



Presenting Historical Photos Using Augmented Reality

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Introduction 1/2

- Challenge: Present historical content and information illustratively and interestingly for the audience
- New mobile devices: good computational and graphical capabilities, have become wide-spread
- Attractive solution: Augmented Reality (AR)
- One of the easiest types of historical content to present in AR: historical photographs
- We present mobile applications to show historical photos for tourists in Augmented Reality

Introduction 2/2

- Projects Futuristic History and StreetSmart
- Both investigated how to present information visually for tourists
 - Futuristic History was a two-year Tekes project (2013-2014), and it provided tools and workflows for museums and cities to create historical content for virtual and augmented reality
 - StreetSmart was an EIT ICT Labs (2014) project with main focus on mobile retail applications, but where we also investigated application possibilities that could be interesting for tourists
- Creating 3D content and animations is tedious and thus expensive
- Therefore, we investigated in both of the above projects an easier approach: presenting historical photographs in AR using mobile devices

Augmented Reality = AR, tracking

- In Augmented Reality we add virtual objects to live video
 - For example, a building being planned can be presented virtually, so the audience can see it in its future location, and they can walk around it and see it from various directions
- So the virtual objects would fit seamlessly to the reality, the camera pose must be determined (in every video frame!) by analyzing the image. This is called tracking
- Often the aim is to detect one or several physical objects in the image, and the virtual objects are rendered on top of the detected physical objects
- 3 tracking methods: marker-based (2D), image-based (2D), and pointcloud-based (3D).
 - Marker tracking: Avoided, markers hard to handle
 - Image tracking: Physical targets must be flat(image, wall).
 - 3D pointcloud: No limitations, but heavy computation
 - (usually 3D object or interior space)



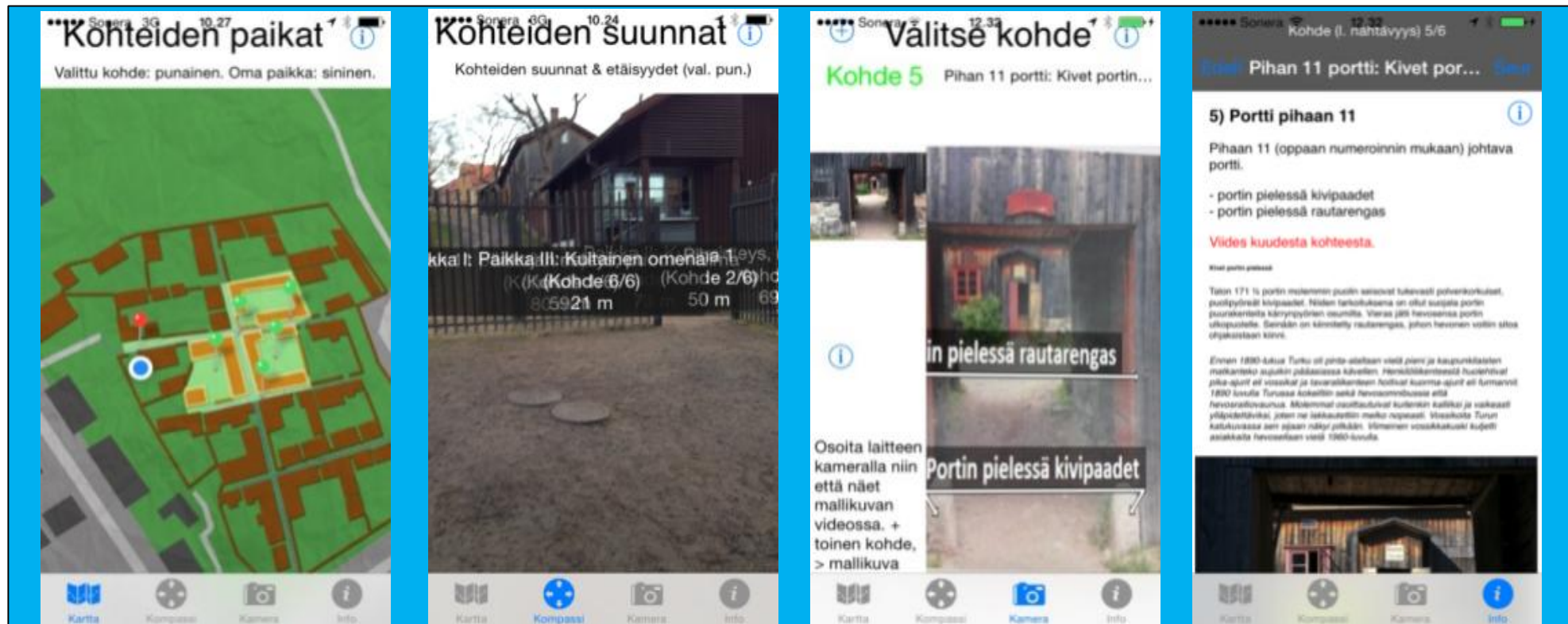
Pilot Software

VTT demo applications:

