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A Participatory Approach to Investigate Potentials of AI based Video Tutorials on Head Mounted Devices

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Knowledge transfer and learning from others play an important role in many current workplaces [1], [2]. Besides other solutions, video tutorials are helpful tools for knowledge transfer in practice [3], [4]. Despite their utility, the use of video tutorials faces several difficulties: First, users need to find a suitable tutorial for a certain situation, which can be time-consuming. Second, tutorials might include instruction steps the user is well aware of or does not need. This leads to a time-consuming and cognitively stressful search for a right sequence to start with because the user has to search the video for the desired step. Third, tutorials need a device to be played on. Especially for tasks that involve users' hands. This poses the challenge to consume and control the tutorial while working on a task. In our project "smARtorials", we aim to overcome these challenges with the help of artificial intelligence (AI) to find tutorials and steps in them in an efficient way and head-mounted displays (HMDs) to show tutorials during the conduction of tasks.

To the knowledge of the authors, there are neither solutions nor research insights available for AI-based video tutorials on HMDs, and therefore little is known about their potential benefits.

We applied a participatory process to design our solution, which involves relevant stakeholders from the beginning. With this process an efficient user involvement into the design process is given to create a useful and accepted solution. As AI and HMDs are new for most users, participatory discussions about the value of AI-based tutorials proved to be difficult. Therefore, we developed a set of criteria that make requirements transparent and usable during discussions with users. With the help of these criteria an efficient discussion with stakeholders can take place and a suitable use case can be detected. These criteria were derived from an ethnographic study at the workplace of our project partners and figure 1 shows an overview of the approach, which is described below.

Figure 1: Overview and current state of the approach.

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In order to get insights into potential use cases, we conducted an ethnographic study, in which we observed 17 people for 39 hours and interviewed them. After that, we used the affinity diagram method as described for contextual design to focus on the perspective of potential users of our product [6], [7]. With the help of affinity diagrams, the collected data was sorted and categorized (see figure 2). Among other insights, this resulted in potential use cases for AI-based tutorials on HMDs.

In the next step, the emerged use cases needed to be analysed together with stakeholders (e.g., user and their superiors). To overcome the aforementioned difficulties posed by the lack of experience concerning AI and HMDs among the stakeholders, we derived three levels of criteria:

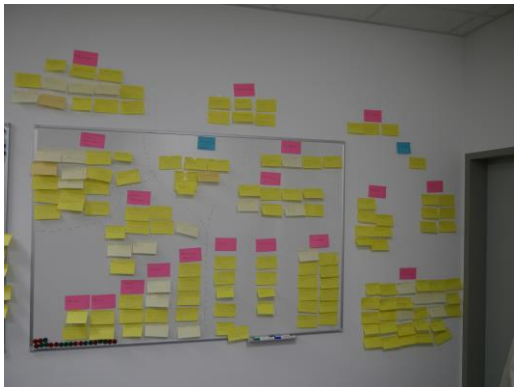

Figure 2: Extract from the created affinity diagram to sort the qualitative data.

1. Criteria for added value by AI based video tutorials: Our approach aims to use AI to determine (e.g., by object recognition) which (step in a) video tutorial is needed while a person is conducting a task. Therefore, our criteria include whether (A) a situation would benefit from choosing from multiple tutorials available and whether (B) there is a need to jump to certain step in the tutorial. In both situations the time and cognitive effort to detect and select a tutorial should be decreased with our solution.
2. Criteria for added value by HMD based video tutorials: One advantage of using video tutorials on HMDs is that users can execute the displayed task simultaneously [8] and thus faster [5]. Therefore, our main criterion here is whether a task needs both hands to be conducted.
3. Criteria for knowledge transfer on the task: To ensure that a use case benefits from knowledge transfer, we included multiple criteria that can be found in the literature, including the following (among others): Frequency of the task, alternative solutions potentially suited better, and the nature of the knowledge transfer problem.

In initial discussions with stakeholders, especially the first level of criteria (regarding the value of AI) proved to be beneficial, as it reduced the question of added value by AI to two simple questions that could be answered by all stakeholders. For example, these criteria led to a decision against a routine task that lasted about 50 seconds per conduction, as stakeholders realized that it was a highly standardized task with only a few steps. Instead, we decided for a more complex task that involves human-robot interaction, in which the human needs to identify and solve many potential errors of the robot.

Overall, we found that the presented criteria allowed the prioritization and discussion of use cases and therefore enable participatory design decisions for human AI interaction despite varying knowledge among stakeholders. Additional, these criteria

increase the quality of discussion with the stakeholder, which results in an efficient selection of use cases. So far, we have applied the criteria to two use cases (production and healthcare). Our next step will be to hold workshops and explorative sessions to evaluate the criteria and resulting choices. This will help us to create prototypes,. The workshops and explorative sessions will be conducted in January and we will present the results at the workshop in February at the WI22. During the workshop, we would like to discuss whether and how our approach can ease the participatory design of human AI interaction.

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