Predicting and Estimating Accuracy of Marker-Based Optical Tracking Systems

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ABSTRACT

Marker-based optical tracking systems are widely used in augmented reality, medical navigation and industrial applications. We propose a model for the prediction of the target registration error (TRE) in these kinds of tracking systems by estimating the fiducial location error (FLE) from twodimensional errors on the image plane. We have designed a set of experiments in order to estimate the actual parameters of the model for any given tracking system. We present the results of a study which we used to demonstrate the effect of different sources of error. The method is applied to real applications to show the usefulness for any kind of augmented reality system. We also present a set of tools that can be used to visualize the accuracy at design time.

Keywords: Optical Tracking, Accuracy Estimation, Error Propagation, Error Prediction, Target Registration Error

1 DESCRIPTION

In our paper submission [1] to ISMAR 2006 we propose a method to predict the accuracy of an optical tracking system based on error propagation methods.

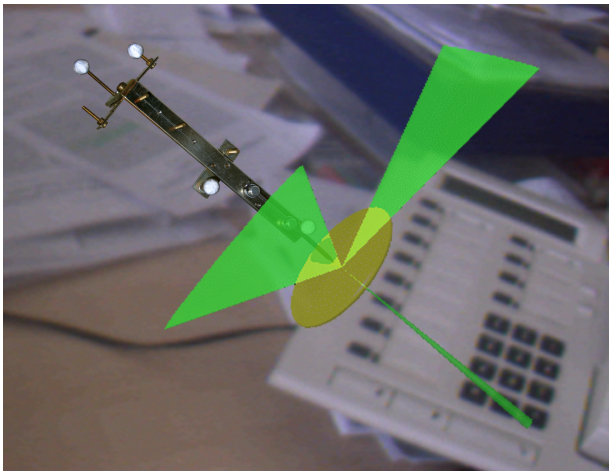

Figure 1: Mockup Visualization of predicted positional and rotational accuracy for a coordinate measurement tool

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In this accompanying demonstration we want to show the results of this prediction in an online augmented reality system. A coordinate measurement tool (cf. figure 1) is tracked using an external outside-in tracking system. The rotational accuracy and the positional accuracy at the point of interest are visualized in the image of an (additionaly tracked) webcam as augmented reality overlay.

More details on the algorithms and background can be found in the respective paper submission.

2 REQUIREMENTS

The proposed demonstration system requires desktops space of about

- 80×150 cm plus additional 50 cm to the side

to set up an optical tracking system. The equipment we plan to bring along consists in

- 1 laptop for displaying the augmentations
- 1 optical tracking system *A.R.T. SmartTrack*
- Cameras and other tools

Additionally we need an internet connection (ethernet) and four power outlets. There is no high egergy consuming equipment involved.

The whole demonstration needs an environment that is not in direct sunlight, but does not require complete darkness. The tracking system emits considerable amount of infrared light and therefore should not be in direct vicinity to other demos that are sensitive to infrared light.

REFERENCES

[1] BAUER, M., SCHLEGEL, M., PUSTKA, D., NAVAB, N., KLINKER, G., *Predicting and Estimating the Accuracy of Marker-Based Optical Tracking Systems*, to appear in Proc. International Sympoium on Mixed and Augmented Reality ISMAR 2006 2006