- Luostarinmäki (Turku)
 - Using AR in orientation and guidance
 - Map overlay, transparent images, historical texts
- Kauppatori (Turku market square)
 - Presenting historical photos in AR
 - Historical photos of demolished buildings + info pages
- Helsinki (market square, senate square)
 - Presenting historical photos in AR
 - Scenes of historical Helsinki + info texts
- Helsinki (market square, senate square)
 - Testing pointcloud-based tracking in AR
 - Simpler UI, robustness of tracking was tested

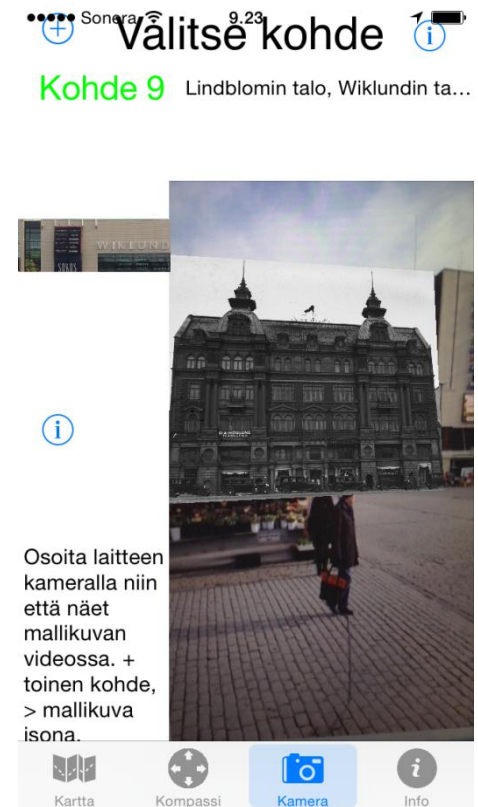
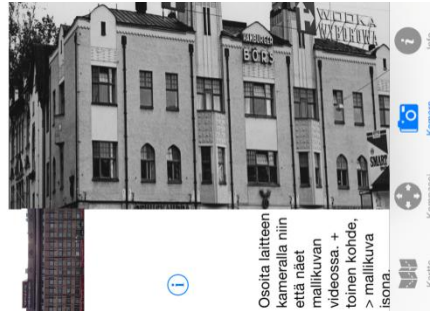
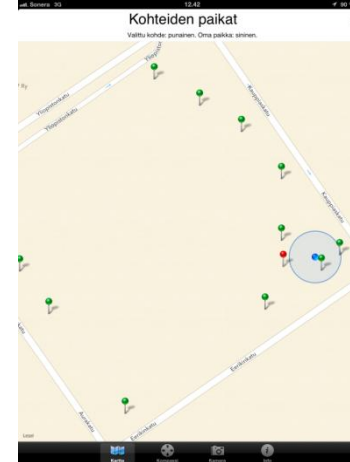
Pilot 1: Turku, Luostarinmäki

- Using AR in orientation and guidance; map overlay, transparent images, historical texts; 4 tabs: Map, Compass, Camera, Info



