Mapping Maps with Augmented Reality

Caroline Appert and Emmanuel Pietriga
appert@lri.fr, emmanuel.pietriga@inria.fr

Although we hope to be able to work at the lab, this internship can be done remotely if necessary.

Internship period: starts March 1st or April 1st, with a 5-to-6 month duration
Supervisors: Caroline Appert and Emmanuel Pietriga
Research team: ILDA, Inria (building 660)

Maps are available on different media: paper, personal devices, public displays, etc. They present different types of geographical features, describe different characteristics of the same features, or represent those features at different points in time. Users often need to relate information from various geographical representations to build knowledge and/or make decisions. However, it is difficult to cross information from maps that are rendered on different media which do not communicate with each other.

Augmented Reality Head-mounted Displays (ARHMDs) such as the Microsoft Hololens or the Magic Leap are becoming both affordable and increasingly powerful, promising a future where wearable Augmented Reality can be part of users’ technological environment. But as smartwatches have not replaced mobile phones or tablets, ARHMDs will likely rather complement our set of personal devices than replace them.

The goal of this internship is to design a system that makes it possible for users to relate a map present in their environment with a map displayed on their smartphone, by means of visual cues displayed in Augmented Reality. As the system does not have any a priori knowledge about the map in the physical environment, users would first indicate to the system a few correspondences between pairs of points of interest on both maps. The system would then infer a global relation between the two maps and display relations between them in AR.

In this internship, the student will:
- do a literature review of cross-layer and cross-device map systems, as well as geographic projections;
- investigate different design solutions to display, in AR, relations between maps or points of interest;
- demonstrate/validate one design solution by means of a working prototype (typically using Unity).

Bibliography

When geographical information is available as different layers that are aligned with each other, some strategies exist to compose information from different layers [1]. Some research prototypes also investigate cross-device solutions for navigating a single map (e.g., [2, 3]). Mobile devices can also be used as peepholes over a large map. For example, [4] combines two spatially-aware mobile devices, a smartwatch and a phone, to navigate a single map representation and create bookmarks. [5] is another interesting example that combines a tabletop and a spatially-aware tablet device to enable both 2D and 3D navigation. However, all these approaches make the assumption that the system has a priori knowledge about all the devices and maps that are at play. In this internship, we will address the challenge of connecting a map present in the environment to the system without any a priori knowledge about this map.


