Augmented Reality (AR) is an obvious enhancement for everyday life and will become critical to applications from medicine, education, industry, space, and many more. AR involves the overlay of virtual imagery on the real world, thus augmenting the user’s view with additional, context related, information.

However, for the synthetic objects to appear real and the scene be believable, these objects must appear precisely registered or attached to the real world. To achieve accurate registration, the system must have exact knowledge of the user’s viewpoint in relation to the surroundings. Head position and orientation information is critical to any AR application.

This work seeks to improve dynamic accuracy of viewpoint tracking for Augmented Reality. Using an inverted pendulum to model the head, dynamic orientation sensing in a vertical plane is achieved using only a dual axis accelerometer. Accuracy is limited by the noise and model error. However, dynamic tracking with better than 1 degree accuracy is achieved analytically and experimentally.

**RESULTS**

The algorithm presented was tested with synthetic and experimental data collected from an inverted pendulum. Results with mean error better than 1 degree accuracy were achieved. The integrity of this result is maintained as the dynamics are increased and it does not suffer from drift. The simple solution for static tilt sensing is shown for comparison.

**CONCLUSIONS**

Viewpoint tracking methods for augmented reality applications that use head mounted displays (HMDs) generally suffer from poor dynamic performance. This work achieves dynamic orientation tracking for a single degree of rotation in the vertical plane using only a dual axis accelerometer. Thus, proving this initial tracking concept.

Paper Title: A New Approach to Accelerometer-based Head Tracking for Augmented Reality & Other Applications

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