X-ray vision augmentation for hidden network maintenance

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Maintenance of hidden or buried networks (power supply, wired communication network, water supply, gaz distribution pipes) is a major concern in urban environments. Modern infrastructures (such as the new Paris-Saclay campus) increasingly rely on a digital representation called Building Information Model, which can be leveraged to assist maintenance operations. Providing on-site, dematerialized, hands-free information about the location and status of such networks would save operators valuable time and money. This internship will investigate how Augmented or Mixed Reality (AMR) techniques can provide actual assistance to operators during intervention on hidden networks.
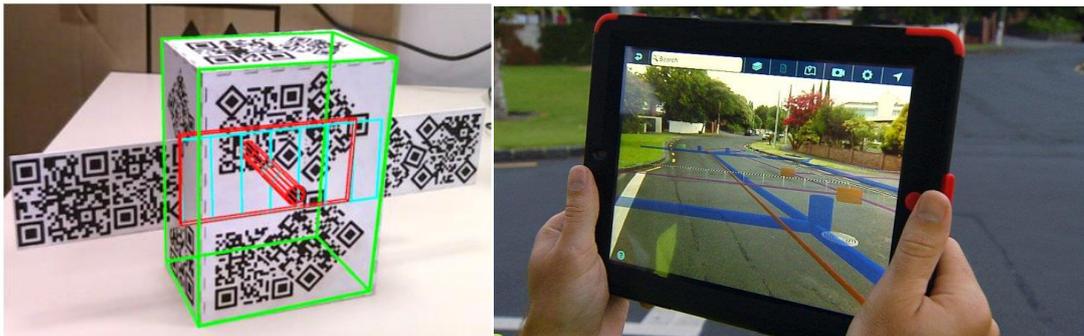
Providing information about hidden objects with an augmented reality display
Left: assembly test case [1]. Right: hidden networks display.

In 2017, a study was carried out on the use of visual augmentation techniques for assembly tasks (see left figure). Building on this initial experience, we now want to study a more concrete scenario where the task consists in locating a breakdown on a hidden computer or electrical network. More specifically the objective will be to compare the current mode of intervention, based on 2D schematics in paper or digital form, with a mode using AMR, which allows visualizing information such as location, but also network status, directly on the site.

The trainee will carry out the entire process of designing and evaluating the system:

-   Refining the scenario down to a workable prototype;
-   Manufacturing a simplified model of the prototype thanks to the Digiscope FabLab, on a reduced scale (due to the technological limitations of the Mixed Reality equipment);
-   Implementing the AMR interface used with the prototype;
-   Evaluating the system both objectively (time of completion, error rate) and subjectively (questionnaires), and compare AMR with a more traditional approach based on paper plans and/or hand-held electronic devices.

The AMR system will use the HoloLens, and the interface will be built with the Unity platform.

Possibility to apply for a PhD scholarship at the end of the internship.

REQUIRED SKILLS: Unity / C# / Visual Studio / FabLab

REFERENCES:
[1] N. Khenak." Mixed Reality and Tangible Interface for Assembly Tasks" Master Internship report 2017.