

A
SEMINAR REPORT
ON

HELIO DISPLAY

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FOR THE AWARD OF DEGREE OF
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IN
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INTRODUCTIONS

Heliodisplay is a hi-tech projector that displays pictures in the air. The **Heliodisplay** is a free-space display developed by IO2 Technology. A projector is focused onto a layer of mist in mid-air, resulting in a two-dimensional display that appears to float. As dark areas of the image may appear invisible, the image may be more realistic than on a projection screen. Heliodisplay can work as a free-space touchscreen when connected to a PC by a USB cable. A PC sees the Heliodisplay as a pointing device, like a mouse. With the supplied software installed, one can use a finger, pen, or another object as cursor control and navigate or interact with simple content.

Heliodisplay is a patented projection system designed to project video, products, information, people in mid-air (50" & 90" diagonal form factor). Heliodisplay is part of a complete two-piece solution (base unit and projection unit). You can connect the Heliodisplay to any video output, or insert a CF (CompactFlash) card with AVI or JPEG files into the Heliodisplay, and project any images or video in mid-air. Press the power button (eco-friendly, low power consumption 100watts, 280watts), connect the video source, and you will see images in air (some content is better than others). Heliodisplay prices range from \$19,000 and 39,000USD (M50/L90) for the hardware. Interactive models such as the L90i are available that allow for touchscreen interactivity of the free-space video or image. No special programming is required as this works like a standard mouse driver. IO2 Technology ships Heliodisplays worldwide. We can work with you to deploy Heliodisplays in your location. Heliodisplays work on any power source, 90-240V, 50 or 60 Hz. No fog or special chemical is required. Heliodisplay does not affect the environment as it works using the existing air that is already in the room to create the image. An internal water tank of 8 liters filled with regular tap water lasts one to two days on the L90 and a 3 liter tank on the M50 lasts a day. A supplied water tank can be configured for operating continuously for a week, month or years. Heliodisplay M50 are ready place on a table or the L90 sits on the ground. No trusswork or hanging necessary. Easily extending a few lines allows the system to run for multiple days/weeks/ months or years. Heliodisplay's images hovers 5 cm (2") beside the unit. Heliodisplay works in any controlled indoor lighting, such as the lighting in stores, museums, offices, and lobbies. Heliodisplay's image looks best when the hardware is hidden inside furniture or structures.

Heliodisplay & its Principle

The heliodisplay is an interactive planar display. Though the image it projects appears much like a hologram, its inventors claim that it doesn't use holographic technology, though it does use rear projection (not lasers as originally reported) to project its image. It does not require any screen or substrate other than air to project its image, but it does eject a water-based vapour curtain for the image to be projected upon. The curtain is produced using similar ultrasonic technology as used in foggers and comprises a number of columns of fog. This curtain is sandwiched between curtains of clean air to create an acceptable screen. Heliodisplay moves through a dozen metal plates and then comes out again. (The exact details of its workings are unknown, pending patent applications.)

It works as a kind of floating touch screen, making it possible to manipulate images projected in air with your fingers, and can be connected to a computer using a standard VGA connection. It can also connect with a TV or DVD by a standard RGB video cable. Though due to the turbulent nature of the curtain, not currently suitable as a workstation. The Heliodisplay is an invention by Chad Dyner, who built it as a 5-inch prototype in his apartment before founding IO2 technologies to further develop the product.

The helio displays are interactive, allowing a finger or hand to move images around in the air as if one were grabbing a virtual object. it requires a power outlet, and a computer, TV, DVD or alternate video source. The current version of the Heliodisplay projects 30" diagonal images in 4:3 and 16:9 aspect ratio. The Heliodisplay system is backward compatible and accepts most 2D video sources (PC, TV, DVD, HDTV, Video game consoles). For connection to a computer, the Heliodisplay uses a standard monitor VGA connection; for TV or DVD viewing, it connects using a standard RGB video cable.

Heliodisplay images are easily viewed in an office environment. Like any computer monitor or TV, images appear brighter the lower the ambient light. Also, just like viewing any computer monitor or TV, viewing a Heliodisplay image in direct sunlight is almost impossible. The image is display into two-dimensional space (i.e. planar).

