**Resumos de Papers**

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**Augmented Reality and Maps: New Possibilities for**

**Engaging with Geographic Data**

-For Map visualization, as opposed to navigation and measurement.

-AR uses camera and printed images, superposing virtual information on it.

-Image Recognition and Computer Vision to determine position and orientation of the features.

-Libraries:

-ARToolkit, fast and reliable, but needs markers (square patterns)

-Qualcomm Vuforia, allows use of map itself as the marker <- used in Unity

-Printed images:

-Outline of area

-Altimetry of area

-Population density

-Shown:  
 -3D Terrain

-2D Density

-3D Density

-Interviews with people, not much in depth information about how it generates terrain.

**CULTURAL HERITAGE 3D MODELLING AND VISUALISATION WITHIN AN AUGMENTED REALITY ENVIRONMENT, BASED ON GEOGRAPHIC INFORMATION TECHNOLOGIES AND MOBILE PLATFORMS**

- Landmarks are unique objects and useful in wayfinding.

- Planning should have people’s preferences in mind.

- The effectiveness of external representation is influenced by how it supports cognitive perceptions. <<http://www.sciencedirect.com/science/article/pii/S0306437904000961>> (Hahn and Kim)

- Perceptions capture an extensive range of sensory variation having a huge epistemological importance, being at the very source of all human empirical knowledge.

<<http://linkinghub.elsevier.com/retrieve/pii/S0169204608002326>>

- Cartography provides a way to interact and perceive spatial environment.

-“Most work in cognition assumes that the mind has mental representations analogous to computer data structures”.

<<http://www.sciencedirect.com/science/article/pii/S0306437904000961>>(Zhang)

- Technological advances, especially regarding the ability to extend (represent) the physical world and computer modelling capabilities, have led to the creation of an increasing number of models of objects and environments.

<<http://portal.acm.org/citation.cfm?doid=1658346.1658347>>

- Digital Representation offers the ability to create detailed models and test different hypothetical situations based on definition of variables.

<<http://www.springerlink.com/index/10.1007/s10816-012-9142-7>>

- 3D DR are generating innovative forms of visualization and interaction, AR is the enriching the world with a virtual environment, expanding it without requiring changing the sense of presence in reality, opposed to total virtual immersion. Generally using mobile.

- Progress in geographic information acquisition and development (hardware and software), allows innovative perspectives for territorial management using third dimension, enabling advanced possibilities of visualisation and analysis in virtual, immersive, or mixed environments. - Many tools for 3D Information and rendering

<<http://www.int-arch-photogramm-remote-sens-spatial-inf-sci.net/XL-5-W4/179/2015/>>

- 3D modelling + cultural heritage has grown lately, partly due to broader use of LiDAR and photogrammetry. Easier to survey and record remotely with this.

- There are advantages in older methods, but UAV photogrammetry is more flexible, low-cost and rapid response to changes.

- 3D Point Cloud Data generates 3D Models:

- DTM

- DSM

- 3D Model

For that it uses laser scan or stereo image matching, processing imagery algorithms by overlapping. This mean it’s low cost, from 3D point cloud data acquisition to the extraction of parameters.

<Eds. Technologies in Urban and Spatial Planning: Virtual Cities and Territories>

- The most prominent manifestation of humans’ pattern recognition capabilities concerns visualisation, revolutionising our behaviour and way of communicating, travelling, organizing and even managing space

<The most prominent manifestation of humans’ pattern recognition capabilities concerns visualisation, revolutionising our behaviour and way of communicating, travelling, organizing and even managing space>

- Many authors use conventional 2D GIS for urban scenarios, but often it is insufficient considering the relations and dependencies in city planning. 3D representations are more intuitive, especially considering users don’t usually have GIS skills, and these are more similar to reality. This principally occurs because of its high level of similarity to reality, congregating detailed information (Level of Detail - LoD) and volume property, stimulating more enthusiasm and simplifying creative solutions for detected problems after a walk-drive-fly-through representation (embodying the user in that environment or presence), improving comprehension and communication. Thus, 3D representations and analysis tools are more adequate for volume variation and enrich the spatial representations

<<http://usir.salford.ac.uk/2178/>>

- GIS has a powerful capacity for querying and analysis

<<http://www.tandfonline.com/doi/abs/10.1080/03098260903556030>>

- There’s a necessity for 3D GIS for urban environments in order to understand the territory at 3D, concerning especially form, components and texture, and to manage geometry and topology.

