

Calibrating the Kinect with a 3D projector to create a Tangible Tabletop Interface

C. J. Hughes¹, F. L. Sinclair², T. Pagella² and J. C. Roberts¹
Schools of Computer Science¹ and Environment², Bangor University, UK

Abstract

In this poster we present a portable and easy to calibrate 3D tabletop display enabling easy understanding of complex datasets and simulations by providing a visualization environment with natural interaction. This table enables users to interact with complex datasets in a natural way and engenders group and collaborative interaction. We also demonstrate the use of the display with an example environmental visualization tool, designed for stake holder engagement.

1. Introduction

In previous work, we presented a 3D tabletop display [1], which used a 3D projector to turn a desk into a 3D immersive display. This display used a Kinect interface to provide basic interaction within an immersive environment. However this set-up relied upon the accurate alignment between both the projector and Kinect, and both being directly overhead. We have extended our software to allow the Kinect to be calibrated to the tabletop from any arbitrary position.

2. Method

In order to calibrate the view the user must initially select the four corners of the tabletop display from within the Depth View seen from the Kinect. As it can be assumed that the 3D position of the corners are coplanar, the defined surface is split into two triangles and an average gradient calculated for the surface, as shown in figure 1(b). The surface is considered as ground zero, and by subtract-

ing the gradient from the depth map the models that are on the surface can be segmented. The volume is scaled to the corners to give us a final calculation of where the objects are on the tabletop, as shown in figure 1(c).

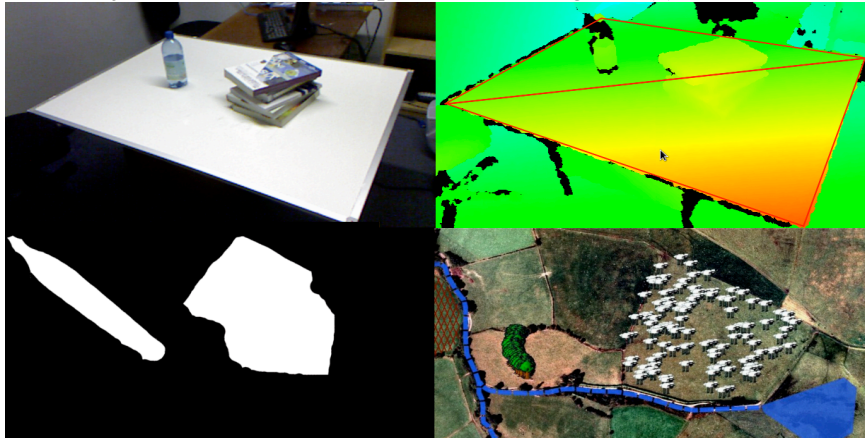


Figure 1. (a, top left) View from the Kinect's perspective, (b, top right) the depth map showing defined tabletop region, (c, bottom left) the estimated position of models on the tabletop; (d, bottom right) an example environmental flooding application.

3. Conclusions

In our poster we demonstrate our tabletop display using example application, which is designed for interacting with stakeholders by demonstrating the affects agriculture can have on the environment, as shown in figure 1(d). We have used the table with our flood management and stakeholder engagement tool. Here, stakeholders can explore the simulated environment by adding objects onto the table to control different parameters, to (say) increase the numbers of sheep or trees in that area, to explore different flood mitigation scenarios.

Although our calibration provides a good estimate of objects above the surface the Kinect requires an unobscured view of the table to prevent occlusion.

References

- [1] L. ap Cenydd, C.J. Hughes, R. Walker and J.C. Roberts, "Using a Kinect Interface to Develop an Interactive 3D Tabletop Display", EG 2011 - Posters, R. Laramée and I. S. Lim (Eds.), pp 41-42, Llandudno, UK, Eurographics Association, 2011