Viewing requires no special glasses or background/foreground screening. Of course, with any type of display, the darker the background and lighting, the higher the contrast of the Heliodisplay images or an display on the market. The Heliodisplay interactive is like a virtual touch screen. A hand or finger can act as a mouse for cursor control interactivity in a computer environment. No special glove or pointing device is required. Just as you use a mouse to move the cursor on a traditional computer monitor, you can use your finger to move the cursor around the Heliodisplay image. It would surely be a great experience to handle them.

HelioDisplay projects the images into free space



How would you like to see a holographic-like image displayed in the air from your tv or mobile device? Sound like science fiction. Apparently not, according to IO2 Technology "IO2 Technology develops technology relating to next-generation interfaces some of which are not currently available, one platform is—the Heliodisplay .

Heliodisplay images are not holographic although they are free-space, employing a rear projection system in which images are captured onto a nearly invisible plane of transformed air. What the viewer sees is floating mid-air image or video. These projected images and video are two-dimensional, (i.e. planar) but appear 3D since there is no physical depth reference. While conventional displays have the benefit of being attached to a physical substrate, Heliodisplay projections are suspended in air, so you will notice some waviness to the quality of the projections.

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By now, we're all jaded enough to figure out that this gee-whiz technology is fun to dream about, but probably isn't going to be something we buy for quite a while.

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HISTORY

In late 2003, a small company from the San Francisco Bay Area demonstrated a unique revolutionary display technology. The (then) prototype device projected an image in thin air just above it, creating an illusion of a floating hologram, reminiscent of the famous scene from 'Star Wars' in which R2-D2 projects a hologram of Princess Leia.

The development of this distinctive technology, dubbed Heliodyisplay by its developer Chad Dyner, began early this decade after Dyner decided to trade a promising career as an architect to become an inventor. Dyner bought an ordinary digital projector, took it apart, and spent entire days trying to figure out a way to stop in midair the light coming from the projector without engaging a traditional screen. Though the details are kept a closely-guarded secret, Dyner was willing to provide a general description of the way the Heliodyisplay works.

Displaying an image using conventional projectors requires a non-transparent medium, typically screens, walls, or even water, but air, which is transparent, cannot



Fogscreen display

be used. A more recent development is the Fog Screen, which creates an image in midair by employing a large, non-turbulent airflow to protect the dry fog generated within from turbulence. The result is a thin, stable sheet of fog, sandwiched between two layers of air, on which an image can be projected and even walked through. The Heliodyisplay creates a similar effect, but, instead of fog, it uses a cloud of microscopic particles whose specific nature is one of the secrets Dyner keeps close to the vest. In 2005, the U.S. Patent Office granted Dyner a patent for a "method and

system for free-space imaging display and interface". Apparently, the Heliodisplay creates a particle cloud by passing the surrounding air through a heat pump, which in turn cools the air to a level below its dew point, where it condensates, and is then collected to create an artificial cloud. The particle cloud is composed of a vast number of individual micro droplets, between 1-10 microns in diameter, too small to be visible to the naked eye, held together by surface tension. The focus and illumination intensity of the projected image can be controlled by changing some of the cloud's properties, enabling a sharper and brighter image.



Heliocast - interactive Heliodisplay

Since 2003, IO2 Technology, the California-based company Dyner founded to commercialize his invention, began selling his device under the brand name Heliodisplay M2 for just under \$20,000, out of reach of most consumers. IO2 Technology is actually marketing the M2 to corporate customers who would use the device as a novel way to display the company's logo or as a strikingly impressive advertising and promotional tool for exhibitions.

The M2 projects its 76.2 cm (30") diagonal floating image at a height of 71 cm (28") above the projector. The native resolution of the M2 is 800 x 600 though it can support up to 1280 x 1024, and the image can be viewed from as much as a 150 degrees angle. The M2i model includes a proprietary system, called Heliocast, for interactively controlling the displayed image. A sensor inside the M2 identifies the movement of the user's hand in the area of the projected image and the Heliocast software calculates the movement of the object projected.

