Interactive Digital FogScreen

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ABSTRACT
The walk-through FogScreen has become very popular and famous during recent years. It is an immaterial projection screen that consists of air and a little humidity, and enables high-quality projected images in thin air, as well as many new applications.

In this paper we describe a new extension, the interactive FogScreen, which turns it into a computer touch screen.

Author Keywords
Projection screens, walk-thru, interactive screens

ACM Classification Keywords
B.4.2 Input/Output Devices, H.5.2 User Interfaces, H.1.2 User/Machine Systems

INTRODUCTION
There are several water, smoke and fog screens, but they are often very wet, non-penetrable, and suffer from bad image quality. We have presented a novel and optimal method for forming a superior quality physically penetrable particle display [1].

FogScreen consists of a large non-turbulent airflow with some fog (or any particle) inside in a planar shape. The laminar airflow protects the FogScreen from turbulence, and the screen thus remains thin and crisp, enabling high-quality projections and the walk-through possibility. The mean diameter of fog droplets is so small, that they do not harm equipment and appear dry to the touch. In fact, our FogScreen feels just like slightly cool air.

The FogScreen creates a magical image floating in thin air and encourages the audience to play with it (see Figure 1). Children love it, but also mature people may get rather excited, or even addicted, as one viewer told us while walking through it once again.

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Figure 1. FogScreen is an immaterial screen.

The FogScreen enables many novel applications indoors. The audience, the performer, or a product to be launched can enter rapidly through the FogScreen. Interesting applications include walk-through advertisements on shops or malls, or a walk-through screen entrance to a theme park, a science center, or a museum. Mixed reality and immersive projection technology can use CAVE-like virtual rooms with fog walls. There are also many applications in art, theater, and in other fields of business and entertainment.

Some nice effects are created, when a video camera captures people in front of the screen, and the image is shown on the FogScreen. In this way people can see and shake hands with themselves, and then walk through themselves. A video-conference with a ghost becomes possible: talk with a real person appearing in thin air. Every FogScreen demonstration has brought up new ideas from the spectators. It seems like people switch to creativity gear in front of the FogScreen.

See http://www.fogscreen.com for more images and videos of the FogScreen. However, the screen looks better in real life.

The FogScreen seems to intrigue people as a passive, immaterial walk-through screen, and few even think that it could be interactive, reacting to proximity or touch. However, our vision is that turning it into an interactive computer touch screen ignites the real fun and significantly widens the application possibilities.

Traditional touch screens and solid interactive boards are good for general drawing and other applications, but they do not allow to walk or to see through the screen. The immaterial property of the FogScreen enables all kinds of magic and fun, i.e., drawing, gaming, interactive visualizations, or web browsing in thin air. It is possible to walk through the screen to and see the interactive work on both sides.

In this paper we present the interactive FogScreen, which greatly extends its possibilities.

INTERACTIVE FOGSCREEN

The tracking of the user's hand or finger could be based on many principles well-known from e.g., virtual reality trackers. Most tracking methods are using some transducers and receivers, which means that some hand-held pointer wands or other artifacts are needed, and perhaps also wires. To use a pointer as a mouse on the screen, we need only 2D tracking on the screen plane.

We employed ultrasonic tracking, and used commercially available e-beam System 1 hardware [2] as the basis. We had to do some minor modifications to the hardware (to remove the need to push the pointer against a solid screen), but after that it worked nicely with all Windows software. We put the tracking plane slightly in front of the screen plane so that the pointing does not disturb the flowing screen. Also the tip of the pointing stick may be sensitive to humidity, so it is better to keep it off the fog.

We have run several test sessions in various venues. The interactive FogScreen seems to be even more popular than the plain passive screen. Typically a FogScreen attracts a flock of people, and an interactive screen does even more so. It keeps some people playing with it even for hours.

Our prototype pointing stick soon broke into pieces at the hands of the children, so it must be robustly built. In Figure 2 we are using the pointing stick with a standard drawing program.

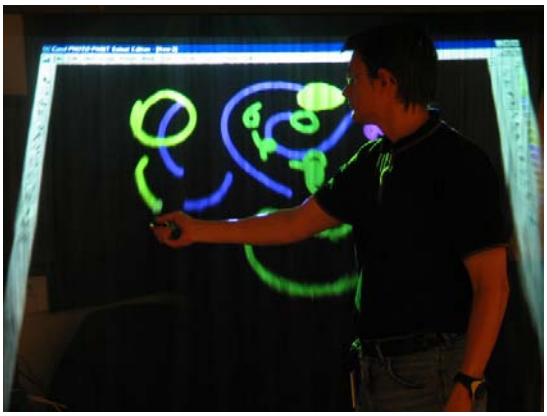

Figure 2. The interactive FogScreen with a standard drawing program.

The e-beam tracking works very reliably. The accuracy of tracking is adequate for most business and entertainment applications, apart form very high-precision work. Small projected buttons etc. on the screen may be hard to use, so some thought may be needed on the correct user interface design of the interactive applications.

CONCLUSION

We have presented an immaterial, interactive screen, which is a new kind of a user interface floating in thin air. It has many applications on all fields of life, and can have an impact on many future interfaces. Interactivity significantly expands the possibilities of walk-through screens.

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REFERENCE

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2. e-beam System 1 whiteboard tracking. www.e-beam.com.