Adding value to research and technology through integration of artists in projects and synergy creation between creative industries, entrepreneurs, researchers and arts

STARTS Residency Public Report
ATLAS

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Abstract

ATLAS is a work taking the form of a scenographic exhibition which hosts a mix of real models and an interactive virtual world.

We build imaginary cities by hand proceed to scan them in 3D as a way to immerse the audience via virtual experiences.

Using augmented and mixed reality, we aim to explore these new spaces, from the physical space to the virtual reality...

During the residency, we had to learn new tools (*Unity* and *C#, Hololens...*). WEKIT pointed us to the right resources to learn these workflows quickly.

Our incremental workflow (we had a first working prototype after one week of residency) helped a lot to collaborate and to start discussions about the work in progress.

Our researches on ATLAS also helped WEKIT solving problems, especially in the field of visualizing the space, where we discovered some interesting tips to help the user having a better interaction with the physical environment.

We investigated a lot too on how to improve the Hololens experience: for example, the Field of View of the holographic headset is very low, so it's not very immersive. We discovered some ways to limit that effect and make it more acceptable.

About the art/science relationships: Science has brought us new mediums (AR and VR) after decades of research. It is now the artists' turn to explore these new spaces, and to discover properties that weren't accessible with previous mediums.

For the near future, we continue to tour with the project. We are discussing with different cultural venues and international festivals (France, Belgium, Israel, the Netherlands, Austria, USA...)

Index Terms—**About five keywords or phrases in alphabetical order, separated by commas**
Augmented-reality, virtual-reality, handmade models, imaginary cities, mixed-reality

I. INTRODUCTION

ATLAS is a work situated between digital and visual arts, taking the form of a scenographic exhibition which hosts a mix of real models and an interactive virtual world.

Marie-G. Losseau begins by building imaginary cities by hand and Yann Deval proceeds to scan them in 3D as a way to immerse the audience via virtual experiences.

WEKIT is a research and innovation project supported by Europe. They develop a novel way of industrial training, with a software that capture an expert experience and share it with trainees.

WEKIT has developed a wearable solution that consists of AR glasses and a suit with embedded sensors to track different key aspects of performance, used in different scenarios, like astronaut training or aircraft maintenance...

Together, using augmented and mixed reality, they aim to explore these new spaces, from the physical space to the virtual reality and all of the layers in between.

II. ARTWORK

After being plunged in an archipelago of poetical islands, spectators are invited to build these virtual cities using a « seed launcher ». Each launch causes a house to grow. The growing houses follow some urbanistic rules, adapting to their environment.

There are cities in the clouds, uprooted cities, cities on stilts, flying cities...

Spectators create empty cities, without inhabitants, giving the potential to imagine what happens inside these houses. Named after forgotten ancient cities, such as Xanadu, Canope, Kerma and Kite, these cities take on a life of their own, with or without the interactions of users, just like living organisms...

The work invites you to create vast cities, in which you can wander and lose yourself. Overall, ATLAS seeks to provoke a reflection on urbanism, architecture, and their influence on our lifestyles.

It gives life to inanimate things...

ATLAS is an asymmetrical experience, using different devices (Hololens, HTC Vive, Ipads) to make the users travel through different levels of reality. For that the users build windows that connect the different worlds.

These different worlds have different properties: in the Virtual Reality world, the user can fly over the cities, get smaller in order to enter in the tiny models...

In Mixed Reality (Hololens), the user can make houses grow in his own physical space.

With the Ipads, he can develop buildings from 2D to 3D, and interact with the real models in the exhibition.

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III. METHODOLOGY

We began our research around the Mixed Reality medium with the question: what could be the relationships between physical space and virtual spaces?

We tried to transform the user's physical space into a map of his environment, changing his perspectives. We discovered that the map helped a lot to create a link between physical space and holographic houses.

Technically, we had to program our own shaders to do this, using CG, the shader programming language by NVidia. Another important thing was to think about how holographic houses can be hidden when they pass behind a physical object. This is relatively simple to do with Hololens tools, but adds real value and credibility to the experience.

The biggest difficulty we encountered during the residency was related to tools.

Our regular language/framework (*VVVV,* nodal programming) not compatible with *Hololens*, we had to learn new tools (*Unity* and *C#,* text programming). WEKIT pointed us to the right resources to learn these workflows quickly.

We had to find a way to animate the house models, to give them life, it was a fundamental part of our research. We chose to work with *Houdini*, a 3D software for procedural animations and simulations, that helped a lot to create organic movements, using cloth simulation…

The fact that *Houdini* is a procedural tool really sped up our working speed compared with when we use our regular tools (*MeshLab* or *Cinema4d*).