TFOT recently covered another unique display technology, called Perspecta, developed by Actuality Systems. Unlike the Perspecta, which is a true 3D display capable of showing a 3D

object perceived when simply walking around the display, the M2 displays a 2D image in midair, creating the illusion of depth. While the Perspecta is currently used mainly for medical and research purposes, the M2 is intended primarily for corporate use as a promotional or advertising tool at this stage. Although it is possible to view movies or play games on the M2, Dyer admitted that the current device is not intended for serious applications such as CAD (computer-aided design). The Perspecta is an enclosed device with lower resolution but with the capability to display a full 3D image and video with almost no flickering or wavering effects. A future display might incorporate the best of both worlds: an open-air display with high resolution, clear 3D capability, along with an accurate interactive capability.

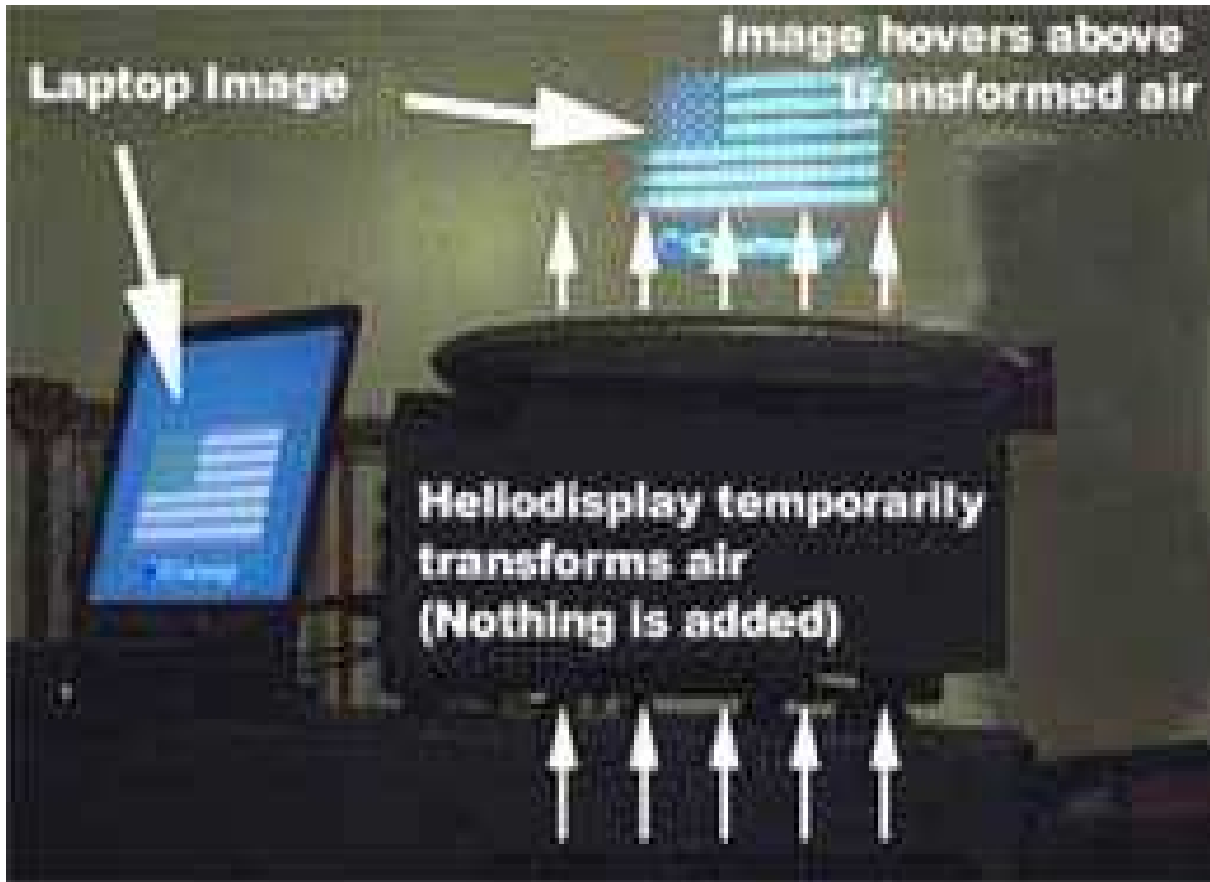
WORKING

The Heliodisplay transforms water into a unique screen of fine vapour, suspended in mid-air to create a nearly invisible screen into which any image can be projected. The display can create a true 3D hologram effect when the right content is used.