<<http://en.zl50.com/2012081117819666.html>>

- Interoperability between GIS and 3D is still a challenge

<<http://www.int-arch-photogramm-remote-sens-spatial-inf-sci.net/XL-5-W4/179/2015/>>

- We can verify the integration of 3D and GIS in the convergence of the two, many tools are released with interoperability tools and being the most discussed int events.

- Regarding 3D GIS, the user can acquire, manage and observe different data configurations, creating Virtual Environments (Virtual, Augmented and Mixed Reality), within which individuals can virtually walk, drive, fly and see the world in real, past or future time (Virtual Time Travel) and/or even communicate, meet and work (creating new forms of human interaction and locational settlements, reducing the needs of transportation, being represented in the virtual environment). 3D GIS representations can also be linked with attributes of a database, allowing, for example, to query the spatial data infrastructure and visualise the results also in a 3D form, or conducting spatial analysis, such as visibility analysis enabling a fully interactive 3D environment that allows users to navigate in the built VE. The integration of data acquisition, 3D modelling and 3D GIS data in an AR environment through mobile platforms provides the opportunity for DR, interaction and dissemination, enabling dynamic 3D contents to be built, visualized and interacted with, supporting attributes and spatial analytical features, being more powerful than traditional methods

<<http://www.tandfonline.com/doi/abs/10.1080/03098260903556030>>

- Virtual or Augmented Heritage or 3D GIS Cultural Heritage are relatively new branches of knowledge that use information technology to digitally capture or represent the data.

<<http://www.springerlink.com/index/10.1007/s10816-012-9142-7>>

- A long-term objective, then, should be the creation of centralised, open repositories of cultural heritage virtual environments, with high technical-scientific value, underlying design documents and metadata, published along with the model.

- AR applications are currently being used at some heritage sites, mostly aimed at enriching the tourist experience, adding information to the real environment merged and over the device display (e.g. Virtual Time Travel) or through audio (e.g. museum audio guides).

<<http://www.springerlink.com/index/10.1007/s10816-012-9142-7>>

-There are several methods to combine GIS and Virtual Reality , even if it is still difficult to achieve full integration, considering technical limitations, which restrict the distribution and display of 3D representations on personal computers and mobile tools. However, hardware developments have created the conditions towards making it possible to advance in the field of 3D GIS and production of DR within VR systems over the Internet, including portable devices.

<<http://usir.salford.ac.uk/2178/>>

- Efforts have been made to model the built environment and planning scenarios using 3D GIS and VR platforms to envision for many goals.

<<http://www.tandfonline.com/doi/abs/10.1080/03098260903556030>>

-3D GIS digital representations can provide information on heritage, which is extremely valuable for several agents in the territory, and allow unprecedented opportunities for communication and collaboration in different fields of knowledge. 4D GIS digital representations can be built to reflect the past, existing and possible future conditions of cultural heritage.

<<http://www.tandfonline.com/doi/abs/10.1080/03098260903556030>>

- “The area of virtual heritage has long been concentrated on generating digital reconstructions (...) to be truly accurate representations of their real-world counterparts”.

<<https://hal.inria.fr/inria-00606745/document>>

-Those technologies reproduce faithfully the real world, going far beyond

geometry or spatial position

<<https://hal.inria.fr/inria-00606745/document>>

-Success Stories

→ <<http://upcommons.upc.edu/handle/2099/9207>>

→ Rome Reborn

→ PATRAC2

- The advantages of using 3D point cloud meshes and UAV systems consist of the ability to rapidly collect higher temporal and spatial resolution information, practically on demand (high frequency) and low cost. The integration of 3D modelling with GIS permits the association between the high capacity of human perception and visualisation (3D) with the strong capability of spatial query and analysis of GIS. AR environments allow the user to combine the virtual data to the real world (in place), using mobile platforms. In this way they allow for a better understanding of the elements of visible and non-visible cultural heritage, not only in the present, but also in the past and future (re-present).

- The DR of cultural heritage has implications, perhaps stimulating more travel (e.g. tourism) as a result of initial available interaction (thus potentially damaging the heritage) or maybe helping to collect information and contribute to better planning (Human as Sensors concept), management and coordination of human activities and conservation (in a 4D real-time monitoring and assessment situation). These emerging representations of the physical (regarding external affordances at different moments) and even the mental world (through internal minds or imagined/simulated/synthetized) are also creating the opportunities for the development of virtual and real environments (mixing DR with the real world), not only on desktop computers, but growing also to people’s daily using mobile devices (with the potential of being mobile and gradual increase in use).

**From urban planning and emergency training to Pokémon Go: applications of virtual reality GIS (VRGIS) and augmented reality GIS (ARGIS) in personal, public and environmental health**

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