A Platform for Creating Augmented Reality Content by End Users

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Abstract. We present work in progress towards the development of a platform for the creation of augmented reality (AR) content by the end user. Based upon a review of existing AR authoring tools and scenarios we have envisioned in the context of smart cities, we have developed SituAR, an architecture for a platform in which the user is able to create AR content using multimedia elements. Our emphasis is on making augmented reality easier to put together and to empower users to become authors in AR scenarios. We also include social media elements for users to share, rank, and comment the content created in order to add new information and to facilitate interaction. This paper discusses the architecture of SituAR and its potential.

Keywords: Augmented reality · Authoring tools · User-generated content

1 Introduction

This paper presents progress on a novel platform for the creation of in-situ augmented reality (AR) content by the end user. SituAR is a platform devised to create AR annotations via mobile devices in the context of smart cities.

AR technology is an important field of study with huge potential for expanding contexts of use, as it adds information to the physical world and is defining new ways for users to interact with their surroundings. The main objective of augmented reality is to take advantage of available devices to enhance user experience. AR has been used successfully in areas such as games, learning environments, and so-called points of interest (POI's) in smart cities. Still, there is ample room for empowering users so they not only view but also create AR content.

1.1 Augmented Reality Content Creation

Authoring tools for AR have been created both in commercial and research contexts. For example, the Designer's Augmented Reality Toolkit (DART) is a well-known authoring solution that extends the functionality for augmented reality in 3D modelling platforms, such as Google SketchUp and Autodesk's 3D Studio Max. Another software library for building AR applications is ARToolKit, which uses video tracking

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capabilities that calculate the camera position and orientation relative to physical markers in real time. Today, both AR applications and their contents are mostly created by system developers; users who interact with these applications are mere viewers of information. For new content, users must wait for updates. Some desktop applications already allow users without programming skills to create augmented reality content. For example, some web applications for creating augmented reality through markers provide toolbars or widgets for attaching photos, URLs, videos and other multimedia content. However, this interaction takes place on the desktop, not at the spot in which the enriched content is relevant.

1.2 Transmedia Storytelling

In order to engage users in the creation of added-value quality content, we propose transmedia storytelling, which is a new way of telling stories across multiple platforms and creating an immersive experience for the viewer. The purpose of transmedia storytelling not only is to reach a wider audience by expanding the target market, but to expand the narrative itself [10]. In transmedia storytelling, engagement with each successive media heightens the audience's understanding, enjoyment and affection for the story [11]. Coordinated storytelling across multiple platforms offers users a new, more compelling perspective of the involved characters [6], with interaction and collaboration of the audience [11].

2 Related Work

Our approach to AR aims to enhance points of interest (POIs) for smart cities. In this context, one of the main issues has been how to use tags to represent information. In [2] floating labels using GPS coordinates are described as one of the most frequently used techniques. Geolocation and markers can be combined: The former uses the mobile device's GPS whereas the latter identifies a space that displays content in real time [8]. The use of these markers is supported by platforms such as Wikitude, Layar, Junaio, Vuforia and ARtoolkit, which are useful to prototype augmented reality [9]. Even though AR-oriented devices, such as Google Glasses and Hololens, have become available, mobile devices such as smartphones and tablets are still more popular tools to experiment with AR applications [4].

Langlotz et al. introduce the concept of Augmented Reality 2.0, which refers to a trend of making users content creators and not only consumers, one of the main characteristics of the Web 2.0 [7, 12]. FitzGerald proposes user generated content (UGC) for location-based learning [3]. Commercial AR applications related to POIs such as Layar, Here City Lens, Yelp Monocle, and Wikitude [1], allow users to view information related to POIs and to upload images or create comments, but users cannot create annotations while visiting POIs. Thus, users are not able to create stories in-situ either.

Annotation is a technique that associates information with places, objects or people. Hansen created a taxonomy for all kinds of system annotations [5]. He described four main challenges for ubiquitous annotation: Anchoring, which describes the linkage

between physical entities and information; structure, which describes the object's relationships; presentation, which describes the type of information that is presented and especially how it is presented in relation to the physical entities; and editing, which describes how the annotation is edited or authored. These concepts are important for the design we present next.