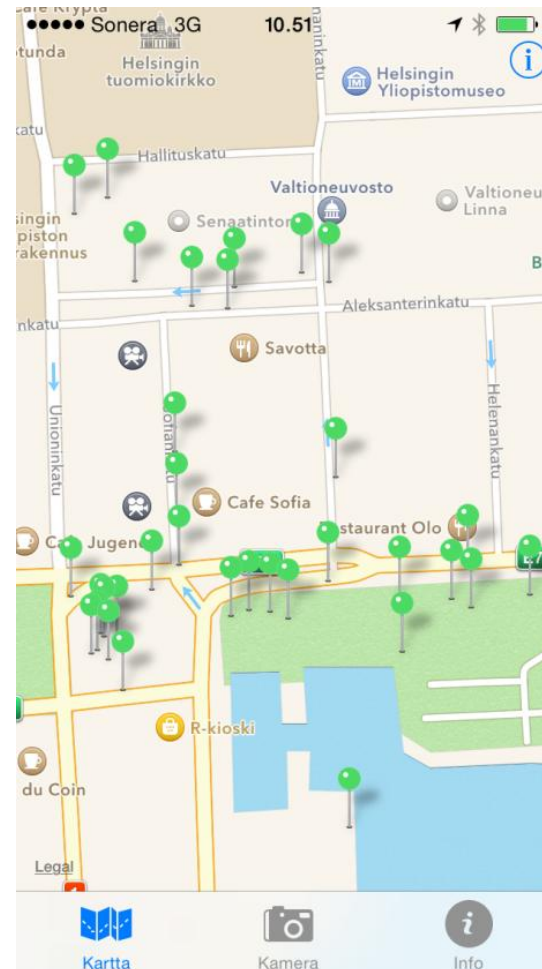
Pilot 2: Turku, Kauppatori

- Presenting historical photos in AR;
Historical photos of demolished buildings;
4 tabs: Map, Compass, Camera, Info
- Modern
buildings: 2D
image tracking
was hard...

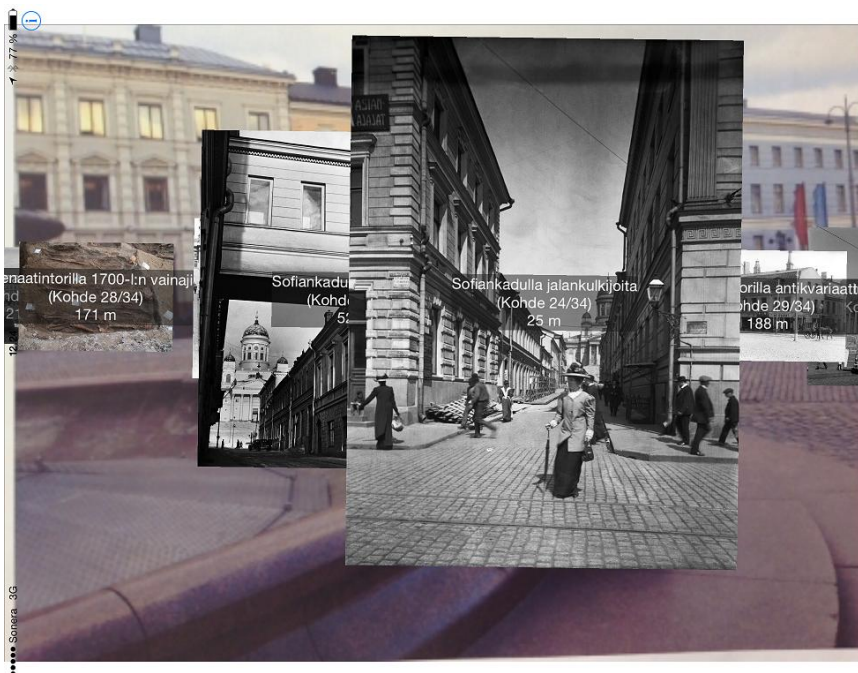


Pilot 3: Helsinki, Kauppatori & Senaatintori

- Presenting historical photos in AR
- Scenes of historical Helsinki, with background texts
- Modifications to the UI, Compass and Camera tabs were merged
 - If no tracking, show photos in correct compass directions



Pilot 3: Helsinki, Kauppatori & Senaatintori (cont'd)



