



## Fog screen projection

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### Abstract

Fog Screen is breakthrough technology that allows projection of high quality images in the air. It is currently the only walk-through projection screen. You can literally use the air as your user interface by touching only the air with your bare hands. The screen is created by using a suspended fog generating device with no frame around, and works with video projectors. The fog they use is dry, so it doesn't make you wet even if you stay under the Fog Screen device for a long time. The fog is made of ordinary water with no chemicals what so ever. With two projectors, you can project different images on both sides of the screen. It is a display device which is the application of computer graphics.

**Keywords:** translucent projection, dry fog, walk-through projection

### 1. Introduction

Inspired by science fiction movies such as Star Wars, two finish virtual reality created the fog screen to recreate some of the effects from these movies in real life. Fog screen is an exciting new projection technology that allows to project images and video onto a screen of "Dry" fog, creating an illusion that the images are floating in mid-air. Fog screen is immaterial walk through screen projection. It allows for projection on a thin layer of dry fog. Imagine the traditional pull down screen that is found in many class rooms. Instead of a screen that is pulled down from ceiling, Fog is pushed down and held in place by several small fans, allowing for consistent surface for display

### 2. History of fog screen

It was invented by two finish virtual reality researchers Fog screen, which was initially known as WAVE (Walkthrough Virtual Environment), was announced in December 2001. The first demonstration of fog screen was in Finland in October 2002. Till then it is in use in different areas and improvements are being done to increase its effectiveness. Fog Screen is a patented technology, which Rakkolainen, one of the senior researchers and founders behind this technology, describes as, "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." (2006). Palovuori (2006) writes that the fog screen creates a large non-turbulent airflow to protect a dry fog flow inside it from turbulence. The fog screen debuted at the 2002 Turku science fair. The fog screen company was founded in 2003 and volume production began in 2004. An interactivity add-on, which lets you write "in the air" and even control a computer, debuted in 2005. The fog screen one launched in 2006.

### 3. Fog Screen

As reviewing the other methods there is one thing is

absolutely common that is a Screen the screen can be made of nothing like a Curtain or a wall (Colour depends on the projection) now thinking the fictions and seeing the science fiction movies there we can see the projection in mid air now this is quite fascinating so finding a way out is the next step. So why not should we try fog screen?

Fog is basically in the chemical structure is a mixture of air(gas) and water(vapour) in india or in any other country you can see foggy seasons in winter and in sometimes in mid rainy season.

So can we utilize this natural phenomenon?



**Fig 1:** Components of fog

In fig: 1 you can see the elements of the fog when air and water vapours are mixed it creates fog which is the curtain for our projection.

### 4. Differentiate between hologram and fog screen

We already discussed about the methods to project down the projection on different things now by using the phenomenon of interference we create Holograms.

Holograms are basically 3D projections but Fog screen projections are 2D in nature.

Holograms can't be created in Mid Air it needs a perfect photographic plate at a particular distance and angle but on the other hand fog screen needs only Fog now it depends the cause of the fog whether it can be created on natural fog or artificially.

The colour of the projection in hologram is only in one colour depends on the colour of the laser light but FSP (Fog Screen Projection) consist of different colours.

Hologram projection needs a particular and specific arrangement of the components whether fog screen needs only projectors and a simple screen.



**Hologram**

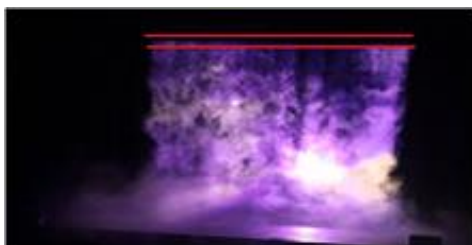
**FSP**

**Fig 2:** Projections: (a) FSP (b) Hologram

In fig 2 you can see the left side projection of a hologram and right side projection of FSP.

### 5. Projection of fog screen

Fog screen is used by forming ordinary tap water and digital technology like ultrasonic device to create a thin layer of dry fog which is sandwiched between two air curtains. The fog is created by suspended fog generating device. It is made of ordinary tap water with no chemicals. Fog screen creates a “dry” fog by ensuring the water droplets are in the range of 2-3 microns in size and electro statically charged and they move around and away from the objects. The fog is made within the device using water and ultrasonic wave. If you hold your hands in the fog flow, the fog feels dry and cool and your hands do not get wet. After the screen is formed, images can be projected onto it. The screen is opaque. The founders of the fog screen were intrigued with the prospect of reating a image that float through the air and people could walk through. They set out to make a projected image float in the air by using a different media like sand, dust, water. And then a mist of tiny water droplets. They had to iterate their design repeatedly to ensure that people could not get wet and that the fog screen could operate within a broad range of environmental conditions. The ultrasonic transducer used to divide the water into small tinywater droplets as the fog which we are using is completely dry and it is light. If we take large water droplets then it will create wet fog and which is used in the formation of screen.



