

The Walk-thru Fog Screen Experience

Ismo Rakkolainen, Mika Piirto, Jan Landkammer, and Karri Palovuori
Tampere University of Technology, Tampere, Finland
Ismo.Rakkolainen@tut.fi

A projection screen is typically made of a solid sheet or a board. There are several proposed ways to form non-solid screens of water, smoke, or fog, but usually they suffer from bad image quality if viewed near-by the screen or far off-axis from the projector. Also, they are not meant to be walk-thru. Particularly, a fog or smoke screen also tends to disperse easily. This is caused by the friction and the dynamic pressure difference between the moving screen and the surrounding stationary air, and by the turbulence created thereof.

We have presented a novel and simple method for forming a superior quality physically penetrable fog display [Rakkolainen and Palovuori 2002]. It is a break-through technology, literally!

The Technology

The basic idea in our fog screen is to create a large non-turbulent airflow, and to inject a thin non-turbulent fog (or smoke etc.) flow into and inside this airflow to become part of it. The laminar airflow protects the fog sheet from turbulence, which thus remains thin and crisp, enabling high-quality projections and the walk-thru possibility. Images can be either rear- or front-projected. The screen can be translucent (as in Figure 1) or even fully opaque.

Laminar airflows can be created in numerous ways. There are also several ways to create fog to be injected into the laminar airflow. We use ultrasound fog generators, which form a dense and white fog. If the mean diameter of fog droplets is small, this so-called dry fog does not wet clothes or harm equipment and appears dry to the touch.

Applications

Our first permanent installation took place in Vapriikki Museum in Tampere, Finland in January 2003. The fog screen creates a magical image floating in thin air and encourages the audience to play with it. Children love it, but even middle-aged people may get rather excited, or even addicted, as one viewer told us.

The fog screen enables many novel applications for indoors and even outdoors. The fog screen is non-breakable, which enables safe gaming, exercise or training, and non-supervised public presentations. It also enables the audience to enter and exit rapidly through the fog walls. Interesting applications could include walk-thru advertisements on shops or malls, or a walk-thru screen entrance to a theme park.

Mixed reality and immersive projection technology can use CAVE-like virtual rooms with fog walls, making them effectively “virtual virtual rooms”. Even a fog ceiling might be possible, but a fog floor would surely be a challenge to implement.

Non-planar surfaces like sharply curving cylindrical shapes parallel to the airflow are also possible. One possible extension to the method is to make 3D fog shapes, if a suitable computer-controlled fog nozzle matrix is used. Light, mobile, and large screens, or virtual rooms can be set up easily.

See <http://www.cs.tut.fi/~ira/wave.html> for more images and videos of the fog screen. However, the screen looks better in real life. This work has international patents pending.

Reference

RAKKOLAINEN, I., AND PALOVUORI, K. 2002. WAVE – A Walk-thru Virtual Environment. IEEE VR 2002 Conference, Proceedings of Immersive Projection Technology Symposium 2002, Orlando, FL, USA, March 24-25, 2002.



Figure 1. Images projected onto the walk-thru fog screen.