Bridging 2D/3D: NeRFs and multi-modal surface reconstruction

Mainblades Inspections is on a mission to change the way inspections are performed for large commercial aircraft. Our company develops data-driven technology, focused on automation of the complete inspection process: from autonomous drone flight to damage detection and assessment of visual data, all the way to automated reporting. Our automated drone inspections for aircraft allow for a more rapid and effective inspection at any location, enabling our customers to *keep their aircraft off the ground*.

Research scope and objectives

After the success obtained in the 2D domain with CNNs, research in deep-learning-based computer vision has shifted focus towards fundamental 3D computer vision problems, one of the most notable being synthesizing new views of an object and reconstructing the 3D shape of it from 2D images. A novel technique, Neural Radiance Fields (NeRF), stores a volumetric scene representation as the weights of an MLP, trained on many images with known poses. The effectiveness of such method and its derivatives has led to more than 50 papers at CVPR 2022 related to NeRFs.

The goal of this assignment is to exploit all the sensor data that we collect with our autonomous drone to construct a unified view of the inspected area of the aircraft, where 2D images and 3D LiDAR data collected is merged and duplicate findings that might be present in overlapping photos are removed. This unified view will be presented to the users as an interactive 3D model, instead of relying on a multitude of photos. Results will need to be visualized on commodity hardware, which poses additional requirements in terms of rendering speed and memory footprint. Relevant reading material:

- Dense depth priors for NeRFs, Depth-supervised NeRF
- Generalizable Patch-Based Neural Rendering, IDR
- MobileNerf, Baking Neural Radiance Fields for Real-Time View Synthesis

Requirements

What you bring to the table

We are looking for a talented and enthusiastic MSc student, preferably with programming experience and a background in computer vision and deep learning. Furthermore, we are looking for people who like to be seriously challenged, have dedication and will for mastering new topics.

What we bring to the table

A comfortable and fun working environment:

- Collaborating with a young, dynamic, and multidisciplinary team in an innovative start-up.
- 2D/3D datasets and computational resources to conduct your research

The internship will have a duration of approximately 6 months starting at the latest in September 2023 and will be carried out in our headquarters in Den Haag.

If you think you got what it takes, and you are up for the challenge, take the first step and apply now! If we are interested, we will reach out and take you through our recruitment process.

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