Human machine interfacing in augmented reality worlds

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Augmented reality is the process of using a transparent head mounted display (HMD - see #1) to overlay computer generated imagery on the real world. This allows users to visualise structures in the real world that do not currently exist, and to see inside solid objects. We have developed a computer system, known as Tinmith-evo5, which is used to explore augmented reality environments.

Using a Trimble GPS and Intersense IS-300 head tracker unit, the computer knows its exact location in the world, and uses this information to draw a display which matches closely with the real world.

Our current application for Tinmith-evo5 is an outdoor augmented reality construction system. Traditionally, AR models are created using CAD systems, laser scanners, and other tedious techniques. Tinmith-evo5 allows the user to create models of outdoor structures interactively while walking outside, using new input devices and techniques designed especially for the task.

Desktop devices like keyboards and mice cannot be used outdoors, and to interact with the system, the user wears a specially built set of data gloves. These use image recognition techniques to track the location of the user's hands.
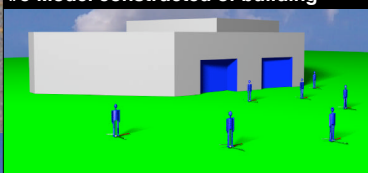

#1 User wearing Glasstron HMD

#2 Tinmith backpack outdoors

#3 Modelling cursor superimposed on user's hand

#4 Virtual model superimposed on real world building

#5 Model constructed of building

#6 Model of outdoor courtyard

This poster shows the system being used to enter in the model of a school. In image #3, the user is controlling the 3D glove cursor on the display, allowing them to interact with the 3D models and select menu options. Image #4 shows what a partially constructed building model looks like when looking through the HMD. Images #5 and #6 show what the models look like when rendered using a graphical raytracer with lighting effects.

Images #7 and #8 show how a camera mounted on the HMD is used to track the motion of the user's hands, which use wires and metallic pads to detect finger presses. Many of the Tinmith devices were hand-built for this research.

Currently Tinmith is used for constructing building models, but there are a number of useful applications for this work, including building, surveying, architectural, military, and any other areas where powerful visualisation is required. AR research is only very recent, and so there are few useable systems to date. This research is concerned with designing new user interface technology that will allow others to develop systems for these areas.

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#7 Data gloves control Tinmith operations

#8 Camera on HMD tracks glove location