We also worked on how to build bridges between the *Hololens experience* and the *VR experience.* A way to make these bridges: by creating windows into the VR worlds... For that we used the "Stencil" function in DirectX, that helps to create some complex compositing effects in real-time.

IV. CO-CREATION PROCESS

Yann Deval & Marie Losseau

- Building, 3d scanning and animating the artwork
- Programming the code of the Hololens app
- ...

WEKIT
- Help in learning new tools (Unity, C# programming, http requests...)
- Information monitoring, pointing to unexpected technological solutions
- Organizing everything related to the Private View of the Atlas exhibition and the residency
- Providing hardware/software
- ...

The first part of the residency was dedicated to familiarizing with the new medium. We experienced other Hololens projects, some of them created by WEKIT.

After first contact with the medium, we had to re-think a lot of the concepts behind ATLAS, considering new possibilities provided by the Hololens, but considering its limitations, too (see next part: IMPACTS).

During the residency we had a weekly meeting for project monitoring, as well as an ongoing email communication and regular informal meetings. The challenge was to establish communication between people from very different backgrounds. The Wekit team understood very fast the challenges faced by that kind of artwork, and Yann and Marie had to jump into some new technical vocabulary very fast. For that, they attended some conferences, tutorials and symposiums about the topics.

Our incremental workflow (we had a first working prototype after one week of residency) helped a lot to collaborate and to start discussions about the work in progress, and to generate new ideas... The idea was to release a new version of the software every 2 weeks and test it on somebody who know nothing about the project. A good way to keep the focus on a fluid user-experience.

The separation of the 3 months of residence into two different parts was a good idea: it allowed us to use the 8 months break to present the prototype (SXSW Austin, IRCAM/Centre Pompidou, Ars Electronica, MCCS Molenbeek...), work on new features, and reflect on new ideas. So, when we came back to Oxford for the second part of the residency, we knew exactly what we wanted.

V. IMPACT

A. Research Impact

Our researches on ATLAS helped WEKIT solving problems, especially in the field of visualizing the space, where we discovered some interesting tips to help the user having a better interaction with the physical environment. We developed a custom shader for that purpose.

We investigated a lot too on how to improve the Hololens experience: for example, the Field of View of the holographic headset is very low, so it's not very immersive. We discovered some ways to limit that effect and make it more acceptable, developing a custom shader that create a circular organic mask around the field of view. After developing that feature, some users thought we just received a new version of the headset, as the field of view appeared larger.

B. Artistic Impact

With ATLAS, we are trying to find new expressive forms, exploring the new mediums that are Augmented Reality and Mixed Reality.
It's not a film, not a video game, not an exhibition, not a performance… But it could be a sum of all of these things.
During the residency, we were searching how to redefine the user's experience: how can he interact with the exhibition, with the performer, and with the other spectators?
A part of the residency was about finding ways to give life to the models. How the houses could grow up like plants or organisms… How they can reproduce themselves, getting old... Augmented Reality offered a magical way to answer this problem.
We had the chance to play the experience in major cultural venues: SXSW Austin, IRCAM Centre-Pompidou, Venice Architecture Biennale... The audience feedbacks were very positive. The care we took to tweak the "user-experience" payed: a lot of our users were people without any knowledge of AR/VR (elderly people, young kids, technophobic people...), without any problems.

The collaboration between Yann, Marie and the Wekit team still continue after the residency: we work on another AR project for a museum, and give some workshops about AR/VR/MR together in Oxford.

VIII.   CONCLUSION

The project resulted in a working prototype of a Mixed Reality experience and exhibition.
The whole team really appreciated this art-science collaboration, and the artists will try to collaborate again with scientists in the future.

VI.   ART-SCIENCE INTER-RELATIONSHIPS

The AR smart glasses and wearable technologies used in the WEKIT project and in the ATLAS residency will change personal computing as we know it.

Augmented Reality (AR) Smart Glasses will be the next generation of personal computing, likely to disrupt the world on a similar scale as smart phones did over the past decades.

The temporal residency at Oxford Brookes centered in on the 'artistic exploration of holograms'. Holograms are 3D content that cannot be captured appropriately in 2D video or imagery. Moreover, holographic exhibitions provide ample opportunity for visual research, exploring reality as a medium for the fine arts.
Smart Glasses and Augmented Reality turn reality into a medium, the characteristics of which, however, still need to be determined through artistic exploration.

VII.   FUTURE DIRECTION AND ACTIONS

We continue the work on ATLAS with MUSEUM LAB, a program by Mons (Belgium) Pole Muséal, funded by EU/FEDER. We expect to work on a multi-user asymmetrical experience for 15 users (5 Hololens, 5 Oculus Quest, 5 iPad).
We continue to tour with the project. We are discussing with different cultural venues and international festivals (France, Belgium, Israel, the Netherlands, Austria, USA...).