berception



SIMULATION DISPLAYS TECHNOLOGIES & INTEGRATION

About 3D perception

3D perception designs and supplies seamless immersive visual display systems and technologies for simulation applications.

Serving civilian and defense customers around the world since 1997, 3D perception has a proven track record of ensuring performance and quality from design to installation and throughout the life cycle.

With offices in the United States, Europe, and China, we work with major defense and high-tech prime contractors as well as with aerospace industry customers and users around the world.

With over 10,000 visual channels fielded, 3D perception is the world's preeminent supplier of immersive, curved screen, projected simulator visual display systems.



3D perception Provides

- Innovative product development
- Projector and Image Generator independent solutions
- Industry-proven expertise in engineering and integration
- Precision auto alignment and calibration technologies
- ▶ FAA and EASA certified turn-key systems
- Global service and support



Innovation & Experience Powered by People

3D perception's people make the difference. We employ industry professionals in visual system engineering, program management, field service installation and support, account management, and product development.

Our staff's combined experience, vision, and passion result in innovative and exemplary products and services.

Customers choose 3D perception because we have a track record of excellence in providing the entire solution; before, during, and after delivery. We enable simulation companies to focus on what they do best, and to not be concerned with developing custom visual display systems for every new project.





Engineering & Integration

3D perception provides display solution design and integration services at any point in the procurement process. 3D perception is well positioned to contribute innovative concepts and proven methods to any project. There are many factors to be considered in configuring a theater to meet program specifications. 3D perception's engineers blend technical knowledge, field experience, and a proven design toolset to ensure performance.

Dependable Results with nDesigner

3D perception's solution for developing visual display system designs to meet complex requirements is our nDesigner[™] toolset.

This sophisticated software allows 3D perception to design, analyze, and previsualize any type of projection display system, while adhering to performance requirements, and incorporating room layout, cockpits, and other obstructions.

nDesigner accounts for a multitude of variables such as projector model, lens selection and settings, eyepoints, and screen size, shape, and surface gain.

nDesigner provides detailed data plots for luminance, resolution, observability range, and outputs Aitoff coverage diagrams showing channel locations, cabin windows, shadows, and other obstructions, and can predict performance from any eyepoint.



Developed and consistently updated to meet the changing needs of the market and our customer base, this tool is well-proven to facilitate the implementation of valid, optimal designs from concept through to completion.



- Detailed performance modeling
- Screen analysis
- Projection analysis
- Shadow analysis
- Heat map plots and diagrams provided in proposals

NORTHSTAR SIMULATION DISPLAY SOLUTION

Northstar[™] is 3D perception's integrated simulation display solution. Northstar provides industry-leading, precision automatic image alignment and calibration, with the ease of centralized push-button operation.

The solution is content-independent, requiring no software integration with—or processing power from—the user's Image Generator (IG). Northstar is completely compatible with all IGs.

Northstar is projector-independent, allowing for use with an ever-evolving catalog of projection technologies and a clear and open upgrade path.

Northstar Key Components



- Centralized system control via unified interface
- > Precision auto warp and blend in seconds
- ▶ Push-button color and luminance calibration
- Image Generator-independent
- Projector-independent
- ▶ Future-proofed upgrade path

nBox Multichannel Display Processor & Manager

At the heart of 3D perception's Northstar solution is nBox[™], an all-in-one display processor that warps, blends, and color corrects raw IG content. nBox outputs to multiple projectors and seamlessly displays imagery across screens of any shape.

This next-generation display processor calibrates color, gamma, contrast and compensates for hot spots, creating a truly consistent image.

nBox treats the multi-projector theater as one continuous display—not as an array of individually controlled projectors.

nBox allows for a projector upgrade path while maintaining overall display architecture.

Features

- Up to 6 channels per unit
- Stackable for any number of Zero frame latency display channels
 Hot-swappable power
- Powered by 3DP's patented Digital Geometry Processor
- Intelligent EDID
- Resolutions up to 4K



Full projector control

- Hot-swappable power supplies & I/O boards
- Scenario management with selectable eye-points
- Non-linear image warping
- Auto image alignment
- Auto color calibration
- Gamma correction
- Hotspot compensation
- Black level enhancement
- Input signal analysis
- > 2U rackmount form factor
- Display Port & DVI interfaces

Northstar System Interface

nControl[™] is an intuitive, user-friendly graphical interface for control and maintenance of Northstar displays and enables users to approach it as an integrated system, not as separate components.

nControl is installed on the user's maintenance PC or IG host which is networked to nBox. nControl is responsible for maintaining a consistently optimized image in concert with all Northstar components, managing geometry adjustment,

Features

- One-click power up/down and maintenance
- Save/load multiple training profiles changes eyepoints, accounts for different obstructions
- Control Dynamic Optical Blenders for time-of-day optimization and NVG training
- Automate procedures which could otherwise take hours

edge blending, color balancing, and gamma correction. With the push of a button, it automates maintenance procedures and readjusts the image in seconds.

nControl can be directly operated or interfaced with the user's IG/host for automatic display optimization for time of day and lighting condition changes.