**Fig 3:** Fog Screen Formation

### 6. Fog screen machine

As our research is based on Fog screen projection then there is

utmost needed thing is Fog the fog can be artificial or natural. As we already aware of fog formation (Air + Water) then we can create it artificial.

The fog machine through the water droplets of microns size with then spread by fans attached internally.

There the air is mixed with the vapour and forms aerosol which is known as fog.

Now fog machine is attached to downwards to the the arrangement of the fog screen and the fog is taken out from it my using simple computing so that we can control the out coming of the fog at the right time.

### 7. Creating It In 3d

As we can observe here that FSP is a 2D projectioning as we seen in the holograms they are in 3D so can we convert FSP into 3D?

Yes! FSP can be in 3D simple projection in FSP contains a arrangement of fog screen and projectors an uffcourse the fog machine. One projector projects it in 2D (XY dimensions) so if we want to add 3D aspect then we can use another projector to add the height and width in it so we can say that we added volume to it.

Another projection works another XY axial part and after merging of the both projection we get the final XYZ axial points.

That's how the 3D projection goes working.



**Fig 4:** 3D and 2D projection

In Fig 4 it is easily seen that if one projector is used then there is 2D projection and f there is 2 projectors are used then there is 3D projection will occur.

### 8. Pseudo volumetric screen

Even though the basic walk-through Fog Screen is a plain 2D projection screen, it is a volumetric display in the sense that the floating image is formed within a volume of empty, freely accessible space. The basic Fog Screen can be extended to become a pseudo-3D display, while still fundamentally being a 2D display technology. Our contribution is a novel interactive, dual-sided, wall-sized system that allows a single user to view objects floating in mid-air from any angle, and to reach and walk through them. Two individual, but coordinated, images are projected onto opposite sides of a thin film of dry fog, and an integrated 3D tracking system allows

users on both sides to interact with the content, while the nonintrusive and immaterial display makes it possible to freely pass physical objects between users or move through the shared workspace. Our system opens up possibilities for a wide range of collaborative applications where face-to-face interaction and maximum use of screen estate is desirable, as well as the maintenance of individual views for different the screen affords an image of 2 meters' width (or 2.5- meter screen diagonal at 4:3 screen ratio) in the centre of a large open viewing area that is limited only by available space and coverage by a 3D position tracker. By tracking a single viewer's head, using correlated projectors on each side and adjusting the projected 3D graphics rendering accordingly, we create a pseudo-volumetric 3D display. This makes the 3D effect more convincing by showing the 3D object from the appropriate angle. The viewer can see objects floating in mid-air from both sides and freely walk around and through them to examine the scene from almost any angle. The eye cannot correctly focus at a real point within the image, but an impression of depth is still achieved due to other monocular cues, most notably motion parallax. The immaterial nature of a thin sheet of fog allows a user to penetrate and even walk through the screen, while tracking a single user's head enables the pseudo-3D visualization. Using the dual-sided option of the screen, projecting coordinated opposing views, 3D objects can be observed from all sides. Also, stereoscopic imaging techniques can be used with the Fog Screen.

## 9. Fog screen related to Multimedia

Displays are hugely important to multimedia. All imaginary needs some way to be displayed, even in its creation. For this reason, there are many technologies out there and as a result many products with a recent one being the plasma screen. Fog screen breaks this mould being the first immaterial capabilities of fog screen products have enabled its success in the world of multimedia and its application can be seen all over the world and in many different industries.

## 10. Limitations of FSP

First, FSP needs a dark background to enhance the brightness and the colour contrast of the projection.

Second, FSP is very expensive arrangement then any other projection so it is not affordable.

Third, Could not be use in Day Light.

Fourth, It takes 1KW to 2 KW energy to project one projection so it is energy consumable.

## 11. Fog screen advantages

- The fog screen developers say the unique nature of fog screen will make it a memorable experience for customers.
- Fog screen is environmentally friendly, as it uses only water as requirement and producers chemical free fog.
- Increase product skill and quality of products safety for kids, fun and play time for the kids. It is immaterial you could walk through it.
- Increase production skills-technology transfer reduce competition-increase quality of product enter to new market.

- Increase for workers with an increase in marginal cost fog screen is working on new hardware products fog screen with specialized capabilities. There are also significant enhancements being made to the interactivity and 3D imaginary capabilities of the screen.

## 12. Fog screen opportunities

- There are endless opportunities to use the products, but for now these have been mostly innovative.
- Development are being carried out in making fog screen a touch fog screen to make it more marketing solutions and different exhibitions.
- Stream of fog can appear and disappear within a fraction of a second, making it a possibility for use in a live theatre setting to aid with special effects.
- Presently it is demand in countries like Japan Malaysia, Germany, France, Greece, Russia, UK and in recent future it will replace the existing method of projection. Interactive for the viewer

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