

Internship/Thesis - Camera-Based Display Content Validation for Automated Testing

Description

Televic Rail designs and develops both LED and TFT display systems, including the complete hardware and software stack. During system testing, product validation, and production testing, it is often necessary to verify whether the visual content shown on a display matches the expected output. Today, this verification is largely performed manually: an operator or developer physically inspects the display and confirms whether the content is correct. This process is time-consuming, error-prone, and difficult to scale in automated test environments.

The goal of this thesis/internship is to design and implement a camera-based validation system that automatically verifies the visual content of a display. The student will develop a scalable and reusable software module that captures images of a display using a camera and processes these images to determine whether the displayed content matches the theoretically expected content.

The system will include several key components:

- Automatic detection of the display region within the camera image (e.g. locating display edges and correcting perspective).
- Sampling and reconstruction of the displayed pixel or color information at a configurable resolution.
- Comparison of the captured display content with the expected pixel map generated by the system under test.
- Decision logic that can reliably determine whether the display output is correct within defined tolerances.

A major part of the work will focus on classical computer vision and image processing techniques such as edge detection, geometric transformations, color space conversion, and noise filtering. In addition, the student may explore the use of machine learning or lightweight AI techniques for a.o.:

- Robust correction of lighting variations and reflections.
- Improving detection accuracy under non-ideal conditions (different camera positions, ambient light, or display brightness).

The outcome should be a proof-of-concept system that can be integrated into automated test setups, enabling objective and repeatable validation of display content without human intervention.

About Televic Rail

With over 30 years of experience in designing, manufacturing and maintaining on-board communication and control systems, Televic Rail is a leading, trusted partner for railway operators and train builders worldwide.

Its Passenger Information Systems and Control Systems are high quality, tailor-made solutions that offer the flexibility, user-friendliness and stability that our clients ask for. Our various types of on-board control systems such as our bogie monitoring systems are innovative, yet reliable products designed specifically for the railway business.

Trains and trams all around the world are equipped with Televic Rail solutions, from New Zealand to Canada, from China to the United States, from India to Belgium, England and France.

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Nature of the work

Level	Keywords	Type of work	Location	Num. of students
Master	AI / Machine Learning, Automation, Software	Research: 30% Implementation: 50% Experimentation: 20%	Televic	1 or 2