Auto-Aligning Instrumented Screens

3D perception's Aurora[™] screens have embedded WarpSync[™] and ChromaSync[™] sensors which detect the alignment and quality of projector images. Via network connection to the nBox display processor, Aurora enables automatic and precise adjustments to geometry, edge blending, color, and intensity.

Screen Options

Aurora screens are available for any size and shape requirements, and custom screens can be produced as needed. Screens can be configured at any horizontal and vertical field of view, up to complete dome display systems.



Features

- Enables Northstar's automatic warping, blending, and color calibration
- No separate instruments are required for alignment and calibration
- Available in any size and shape—spherical, cylindrical, conical, flat



The **Click Screen** is our most popular Aurora model due to its flexibilty. Modular panels are assembled to create the desired field of view within a 3.25-meter radius sphere.

WarpSync sensor clusters embedded within screen detect alignment patterns for precision automatic warping and blending.



ChromaSync sensors, typically mounted at the screen's edges, measure and automatically calibrate channel color and intensity.



Northstar Simulation Certified Projectors

3D perception products are projectorindependent. This allows our customers to retain the benefits of a rapidly advancing feature set available in the professional projector marketplace. Not every commercially available projector should be used in a real-time, long service life, deterministic environment. This is why we have developed the Northstar Simulation Certified Projector program — to indicate to our customers the specific projectors that pass our qualification of fit for use in professional simulation environments and are fully interoperable and seamlessly managed within 3D perception's Northstar solution.

Simulator systems have an array of differing projection requirements. Considerations like resolution, light output, NVG suitability, latency, contrast, weight, size, ruggedness, and cost are all important factors. It's key to have a range of models from which to select that can meet specific use-cases. 3D perception provides and integrates a variety of professional projectors from several manufacturers.

We offer options for one- or three-chip DLP and LCoS technologies, UHP, LED, and laser phosphor illumination, along with a wide range of high quality lenses, modules, mounts, and accessories. We design display systems based on application requirements – not around a specific projector make or model.



StarScan Automatic Image Alignment Scanner

For Northstar systems where Aurora's screen-based sensors are impractical, including soft-screens, rear-projection, collimated screens, or for system upgrades, StarScan[™] is the ideal solution for precision automatic image alignment.

A true 3D solution for a 3D problem, StarScan provides detailed measurements of display system geometry using high precision gimbal pointing, and laser rangefinding. StarScan measures both the exact 3D screen geometry and the projected image geometry, resulting in the industry's most accurate warp and blend down to 1 arc minute.

The device can be mounted virtually anywhere in the display system and can automatically align itself using reference points on the screen, enabling repeatable, high accuracy performance, even from off-center locations.

Using high precision gimbal pointing, StarScan operates up to a 360° azimuth and 135° elevation range, with options for eye-limiting resolution accuracy.

StarScan requires no special software to be loaded onto the user's IG, nor does it require the 1.5-2 ms of IG render time required by software and camera-based solutions.





3D Screen Mapping & Alignment

StarScan creates a detailed 3D screen surface map using the gimbal-mounted laser rangefinder. This map is used in geometric projection software to calculate the location for every alignment point on the real display surface. This surface map can also be used for display system acceptance testing to ensure compliance with design specifications.

Screen Integration Support

The integrated rangefinder can be used to accurately locate a screen to specified coordinates to ensure proper setup.

- Precision 3D screen mapping and image autocalibration
- ▶ Up to 360° H x 135° V operation area
- ▶ Absolute geometric accuracy 1 5 arc min
- Off axis alignment head positioning
- Screen installation support
- Display channel setup support
- Easy and cost-effective retrofit of auto-alignment to existing installations

Dynamic Optical Blenders Day to Night and Everything in Between

In a multi-projection display system, all projected images will have one or more sides overlapping with another image. In these overlap zones, the image will be doubly bright. 3D perception's Northstar[™] system automatically applies electronic edge blending via the nBox[™] display processor. During daytime scenarios, the electronic blend is all that is needed used to achieve a seamless, uniform image.

However, during darker scenarios, the overlap zones cannot be completely electronically erased because all digital projectors output some level of light even with completely black content. The result is a grey stripe in the overlap, and the only way to remove this is with optical blending.