The mist is formed by a series of metal plates, and the original Heliodisplay could run for several hours on one liter of tap water. 2008 model Heliodisplays use 80 ml to 120 ml of water per hour, depending on screen size and user settings, and can be built with any size water tank.

The system supports all those formats compatible with Win2000, XP and Mac platforms. This is just a display, and works similar to one.

The Heliodisplay uses no additives or chemicals, only plain tap water (you can also use distilled water, ionized water or demineralised water if desired).The image feels just like air and there is no noticeable difference. Images are visible under typical indoor lighting. Similar to any display on the market, the darker the ambience, the brighter the image will be perceived. It does not use any gas except the surrounding air that you are already breath; and is not toxic. An internal or external tank (depending on mode) needs to be refilled with regular tap water for operation. The tanks last a few days to a week (depending on settings and operating time) or can configure for constant use. Heliodisplays use 80 ml to 120 ml of water per hour, depending on screen size and user settings, and can be built with any size water tank.The system supports all those formats compatible with Win2000, XP and Mac platforms. This is just a display, and works similar to one. The Heliodisplay uses no additives or chemicals, only plain tap water (you can also use distilled water, ionized water or demineralised water if desired).The image feels just like air and there is no noticeable difference. Images are visible under typical indoor lighting.



Displaying Data in Thin Air

The first permanent prototype was installed in the Vapriikki museum in Tampere and has since been loaned for use in France. FogScreen is renting some devices and expects to begin sales soon. Rakkolainen said, "This project started as a wild idea." The researchers formed FogScreen Inc. last year and are currently marketing the device. Although Heliodisplay and FogScreen are interesting, it remains to be seen if two new techniques represent the latest approach to display technology: doing away with the screen. While unlikely to replace the desktop computer monitor, these thin-air displays could eventually be put to use in product showrooms, museums, military training facilities, corporate conference rooms, trade fairs, theme parks, and advertisements. Chad Dyer, a graduate student at the Massachusetts Institute of Technology and chief executive officer for IO2 Technologies, has invented the Heliodisplay, which condenses the air above a video projector. The device then projects an image onto the condensed air, Dyer

said. IO2 has constructed proof-of-concept devices with 5-, 15-, 27-, and 42- inch screens. These can display twodimensional images that hover above the projector. Because they are displayed on a surface that is not flat, the images appear 3D from a few feet away and can be seen from any surrounding position. yner said he created IO2 Technology license the technology to “one or more key players in the display market or companies that have the manufacturing capability to produce and distribute Heliodyisplay.” Senior researcher Ismo Rakkolainen and Professor Karri Palovuori of Finland’s Tampere University of Technolog have developed the FogScreen, a display surface made out of a cloud of water vapor diffused into the air as a very dry fog. A projector can display images on the FogScreen. “It appears dry to the touch, so it feels just like air,” Rakkolainen explained. Viewers will thus see images they can walk through without getting wet. The water vapor is diffused between thick layers of emitted stable air, which keeps the fog thin and flat, enabling high-quality images, he added. they will be cost effective and will find an important use, said analyst Chris Chinnock of Insight Media, a displayindustr research firm. “Both are more likely to work as advertising or information screens in museums, public displays, entertainment centers, etc.,” he explained. “These are specialty displays that need a novel experience and they need to be marketed and positioned as such.” _

FogScreen technology, invented by two Finnish researchers, projects an image onto a display surface of water vapor diffused into the air as a very dry fog. Viewers can even put

their hands through the images. Any fan of the movie Starwars or Minority Report or a similar futuristic movie is in for a real delight because one of the features that these movies boasted, was 3D Virtual Holographic Displays and seemingly Floating TouchScreen Displays are now a reality!

Yes you are not dreaming, these displays and the technology for these displays has been finally perfected! IO2 Technologies have developed displays under the brand Heliodyisplay, which projects any standard computer or video cable attached to the Heliodyisplay system, and project video or images into mid-air.



Various models are available ranging sizes from 30", 50" and 100" (diagonal) areas. The 'i' version allows for a "virtual" touchscreen (new for December 2007). No special hardware or software is required to view images. The 30" Heliodyisplay is now only 5.9" tall, and weighs 15lbs. The 50" and 100" are each only 10" tall and weigh 28lbs, and 68lbs respectively. All afford a wide range of flexibility and options.

