

Automated Model Acquisition using 3D Reconstruction for Urban Planning

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Abstract:

Outdoor Augmented/Mixed Reality applications often require a model of the real environment either for tracking or for interactive modification. While these models are often manually constructed using some 3D modeling tools, an automated acquisition pipeline is still not available for that purpose. Especially for urban planning, the status quo of existing buildings often need to be available in a 3D model. Since manual model creation is a tedious and time consuming task, a need for automated 3D reconstruction is given. Therefore, we come up with the idea of using a human scout equipped with a camera, GPS, and a UMPC (ultra mobile PC) who delivers a sequence of outdoor images annotated with GPS tracking data. These images are transmitted to a command center where spectators can observe the position of the scout on a pre-calibrated ortho image. During image acquisition, the 3D model is created on-the-fly using sophisticated 3D reconstruction algorithms and geo-referenced images. The final 3D model can then be projected onto the pre-calibrated ortho map and can be used for further interaction/modification. Although the reconstruction framework is shown within this scenario, it can also be used for any other applications, where 3D models of urban scenes are required (e.g. feature based tracking). This demo tries to bridge the gap between computer vision (3D reconstruction in particular) and AR/MR by building a framework for automated 3D model generation.

Demo Description

The demo will show a first prototype of this automated model acquisition pipeline. It consists of two different setups. On the one hand side, the scout, who delivers the images, is equipped with a GPS receiver, a camera and a UMPC (i.e. Sony Vaio or Sony Vaio UX180). The scout is connected wireless to the command center and transmits the images annotated with GPS data. On the other hand, the command center consists of a projector showing an ortho image which is calibrated according to the environment. As the scout leaves the command center, the position is shown on this map in order to inform the spectators about the path. As soon as tracked images are sent to the command center, the automated 3D reconstruction pipeline starts generating the 3D model which is then projected onto the map and can be explored by the users. For this demo we will use the ortho images taken from Google Earth, however any other map resource can be used as well.

Why showing this demo

A fully automated pipeline of generating 3D models by using 2D images only is still not available since the individual research groups either focus on computer vision or AR/MR technology. This demo again shows the power of interdisciplinary research which bridges the gap between both research fields. This framework may also be useful for other type of AR applications where models of existing buildings, statues, or other monuments need to be captured within one model.