The Solution

3D perception's Dynamic Optical Blenders[™] remove the visible edges and render the image seamless across the entire display. The blenders optimize the image without sacrificing contrast in favor of black level uniformity.

During transition periods like dusk or dawn, content becomes more difficult to optimize while completely eliminating the overlap zones. This unique challenge is addressed via hybrid blending—a combination of transitional optical blending AND electronic blending. The servo-controlled optical blenders and electronic blends are gradually applied during transitional periods.



Blenders automatically make adjustments to the scene upon receiving time-of-day signals from the simulator. The Northstar system allows for smooth interpolation between scenarios, enabling a seamless and dynamic transition from day to night without interruption.

- Eliminates extraneous light in overlap areas
- Optimizes image for day, dawn, dusk, and night without sacrificing contrast
- Gradual transitions, or immediate change on new scenario load
- Available with hard-edged or progressive blend blades with precision-cut gradient edges for the most demanding requirements
- Content-Awareness feature provides real-time signal analysis and blender adjustment



Turn-Key Systems Commercial-Off-The-Shelf Northstar Displays

3D perception offers a range of preconfigured Northstar display systems designed and priced for quantity delivery. These systems are adaptable to accommodate trainer cabins or other components. Design variants are also available to accommodate differing program requirements.



- Proven and mature Northstar platform
- Precision auto-calibration
- ▶ Works with any Image Generator
- Available for fast delivery
- Variants include projector type, resolution, field of view, and screen gain



ATLAS 240 Partial Dome

2.0M/6.56' radius dome 240° Horizontal +120°/-35° Vertical 12 WQXGA projectors <6 arc min/OLP >11 ft. lamberts

Applications

Attack/fighter Air superiority/multirole



ATLAS 360 Full Dome

3.5M/11.5' radius dome 360° Horizontal (20° entry) +100°/-30° Vertical 15 WQXGA projectors Nearly complete immersion Near eye-limiting resolution Area of Interest

Applications

Full mission attack/fighter Air superiority/multirole 2-seat trainer



DRACD Bast Jet Mini Displays

DRACO 160 Mini Display

1.05M/3.4' radius dome 164° Horizontal +30°/-30° Vertical 2 WQXGA OTW projectors 1 Optional HUD projector ~7 arc min/OLP ~70 ft. lamberts

Applications

Attack/fighter Air superiority/multirole Desktop trainer Civil aircraft



DRACO 220 Mini Dome

1.6M/5.2' radius dome 220° Horizontal +120°/-10° Vertical 5 WQXGA projectors ~4 arc min/OLP ~40 ft. lamberts Fits within 4x4x3M space

Applications

Attack/fighter Air superiority/multirole Civil aircraft





LYRA 220 Full FOV Enclosed Display

3.5M/11.5' radius dome 220° Horizontal +25°/-55° Vertical 7 WQXGA projectors ≤7.3 arc min/OLP ~25 ft. lamberts

Applications

Attack Heavy lift/transport Multi-mission Search & Rescue



LYRA 240 Light Helo Display

3.25M/10.6' Radius Dome 240° Horizontal +22.5°/-60° Vertical 6 HD Projectors ≤6.5 arc min/OLP ~10 ft. lamberts

Applications

Attack Light utility Multi-mission Search & Rescue





GEMINI 240 Small Dome

2.43M/8' radius dome 240° Horizontal +70°/-20° Vertical 7 WQXGA projectors ≤6 arc min/OLP >10 ft. lamberts Area of Operation suitable for 3 trainees

Applications

Forward Observer/Close Air Support Call For Fire Cave/R&D



GEMINI 270 Large Dome

2.8M/9.1' radius dome 270° Horizontal +115°/-15° Vertical 14 WU/WQXGA projectors Near eye-limiting resolution Area of Interest >7 ft. lamberts Area of Operation suitable for 6 trainees

Applications

Forward Observer/Close Air Support Call For Fire





ORION 180 Large Spherical Display

3.25M/10.6' radius dome 180° Horizontal +22.5°/-22.5° Vertical 3 WUXGA projectors ≤7 arc min/OLP ~6 ft. lamberts

Applications

Incident Command/Emergency Mgmt. Weapons trainer Multipurpose immersive visualization



ORION 180C Portable Cylindrical Display

1.7M/5.5' radius cylindrical screen
180° Horizontal 46° Vertical
3 HD projectors
≤9 arc min/OLP >15 ft. lamberts

Applications

Incident Command/Emergency Mgmt. Driver trainer Maritime Multipurpose visualization



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