Bundesministerium
für Verkehr,
Innovation und Technologie

PlasmaTram

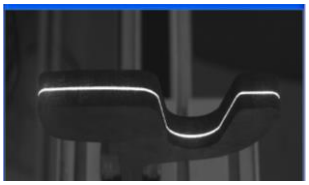
Profile Laseracquisition System meets Austrian Tramways

(A research project funded in the 4th call of the funding scheme i2v relating to the research- and technology program i2vsplus)

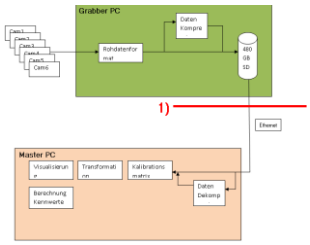
Within the collaborative research project **"plasmaTram"** a prototype was designed by a Viennese consortium consisting of Wiener Linien, Austrian Institute of Technology and Plasmo Industrietechnik GmbH. The new system scans and measures the surface of the entire track elements of the Viennese tramways, with an accuracy that has never been obtained before. By using a very fast camera technology, which was tested on a rail system, it became possible to record the surface **geometry of the tracks with an accuracy of 0.14mm x 0.9mm (height x width) and a longitudinal resolution of 6 mm at a forward driving speed of 60km/h**.

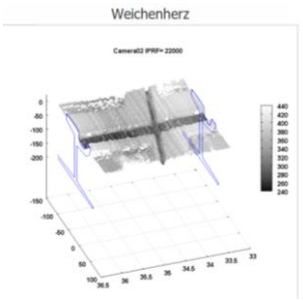
The prototype was integrated into the test and measurement vehicle of Wiener Linien. So the measuring system was tested and demonstrated several times under actual conditions in an urban environment. Following the achieved insights and basic conditions, the system was adopted to reach the best measuring-outcome. The integration of the measuring system into the test vehicle in an ideal way, required to develop a special mounting and enclosure. The entire cabling was integrated and a custom control and measuring station was built. To reach the high accuracy, a laser with an enormous light energy was used in this prototype. To provide the safety and security from the laser light, experts were procured from Seibersdorf Laboratories and the system enclosure was designed. So that it reaches the security claims for the safe use in a public area, the measuring system was certified to be a class 1 Laser System.
A couple test measuring rides were made for demonstration, validation and detection of required adjustments. Out of these results the absolute-accuracy, the repeatability-accuracy and the systems stability were verified. This also required that measuring and evaluation software be developed. Therefore a couple different criteria had to be fulfilled: First, it has to insure that a **live-view** was shown **during the inspection ride**, where the staff operators can immediately find enormous faults in the tracks surface. Thereby a large amount of data has to be processed and the necessary measuring values to be calculated in **real-time**.
Also, an enormous amount of data has to be shown and saved in real-time, so that it can be stored in a maintenance database, and available for any further analysis. For this purpose a **special compressing algorithm** was developed, which compresses the data to a tenth of the origin size, in real-time without any losses. It is a streamable file format which enables highly efficient access, to only one profile without any additional indication, even when there are hundreds of gigabytes of data. To function with the requirements of street conditions, the optical system was designed to withstand any **dynamic requirements**. Also some special elements for calibrations were developed, which are supposed to help the measuring system to calibrate absolutely and automatically. It offers the opportunity during long-term work to check on a regular basis if another calibration is required. It is also needed to ensure the system comparability and that an absolute optical measurement between the two rails is possible. The derived measurement values (e.g. distance between the rails) are very important. Because of the high resolution of the camera system, it was determined in the course of this project that it's possible to capture and measure elements on the left and on the right side of the rail. This provides will provide a great benefit to the rail systems in future. Especially, when it becomes possible to **recognize special elements of the rail track** with the prototype, **like switches, switch blades or cross-ways**. These elements can also be automated for continuously monitoring using an accuracy that has never been seen before. The long-term goal is to use the insights reached to manufacture an automated system for maintenance and level grinding of the rails and to apply similar developmental steps to subways. The final goal is to produce a track control system for

any urban environment which established itself on international basis, where it can easily be modified for use on all the different gages and types of railways around the world.





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