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MiniGI: Guerilla Mappings in Miniature

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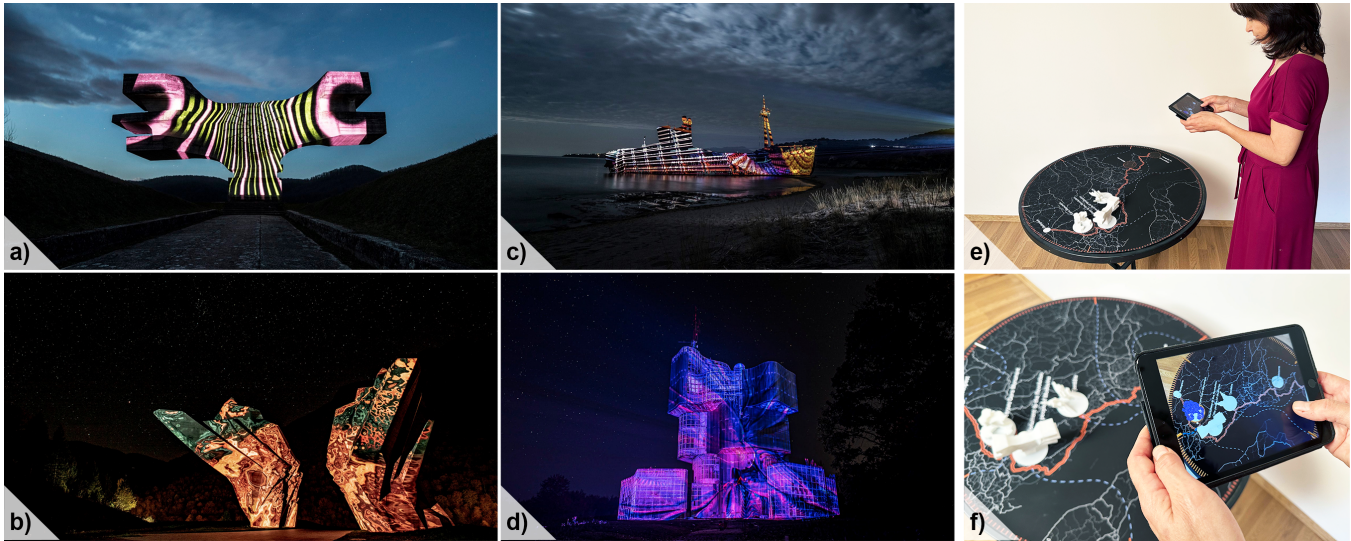


Figure 1: a-d): Photo collection of the "guerilla mappings" created by the Secret Mapping ensemble. e): AR installation, including a map and 3D printed objects of the real monuments. f): Visitors can explore AR visuals superimposed on the 3D printed objects through an iPad.

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1 INTRODUCTION

We present MiniGI, an interactive tabletop installation coupled with a handheld Augmented Reality (AR) visualisation. The installation showcases five selected locations which are the human-scale twins of actual, real-world exhibits all located throughout former Yugoslavia. AR visualisation illuminates these miniature 3D replicas and encompasses them with an extended version of the archived

visuals created by the artists, specifically to each spot. The installation invites visitors to join the artists on their trip and reenact their journey with an collaborative tabletop interface, while offering the possibility for backwards or forwards exploration.

Projection Mapping is a technique for aligning virtual contents, e.g. 3D animations onto irregular surfaces or facades and turning them into a display. Preparation steps typically involve 3D reconstruction of the surface of interest and 3D animations carefully designed for said surfaces. When well-aligned, these animations can create captivating experiences [Raskar et al. 1999]. In a large-scale context, striking illusions of building moving or transforming are achievable [Anadol 2019]. In order to fit 3D structures as closely as possible, it is necessary to achieve real-time on-site image warping. Many dedicated software exist for this purpose, e.g. Resolume.

Usually, large 3D projection mapping events are created in a commercial setting, and the visuals are designed to fit the customer's requirements. The formation of the Secret Mapping ensemble emerged from the desire to create 3D mappings from the specific imagination of the each creator individually. Currently, the collective includes three people coming from different art fields.

