

Augmented reality for the smart railway workshop

Al-supported assistance systems for intelligent maintenance

Content Partner: ZEDAS GmbH, Senftenberg

Mobile applications are becoming increasingly important in railway maintenance workshops, as they facilitate the maintenance of complex equipment such as a rail vehicle. ZEDAS GmbH, a software specialist for the maintenance management of railway vehicles, is already supporting its customers in the digitalisation of the workshop towards a paperless workshop, among other things with intuitive tablet applications especially for workshop employees.



In other industries, data glasses and Al-supported assistance systems are already in use in maintenance. The practical suitability for the railway industry needs to be tested. In order to better guide maintenance staff through the maintenance process, ZEDAS GmbH is working together with BLG RailTec GmbH and the Brandenburg Technical University Cottbus-Senftenberg in a research project on an augmented reality (AR) application for the data glasses and tablet specifically for the railway maintenance plant.

With the AR application, it is possible to relate a vehicle in the workshop and an order from the asset management system in three dimensions. This means that the corresponding work area on the vehicle is marked for the maintenance task, arrows show the correct position of the next component to be worked on and drawings, documents, photos and videos are displayed in context.



When a vehicle arrives at the workshop, the artificial intelligence-based system of vehicle number recognition takes over the unambiguous identification. Existing orders, faults and checkpoints are displayed via AR directly on the screen section with the vehicle. In this way, the maintenance staff immediately know which components are subject to orders. They are supported by checklists, instruction videos and documents when carrying out maintenance measures.

High process reliability

There are high safety standards in the rail sector. Through guided maintenance, the digital assistance system guarantees that the workshop employees are specifically informed about safety-relevant components. The next work steps are only activated once the instructions for the work step have been read. In addition, the notes and process information can be updated easily and centrally - the workshop employees are always up to date.

Clearly defined workflows give the maintenance staff exactly the sequence and the positions at which they must carry out the work steps. They are guided step by step from component to component and receive visual instructions. The AR application also displays the measured values, limit values or circuit diagrams of the components to be processed. In addition, the associated maintenance plans can be viewed: this means that maintenance staff can carry out maintenance at the same time as rectifying a fault. AR helps to increase the reliability of service and maintenance processes and reduce the risk of errors.

Time saving through automated, immediate ECM-compliant documentation

Which orders have been processed? Which ones were started? Which resources were used and which materials were consumed? In many workshops, this is filled out on paper by the maintenance staff and then has to be digitised and archived by office staff in a time-consuming process so that all documents are available in ECM-compliant form for official inspections.

Digital documentation is different: the workshop employee simply documents work steps, measured values and the like by voice command or tablet in parallel during maintenance, because the digital assistant is always with him. The immediate, digital documentation alone saves a lot of time and avoids errors.

This creates uniform, person-independent protocols that are available in real time in the main system for archiving, for authorities or for the end customer during contract work.

Securing and providing knowledge

It is a challenge when experienced employees retire or leave the company for other reasons. Much of the knowledge goes with these employees.

The AR application can mitigate this loss somewhat, because it acts as a knowledge repository that supports new and external employees in particular. Experienced employees store their knowledge of the process steps in the central database and show how certain maintenance processes are best carried out. This creates a reference manual that can be implemented later by other employees, but can also be further optimised. If the instructions and documentation are only saved in paper form, it is difficult to always provide all employees with the latest version. After all, who can ensure that no old versions are in circulation?

But how is the knowledge store filled? The knowledge store is fed from two sources: the main system zedas®asset, which is a railway-specific CMMS (short for Computerised Maintenance Management System, which helps to manage assets, plan maintenance work and track work orders) and the editorial documentation. In the best case, the recordings for the documentation are simply made in parallel during maintenance. In the process, maintenance activities are also documented and recommendations for action are stored, which only take place infrequently or are only carried out by individual persons or in individual workshops.

Skills shortage

Maintenance staff who are specialised in certain series of rail vehicles can more easily switch to other series. Shortages of skilled workers can be mitigated by assistance systems. For example, they can support



new employees or subcontractors who are less familiar with certain components. Especially for young employees, the workplace is more attractive with new technologies. An intuitive, simple user interface with few buttons and short instructions is essential so that both experienced and inexperienced employees accept and work with this digital assistant.

What are the advantages of AR applications?

Defined workflows ensure processes that follow a continuous, everlasting concept. This makes it possible to control the use of components and personnel much more efficiently and to achieve the greatest possible economic success.

In addition, the use of AR can be used for the induction of new employees or for training. But long-serving employees can also use these applications for training and instruction in new processes or series.

With the help of checklists, the company's own processes can also be covered and the quality of the work can thus be ensured across other maintenance centres.

Conclusion

The aim of the zedas® AR applications is to improve the quality of work and also safety with the help of AR. Depending on the situation and object, information is displayed to the user where it is needed: directly in the field of vision and on the object in question.

The goals of the research project are the development of an Al-based repair assistance system to secure knowledge, which can simultaneously take over the qualification of specialist and non-industry personnel, the establishment of an attractive employer image and the development of SMEs, via the digitalisation of their processes and the use of AR/VR systems, into an efficiently and innovatively working interface between society and industry. In this way, it aims at technical, especially Al-based, but above all also economic and social innovations.

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The AI-based application recognises the wagon number