Features:

The new M3 / M3i boasts "an improved tri-flow system for increased image stability and uniformity," enhanced brightness and clarity, a 1,024 x 768 resolution, 16:9 or 4:3 aspect ratios, 2000:1 contrast ratio, VGA / S-Video / composite inputs, USB, NTSC / PAL compatibility, and "significantly quieter operation" to boot.

Marketed to the uber-wealthy and board room runners who'd like to teleconference on a free-space device (and blow the minds of clients), the basic M3 is available for a stiff \$18,400, while the M3i — which also serves as a "computer input device for cursor control in a desktop environment" — will set you back a whooping \$19,400.



When the Heliodisplay is connected to a PC using a standard USB cable, and with the supplied IO2 Heliocast software installed, you can use your finger for touchscreen control to navigate and interact with content such as drag & drop, clicking, double clicking etc as one would on a standard PC. This is available starting December 2007

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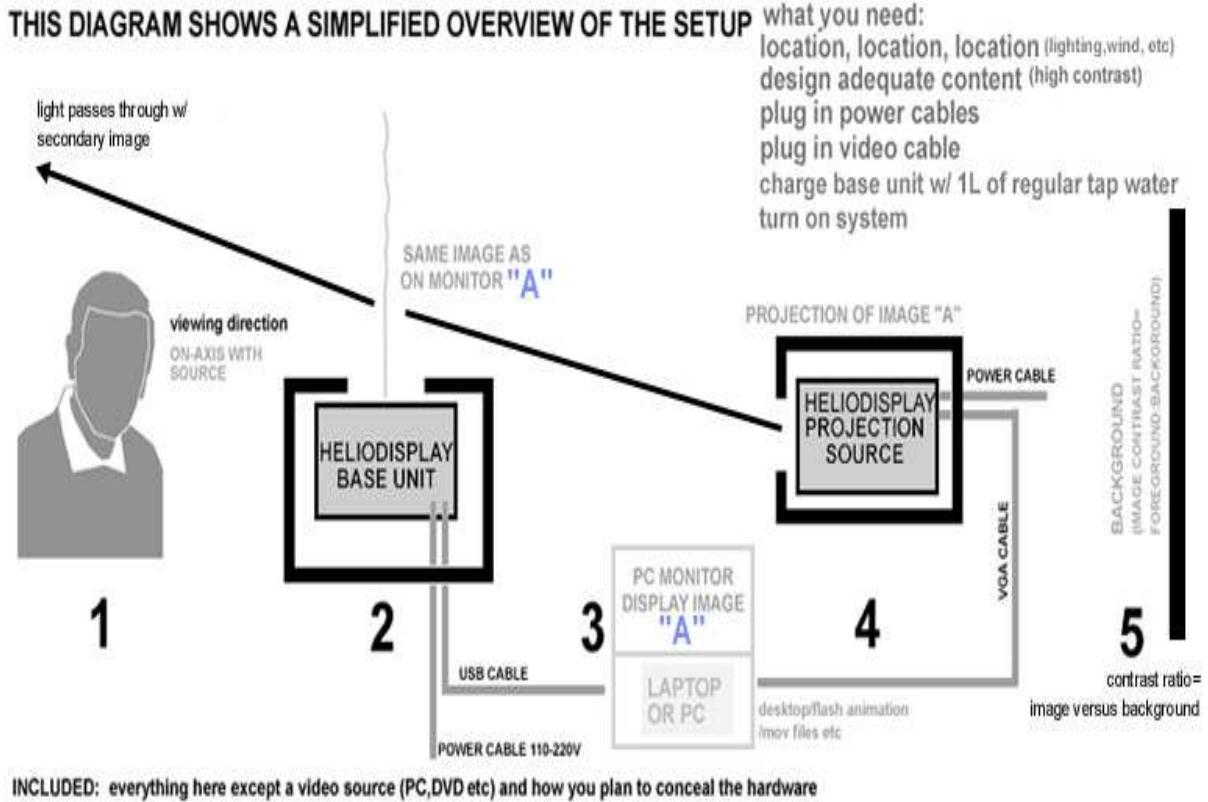
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Mid air video display



- Project video or images into mid-air
- Supports
 - JPEG
 - FLASH
 - QUICKTIME
 - Text
- Added Capabilities installed Software
 - Cursor control
 - Navigate and interact with simple content

MODELS

M1

The original **M1** units produced by IO2 were advanced prototypes and proof-of-concept, but a few were sold to early adopters through channels such as eBay.