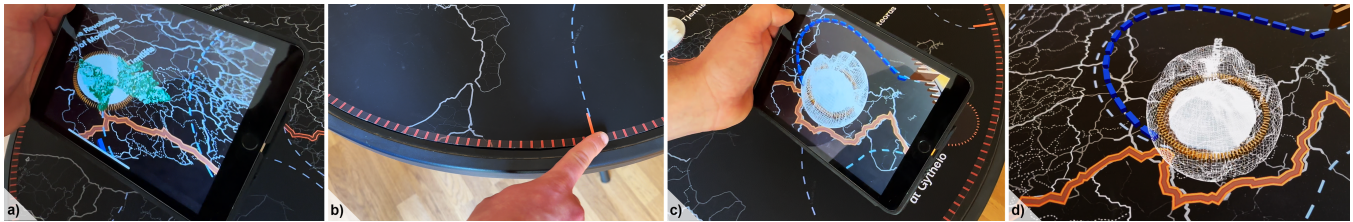


Figure 2: Image sequence showing the installation's interaction design. a) the user holds the iPad over the table which shows the AR elements superimposed onto the 3D printed objects. Only one object is illuminated the rest of the map is dimmed. On image b) the user touches the edge of the table to trigger the interaction. A luminescent sphere appears over the route and shows the current position of the user on the map. On image c) the user slides her finger along the edge of the table. This gesture moves the user forward or backward on the map. On image d) the user reached the next destination on the map and the 3D printed object at this location gets highlighted with AR visuals.

The Secret Mapping collective made projections on outstanding environmental formations, abandoned structures, and industrial buildings. The most interesting facades available were identified to be part of abandoned brutalist buildings, remnants of the Yugoslavian era. Originating from Hungary, the collective travelled many hours into neighbouring countries like Croatia, Bosnia and Herzegovina, to achieve these projection mapping happenings, with a van loaded with a professional projector and a power generator since these locations often fall outside of our accustomed infrastructure. Such "guerilla mappings" start after sunset and end before sunrise.

The proposed work invites the visitor to join the creators on this impromptu trip, starting from Budapest and visiting five selected locations the collective has visited. The virtual interactive journey takes place on a table laying out a miniature map of the road trip coupled with 3D-printed small-scale replicas of the featured buildings. It combines AR mapping [Reitmayer et al. 2005] technologies with tangible tabletop interactions [Patten and Ishii 2007].

2 DESIGN

The installation includes a table ($r=50\text{cm}$) with a printed map layout on top of it. The map shows the five selected locations and highlights the road connecting them, starting from Budapest and ending at the tip of Greece in Gytheio. The installation's core parts are the printed 3D replicas of the visited structures placed on the map (created using Agisoft Metashape photogrammetry software and Cinema4D 3D modelling software), with the digital projected visuals appearing as augmented reality (AR) elements. Using AR, the 3D animations not only appear on the surface of these structures but also around them, thus encompassing these objects completely. These AR visuals or mappings were designed as extensions of the archived visuals created by the Secret Mapping artists during their actual real-world trip. The installation utilises handheld AR technologies in the form of two Ipads, so that the visitors can each see these AR mappings on accompanying tablet displays, from their respective vantage point (see Figure 2). The iPad screen is large enough so that the view can be shared amongst multiple visitors, creating a sense of a collective experience. The AR software was developed in Unreal Engine 5, and it uses the printed map as a marker for placing the AR objects onto the physical installation at their respective positions.

A Playtron Midi controller detects the touch of the users on the edge of the table covered with conductive ink. To determine the

direction of the hand gesture (clockwise or counterclockwise) we analyse the camera image with optical flow technique.

3 USER EXPERIENCE

The road connecting the locations together is mapped onto the table's perimeter, see Figure 2. The interaction design is meant to involve the users and invoke the feeling of travelling together with the artists. The 5cm stroke on the table's edge functions like a touch interface. When the user touches the stroke and slides their fingers along, they "drive" with the artists along their route forwards or backwards depending on whether the users slide their fingers clockwise or counter-clockwise. The AR elements around each of the five miniature objects appear only when the user reaches their respective point on the map, while all others are rendered blank and featureless. When the user moves away from a given featured location, the AR mapping around the building fades out and a sphere travelling along the map highlights the current position of the artists in-between adjacent structures.

4 FUTURE WORK

Future work on the MiniGI installation includes providing multi-user interaction, as currently only one user can "travel" on the digital road at a given time. We also wish to include AR visualization through headsets, which would enable viewing digital twins of the installations at their original scale as well.

Finally it should be noted that such an interactive map could be used for upcoming events occurring in distributed sites (e.g. Olympics 2024 taking place in various locations in the Paris area).

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