

WHITE PAPER  
BY IMMERSION

**REMOTE  
ASSISTANCE  
IN MIXED  
REALITY**

 **IMMERSION**  
imagination, interaction...

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## INTRODUCTION



Working with others has always raised multiple questions. What is the optimal process to take together the best decisions? Which solutions can facilitate the communication between participants? How to handle conflicts and contradictory opinions?

Answering such questions is already complex when users are co-located, but it becomes even more tricky when it is not the case.

Remote assistance scenarios imply two main characteristics: 1) users do not share the same physical space and 2) they do not have the same knowledge and capacities. On the one hand, local users can physically act on their surroundings, but need help because they do not know how to proceed with the task they have in mind. On the other hand, remote helpers have the expertise to perform this task, but cannot achieve it because they are not physically present at the corresponding location. Remote assistance is thus closely linked to remote guidance.

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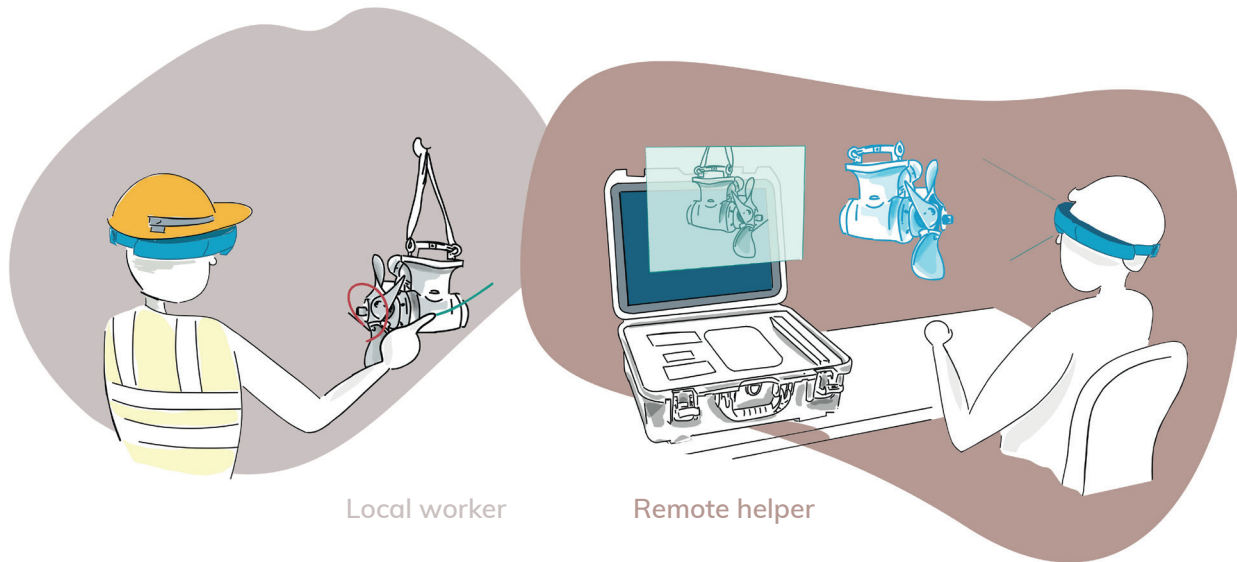


Figure 1 : Example of remote assistance scenario in Mixed Reality.

The recent Covid-19 pandemic and technological progress increased further the already growing interest for remote assistance. In particular, Mixed Reality (MR) is currently explored as a promising tool for many application domains like industry [43] and surgery [18].

The goal of this white paper is to give an overview of the current research about remote assistance in MR. To do so, we present 10 selected research articles on this topic: 9 recent articles (from 2015 or more recent) and 1 legacy article (from 1994). These articles are regrouped into four main sections. After discussing the notion of MR (Section 1), we present two key application domains for remote assistance: industry and surgery (Section 2).

Then, we focus on visual activity cues and methods to represent remote users in order to facilitate guidance and remote cooperation (Section 3). Eventually, we go over a selection of out-of-the-box papers with unique concepts or approaches (Section 4).

By adopting a Human-Computer Interaction (HCI) point of view, we hope to inspire developers, designers and researchers interested in remote assistance to bring further Mixed Reality applications.