

Abstract

Advancements in mobile and Augmented Reality technologies have both increased the complexity of their design and improved their accessibility. This shift has opened the door for more affordable AR based content creation through the use of 3D reconstruction tools, and images captured from modern smartphones. Using open-source software tools, this research investigates how different environmental factors impact 3D reconstruction quality. Existing literature was leveraged to identify the most prominent quality impacting factors, which include image resolution, number of images, distribution of images within the scene, object of interest texture and lighting conditions. From this knowledge, an automated framework for capturing and reconstructing a synthetic scene was designed and implemented. Using this testing framework, a diverse set of synthetic scenes were created to model the identified impacting factors. These scenes were captured and reconstructed, with their final reconstruction quality being evaluated. From this testing, it was found that increasing visible geometry and detailed texturing has the capability to drastically improve final reconstruction quality. It was confirmed that controlled lighting conditions with minimal hard shadows, such as on an overcast day, produces the best results for a given scene. Finally, it was determined that capturing images in an evenly distributed circular pattern around a focus point within the scene produces the optimal scene coverage and thus, reconstruction results. It is hoped that this research can be used to further the understanding of the 3D reconstruction quality impacting factors, enable automated synthetic scene evaluation and ultimately, inform and guide end-users on how best to capture their scene of interest.