labeled with the corresponding street material category (e.g., asphalt, pavement and unpaved). This annotated dataset serves as the ground truth for training the deep learning model.

The deep learning model, typically a convolutional neural network (CNN) or a similar architecture, is then trained on this labeled dataset. During training, the model learns to identify and segment different street materials based on the patterns and features present in the images.

Once the model is trained, it can be applied to new Google Street View images or similar urban scenes to automatically segment and classify street surfaces.

On the part of Deutsche GigaNetz GmbH, the following digital resources are available for a concrete build-out project:

- Ground truth driving data (point cloud and polygon)
- Images on site
- Orthophotos with 20 cm resolution

References

https://www.researchgate.net/publication/359747728_Pavement_Surface_Type_Classification_Based_on_Deep_Learning_to_the_Automatic_Pavement_Evaluation_System

Image-Based Pavement Type Classification with Convolutional Neural Networks | IEEE Conference Publication | IEEE Xplore

google-streetview-api · GitHub Topics · GitHub

GitHub - ProjectSidewalk/sidewalk-cv-2021

(PDF) Developing Sidewalk Inventory Data Using Street View Images (researchgate.net)

(PDF) FedUKD: Federated UNet Model with Knowledge Distillation for Land Use Classification from Satellite and Street Views (researchgate.net)

Street pavement classification based on navigation through street view imagery | AI & SOCIETY (usualwant.com)