## Assignment

Research Group Mechatronics is collaborating with civil engineering bureau StadLandWater (SLW, Goor, the Netherlands). SLW is responsible for consultation in the state of the sewer system in several gemeentes in the Netherlands. Due to the old sewer system in growing tree roots, cracks and corrosion of the concrete pipes are a major issue and can cause the sewer pipes to leak. Currently, SLW is driving around manually with a mobile platform, equipped with a camera, in a sewer system and visual detection of the issues is also done manually by an engineer sitting outside in a van. SLW would like to automate the detection of the issues and the movement (navigation) of the mobile platform.
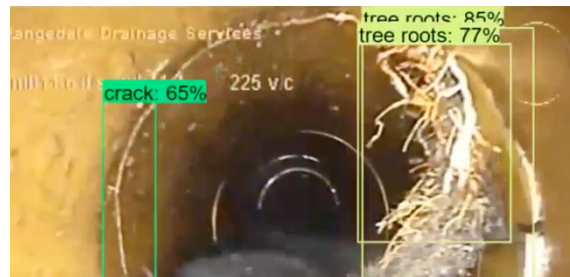
One of the ways to detect these issues is the use of artificial intelligence (AI) in combination with a vision system to classify the issues and localize and map the issue for navigation purposes. Therefore, the research group and SLW would like to have a trained AI network that is able to classify and localize the issues. Additionally, the coordinates of the localization have to be used to drive a mobile platform towards it. SLW has a huge data set available which is already labelled manually, and this data set can be used to train the network. Furthermore, support by the research group of Computer Vision and Data Science of NHL-Stenden in Leeuwarden can be realized.

Task description

The graduation assignment focusses on the design and realization of a classification and localization trained network for sewer inspection that can be used in a mobile platform in sewer systems. The tasks of the student will include:

- Formulating the system requirements, according to the V-model
- Camera and lens selection suitable for sewer inspection
- Continuation of artificial intelligence (AI) research based on results from Saxion MT and NHL-Stenden in Leeuwarden on the already deployed AI frameworks to:
    - fully detect the need for sewer maintenance due to material fatigue and defects (e.g. sewer pipe deformation by corrosion)
    - determine the localization of these sewer defects with respect to the inspection robot position inside the sewer system
    - automatically navigate through a sewer system by using e.g. visual odometry in combination with stereo vision to measure robot displacement
- Setting up experiments and performing measurements to validate the performance of the AI framework in relation with autonomous navigation.
- Realizing of a functional proof of concept for the automated inspection robot.

Practical Information

Student Profile: Mechatronics, Electrical Engineering, Computer Science
Duration: September 2020 – February 2021
Compensation: 230 euro per month, before taxes when carrying out this assignment at Mechatronics.
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