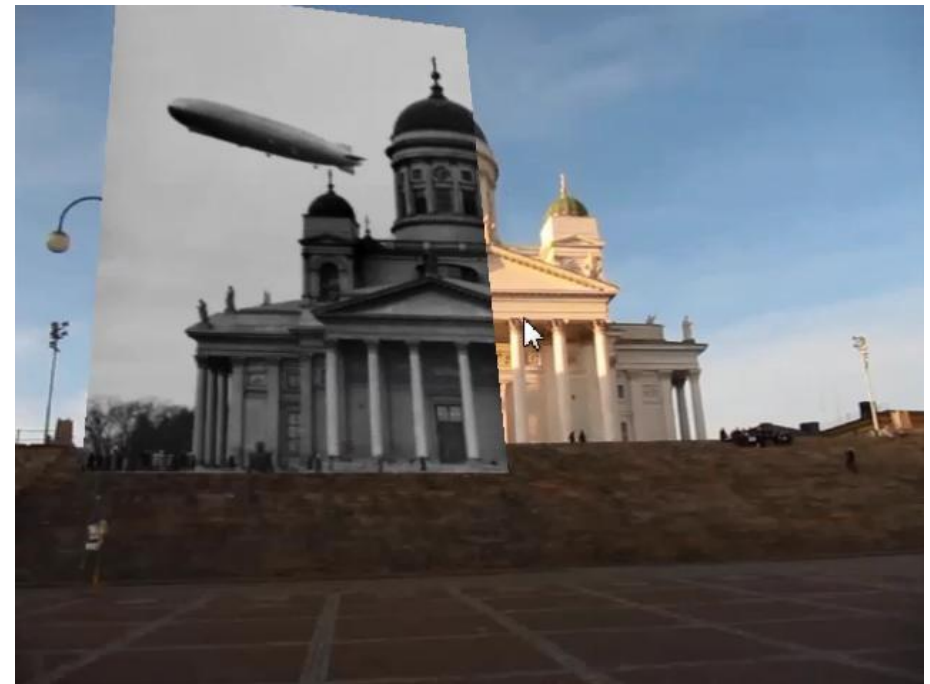
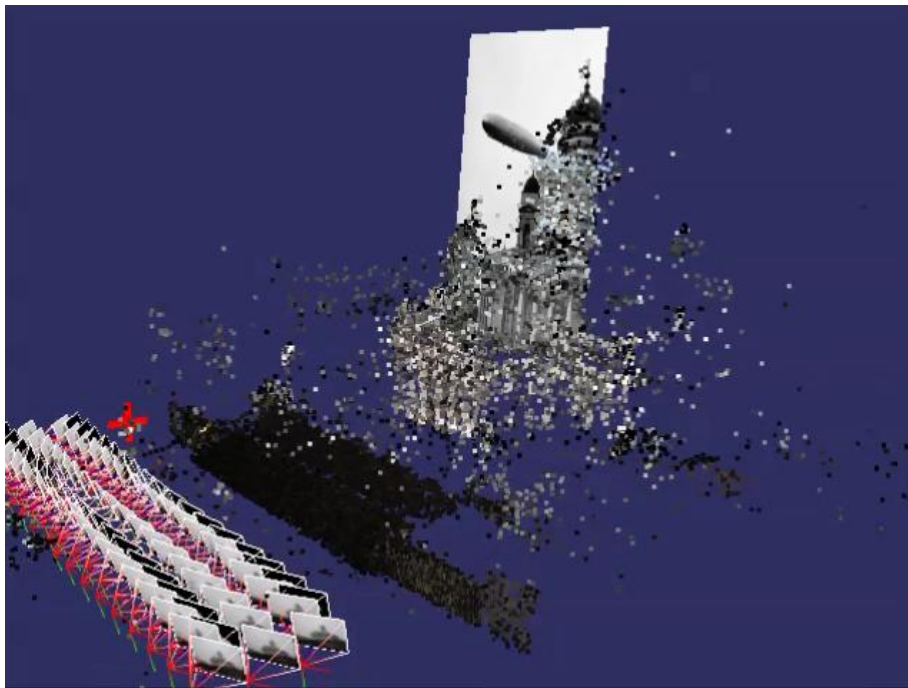
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Pilot 4: Technical Pointcloud Test in Helsinki

- Testing pointcloud-based tracking in AR; simpler UI
- Robustness of 3D pointcloud tracking was tested =>
- It worked well in various illumination and weather conditions



Results

- We created a few relatively simple mobile applications, which present historical photos in the locations where they were taken, and guide the users to those locations. We wanted to find out whether users would find such applications useful.
- The chosen locations made a good ensemble, which used two different markerless tracking methods (2D image, 3D pointcloud). On the other hand, a similar code base and user interface could be used in three locations, so there was synergy in the programming effort.
- The applications turned out to be useful, both in guiding the tourists to the correct locations and in presenting additional historical information.
- There were some challenges especially in 2D-tracking of building façades, but sufficient work-arounds were found.
- 3D pointcloud tracking could be made robust in various illumination and weather conditions, if there were a sufficient number of sample photos, taken in various conditions.



TECHNOLOGY «FOR» BUSINESS

