Social Media based 3D Modeling and Visualization

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Social Media is a very rich source of up-to-date localized information. In recent years, image collections from photo sharing websites (e.g. Flicker) have been effectively used for 3D reconstruction of objects, buildings and even cities [1]. While 3D reconstruction techniques are highly improved in terms of accuracy, performance, and parallelism [5, 4] there are still means to utilize the up-to-date information available from public social sharing websites such as Twitter and Instagram for continuous refinement of the 3D models and information visualization. Our emphasis is on utilizing the information for detecting and refining the changes in the scene, adding new structures and visualizing saliency/popularity information in 3D (See Figure 1).

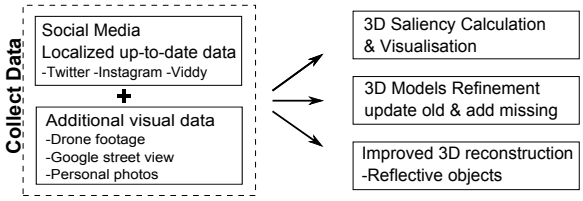

Figure 1: Overview.

Data Sources. We use visual data gathered from social networks, proprietary drone videos, and personal photos. Data from social networks is kept in JSON format and is harvested from Twitter, Instagram, and Viddy using their public API's [3]. Along with the visual media, social networks include extra information such as GPS location, time, and keywords that help augmenting semantic information. Our database contains public social media activity around TCD (Trinity College Dublin) after December 2014.

Refinement of 3D content. Combining visual data from different sources helps for generating more complete 3D models. One example is shown in Figure 2. Upper parts of the Campanile which are not captured from ground level can be completed by employing drone photos in the reconstruction. Recent structures or modifications (e.g. updated facades, newly built statues, event specific temporary changes) can also be integrated in 3D models using continuously updated visual content posted on social media. As an example, the Walton sculpture (see Figure 2) is a fairly new statue in TCD built in 2013. This statue has a fully reflective surface causing severe inaccuracies with the state of the art 3D reconstruction methods. We have proposed a method that utilizes the normal correspondences in a reconstructed 3D point cloud to improve 3D reconstructions of spherical reflective surfaces [2] (see Figure 2).

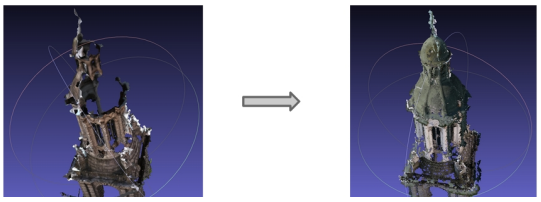

Figure 2: 3D reconstruction using additional visual information from drone images.

3D saliency maps using Social Media. While photos on social media alone are often too noisy for an accurate 3D reconstruction of the scene (e.g. due to partial occlusion from people), these images reflect the popularity of the captured regions. Thanks to GPS information and with matching social media photos with other images of the scene already available (e.g. harvested from Google street view using Google API), it is possible to recover the field of view captured in each social media photo, and infer the 3D structure that is captured in the social media picture. An example of this procedure in TCD is shown in Figure 3.

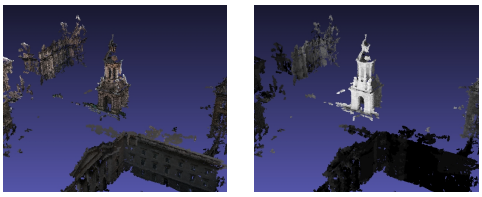

Figure 3: Left: Reconstructed scene. Right: 3D saliency/popularity map computed with 50 photos from social media (brighter regions are more salient).

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