M2

The second-generation **M2** Heliodyisplay supports a 30" image with 16.7 million colors and a 2000:1 contrast ratio. The interactive **M2i** version includes virtual touch screen capability.

Specifications

Image Size: 30" measured diagonally (4:3 aspect)

Interactivity: Virtual Cursor Control – Heliocast ver. 2.0

Aspect Ratio: 4:3 or 16:9

Resolution: Native – SVGA 800×600 pixels; Resize Support: 640×350 to 1280×1024 pixels

Contrast Ratio: 2000:1 (at projection source)

Color Reproduction: 16.7 Million colors/ full frame video

Video Input connectors: RGB analog, USB, RCA video, S-VIDEO, VGA

Input signal frequency: Fh: 31-80kHz; Fv: 56-120Hz

Video & PC Compatibility: PC, Mac, NTSC, PAL, SECAM HDTV: 480i/480p, 720p, 1080i

Image Translucency: Controllable visibility

Operational Sound Level: 38 dB

Electric Power Voltage: 95-115 or 220-240V VAC

Electric Power Frequency: 47-63 Hz

Electric Power Consumption: 350W

Working Temperature Range: 55F (12C) to 95F (35C)

Working Humidity Range: 25% – 95%

Weight: 34.5lbs/ 15.7kg

Dimensions: (W): 28.3", (D): 15.9"[29.8" expanded], (H): 9.3"(71.8cm x 39.6cm [76cm

expanded] x 36cm)

Warranty: six months limited parts and labor

M3 and M30

The new third-generation **M3** version launched on February 28, 2007 has the same basic specifications as the **M2** but is said to be much quieter, with improved brightness and clarity and more stable operation with an improved tri-flow system.

Apart from displaying at a standard ratio of 4:3 in addition it also displays 16:9 widescreen ratios. There is also an interactive version called the **M3i**.

The M30 is the updated version of the M3, which fits into the current model numbering system, 30 designating the diagonal screen size.

M50 and M100

In late 2007, IO2 Technology introduced two larger Heliodeisplays, the M50 and M100. The M50 has a 50" diagonal image, equivalent to displaying a life-size head-and-shoulders person. The M100 has a 100" diagonal image, equivalent to displaying a large full-body person (about 2 meters tall).

According to the press release, the Heliodeisplay is now available for purchase. Heliodeisplays are available in projecting image sizes from 22 to 42 inches (diagonal), and is available with interactive features. IO2 Technology's website (<http://www.io2technology.com>), which has Heliodeisplay(TM) units available for direct purchase, demonstrates how a user can move the image of a watch in mid-air with their finger.

I saw this device demonstrated at Wired NextFest, a technology exposition in Chicago earlier this summer, and it really works - it's an impressive device.

