8) AWEAR - A Wearable Expert Augmented Reality System; **Research Studio Forschungsgesellschaft mbhy**, Austria

EXPERIMENT DESCRIPTION

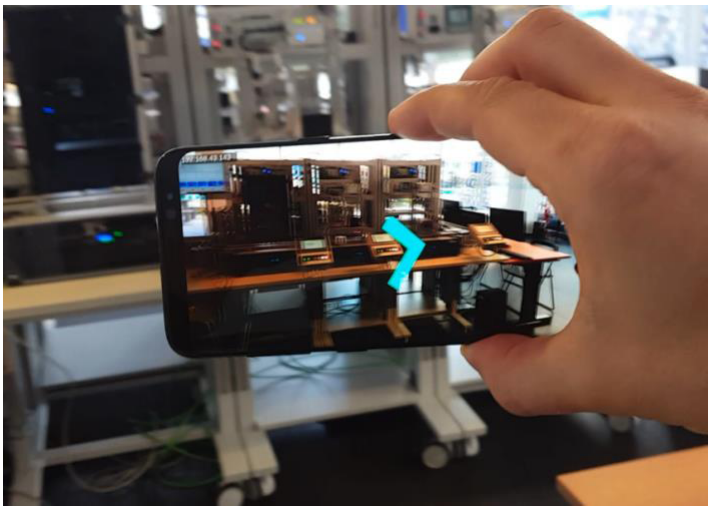
The AWEAR platform enables the creation of 3D maps (development of 3D models) of complex industrial facilities using low-cost mobile sensors. The AWEAR platform is, based on the created offline models and current sensor data (RGB + IMU), able to accurately localize the worker (position and orientation) without the need of further expensive sensing infrastructure and provide assistance in the form of augmented navigation guidance, e.g. for maintenance workers or remote expert applications. The challenge of the AWEAR project was to realize the integration of cutting-edge awareness technology (object tracking, real-world interaction, user localization in complex environments, augmented reality) and to provide a unique combination of technology and thus functionality. The modular technical augmented reality (AR) platform can be adapted to most diverse industrial assistance applications enabling both, adaptivity and scalability.

TECHNICAL IMPACT

The realization of the AWEAR platform consists of three main components:

1. Generation of a point cloud 3D model of the relevant **environment**.
2. **Localization** of the user in the recorded environment and tracking motion of user or users.
3. Displaying **AR** guidance markers.

Environment Model Generation – SLAM (Simultaneous Localization and Mapping) is an approach towards solving the problem of localizing a mobile device in a potentially unknown environment and keeping track of its position.
The localization of the camera in its environment is performed by extracting 2D features from the RGB image and associating them with 3D locations in the environment. 2D features are saved to a database, once the environment is mapped.
Visual guidance markers were created in Unity, a cross-platform real-time 3D engine developed by Unity Technologies. The application creates markers and places them in 3D AR space following the localized position from the SLAM / odometry information. This application was deployed to the smart phone and used in the testing and demonstration cases.



ECONOMICAL/BUSINESS IMPACT

The number of embedded and wearable computers increases exponentially, it is being introduced into more and more types of everyday applications, and a wide span of algorithms tackle increasingly complex problems. However, the nature of man-machine interaction is still largely dominated by decades old paradigms. The latest developments in interactive ICT systems are approaching truly immersive and intuitive interaction. Especially augmented and mixed reality technologies offer interaction potentials which will shape the future of interaction design.
With the lack of available commercial solutions that combine the different fields of research, the AWEAR project explores the feasibility of the technological fusion of mobile sensing, awareness, actuators and interaction design in a mobile, modular ICT solution. The AWEAR project realized the fundamental prerequisite of advanced AR systems, which covers the detailed indoor localization (location and orientation) based alone on the mobile sensors. For that purpose, it provides the 3D mapping of a shop floor into a 3D model based on the SLAM technologies.

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