Trainingsbilder-Generator für die IceBrain-1 Bilderkennungs KI

Training Image Generator for the IceBrain-1 Image Recognizer AI

Motivation:
Luleå University of Technology is heading to fly a series of AI in-orbit image recognition missions based on GOMSpace CubeSats. The system consists of a camera with large focus-length optics, an Instrument control Unit (ICU) and a reference AI image processor as well as a high performance GPU/FPGA processor. To train the image recognition algorithms before flight and later in flight to improve their performance, they need to be fed with a large amount of training image material and known recognition results. For this purpose an initial training image generator shall be implemented in Python. The image generation shall be based initially on Google Earth images and their artificial variation.

Task description of the thesis work:

- Familiarize with Google Earth and generation of images of a reference resolution. The initial source image shots need to be taken in 8k Resolution.
- Familiarize with the Python Image Library PIL. For purpose of automating the latter process, the image generator has to be implemented in Python or toolkits like OpenCV.
- Implement in PIL a function to center at a selectable position a 4096x3000 pixel frame inside the 8k original (7680x4320 pixels) and a crop/save-function to store the cutout under an automatically generated reference name. For visualization a 4k Monitor is sufficient.
- Implement a function to generate statistically differently positioned subselections/crops/filings.
- Implement a function to generate automatically rotated cutouts in 4096x3000 pixel resolution.
- Analyze the complexity to implement a cloud simulation by artificially (automatedly) place whitened areas in the image.
- Document the use of your image generator and the code for further enhancements.

The thesis will be accomplished at IRS, Uni Stuttgart.

Internal supervisor: Hon. Prof. Dr. Jens Eickhoff
External supervisors: Prof. Dr. René Laufer
Starting date: 01.07.2024
Submission until: 31.12.2024

Acknowledgement of receipt:
I hereby confirm that I read and understood the task of the master thesis, the juridical regulations as well as the study- and exam regulations.

Date
Prof. Dr.-Ing. Sabine Klinkner
(Responsible Professor)

Date
Prof. Dr. René Laufer,
Ext. Supervisor: Luleå University of Technology

Date
Signature of the student

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