3 SituAR Conceptual Design

The conceptual design of SituAR, our platform for in-situ creation of AR content is illustrated in Fig. 1. SituAR has four main interaction modules: Multimedia, social media, 3D tools and maps. The user is able to create multimedia annotations such as text, pictures, videos and audio. All the augmented reality elements created can receive comments, ratings and can be shared. SituAR allows the user to create 3D geometric shapes and perform actions such as moving, rotating, scaling, and copying elements to paste them into the environment. Another feature is freehand drawing, through which people can create multiple shapes. Mapping real-world objects also has been considered. The user can take a panoramic picture and create its 3D model. In addition to available default 3D models, an online community allows designers to upload their models and share them with the SituAR community. Users can see their private annotations on a map as well as the public annotations made by other users. Collaborative tags allow users to search specific information and filter their results by using tags, dates and selecting the type of the multimedia element.

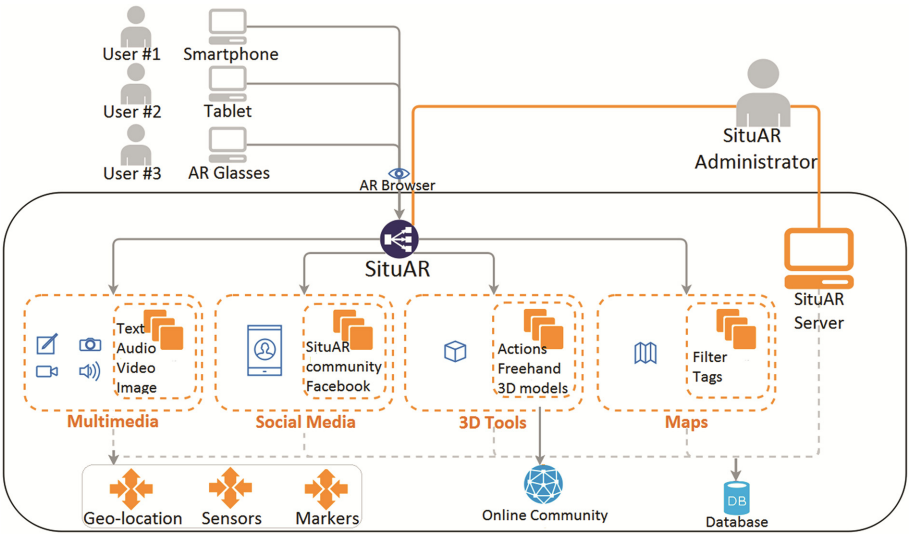

Fig. 1. SituAR conceptual design

SituAR uses a client/server architecture. The data generated by SituAR will allow users to explore the city and interact in a ubiquitous computing environment.

Furthermore, users can tell stories using the 3D models, text, audio, pictures and videos. They can share their experience by locating multimedia elements in the context. This information can be seen in the SituAR community. Also, it can be shared in social media services such as Facebook and Twitter. In order to deploy augmented reality, an AR browser is also included in SituAR. Moreover, the use of AR markers, geo-location and sensors such as RFID are proposed.

Figure 2 presents some interfaces that have been prototyped to illustrate SituAR's main functions. The main interface displays the available options: Creating and visualizing annotations, viewing a map and expanding nearby annotations. The prototype has five multimedia elements: audio, video, image, 3D models and text. New elements can be uploaded and placed in the real world. The 3D model option allows the user to create geometric shapes in a real environment. Another feature is the default 3D models which designers share them through an online community. The goal of this platform is to enrich the content of SituAR. A relevant component of our platform is "AR Maps", which allows users to visualize all the content published by the end user. This feature has filters in order to make specific search. Interfaces are based on the conceptual design and will be evaluated with potential users in order to validate SituAR.

Fig. 2. SituAR interfaces.

4 Ongoing Work

In the near future, users can interact with SituAR using different mobile devices such as smartphones, tablets or Google glasses. Also, we are exploring the use of storytelling and gamification as components to include in the platform to enhance user experience at POIs.

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