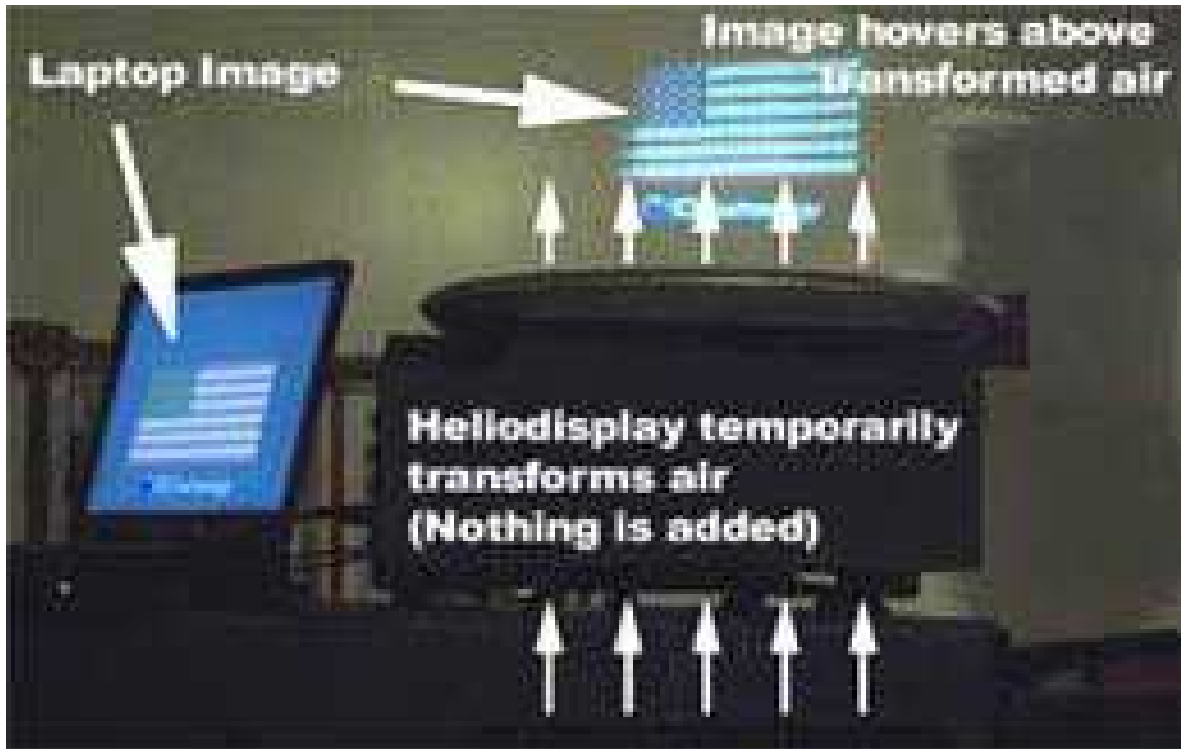
In his *Dune* novels, Frank Herbert makes use of something he calls a "solido projector" - a device that forms an image directly on a conference table. Films like Star Wars show how

images projected into the air might be used. The Heliodyisplay from IO2Technology projects images - both still pictures and video - into mid-air. It works with most video sources. It is also interactive, forming a floating touch screen that can be manipulated with your hands.



(From Heliodyisplay)

As shown in the diagram below, air flows into the device, is modified and then ejected and illuminated to produce the image. Nothing is added to the air; nothing affects air quality. Images can be seen up to 75 degrees off aspect, similar to an LCD screen; no special glasses or projection screens are required.



(From Heliodyisplay diagram)

The image is two-dimensional, not volumetric.

The science fiction film *Star Wars* has several famous examples of how a projection device like this might be used. For example, in the scene below, R2D2 and Chewbacca are playing a board game with projected pieces.



Proposed applications for the real-world Heliodyisplay include:

- Advertising and Promotion, e.g.: trade shows; in-store displays; museum, movie and casino displays; theme parks.
- Collaborative Decision Making, e.g.: board meetings and presentations; air-traffic control; military command and control; architectural and engineering design; teleconferencing.
- Simulation & Training, e.g.: virtual targets; pre-operative planning; virtual surgery.
- Consumer, e.g.: video games; home theatre.
- Heads-up displays in new fields, e.g.: a patient's vital signs could hover above the chest during open heart surgery.
- Build one into a door jamb and have a walk through image or virtual privacy screen.
- An in-store end cap advertising display and demonstration through which the customer can reach and grab shown product.
- Build the Heliodyisplay into furniture, e.g. project from desk.

NEGATIVE ASPECTS

- Needs controlled lighting for best working conditions
- Images become less visible under bright lighting
- Wind and bright lights interfere with image visibility
- Expensive

APPLICATIONS

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CONCLUSION

Helio display is a good projection unit which does not require any special hardware and support videos and jpg images, flash, quick time etc. we can also play games on helio displays. This unique technology, developed by a former architect, creates one of the most convincing open-air holographic-like images in existence.

Heliodisplay can work as a free-space touchscreen when connected to a PC by a USB cable. A PC sees the Heliodisplay as a pointing device, like a mouse. With the supplied software installed, one can use a finger, pen, or another object as cursor control and navigate or interact with simple content.

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