HiBall™-3100 Wide-Area Tracker and 3D Digitizer

6 DOF Position and Orientation with Unparalleled Precision and Performance

Highest-Performance Tracking

The HiBall-3100 Tracker creates a new standard of performance for wide-area tracking. Fast, accurate, steady, consistent – you've never used a tracker like this. Based on results of the wide-area tracking research project of the Department of Computer Science of the University of North Carolina at Chapel Hill — the HiBall-3100 optical tracker delivers:

- Low latency and high update rate — solid, smooth tracking even with high-speed sensor motion.
- Precision — the position and orientation of the sensor are tracked so precisely that the system can be used as a measurement device for manufacturing.
- Consistency — performance is unaffected by metal, magnetic fields, or noise, and is high quality throughout the tracked space. Built-in redundancy overcomes most line-of-sight obstructions.
- Scalability — add *ceiling beacons* to cover very large areas, almost without limit.

HiBall -3100 Tracker Technology

The HiBall-3100 tracker's revolutionary design employs hundreds of individually addressable infrared LEDs in *Beacon Arrays* mounted on the ceiling or wall, and a *HiBall Sensor* composed of 6 lenses and photodiodes.

The HiBall Sensor provides 26 individual views of the Beacon Arrays and, using a *single contraint at a time (SCAAT)* algorithm, updates the position and orientation of the sensor at every new lit LED sighting — up to 2000 times per second. By locating the sensors on the person or object being tracked — *inside-out tracking* — sensitivity around the working area is increased, especially for the rapid changes in orientation associated with head and hand motions.

In addition, the tracker area scales simply by adding Beacon Arrays. These modular, 2 ft. long, daisy-chained strips are designed to slip easily into a typical 'drop ceiling' with no changes required in panels, lights, vents, etc. — the more strips deployed, the greater the range of the tracker. An entire lab, visualization display area, movie set, or assembly area can be tracked.

AutoCalibration

The HiBall-3100 Tracker system incorporates *autocalibration* — tuning the modeled location of individual LEDs initially after installation and on every update. This makes installation fast and simple — no precise measurement or alignment is required. It also accommodates typical variations in ceiling height, as well as shifts and movements in the ceiling tiles and Beacon Arrays, without loss of accuracy or performance.

Applications

The HiBall-3100 Tracker's unparalleled performance, low latency and scalability make it the ideal tool for 'traditional' tracker applications like virtual reality, simulation and training, and film and video production. And its amazing accuracy and low noise make it singularly well suited for augmented reality, military simulation, and industrial tracking and measurement.

- The range and performance of the HiBall-3100 Tracker open up new possibilities for large-scale virtual reality such as exploring full-size architectural designs or engineering prototypes. Imagine being able to walk freely throughout a 1600 sq. ft. space with uniform tracking performance.
- The HiBall can be mounted on a small probe or stylus, enabling very accurate measurements of individual objects within a large space. This can be used for accurate location of machine assembly components or very rapid measurement of television, movie or game sets to be combined with virtual scenes. No other device can provide comparable speed and accuracy over such a wide area.
- The HiBall-3100 Tracker's precision enables large-scale augmented reality for applications in medicine, training and entertainment where accurate correspondence between physical reality and the virtual world are critical. The unmatched precision in orientation is a must for weapon tracking. This precision and speed also enables industrial tool tracking in high-precision manufacturing applications.

Proven Results

Since its introduction in 2000, the HiBall-3100 has become the de facto standard for high-performance wide-area tracking, with installations in major universities, manufacturers and government research centers.

3rdTech™

Digitizing with the HiBall-3100 Tracker

HiBall-3100 Wide-Area Tracker Features

- Very Wide Area — Scalable to over 1,600 sq.ft.
- High Precision — Ideal for augmented reality, rapid scene digitizing, and measurement
- High-update, low latency — Steady, high-speed tracking; no "swimming"
- Small, light — Head or stylus mountable sensor
- Easy installation — Installs in standard drop-ceilings; requires no room modifications; system includes autocalibration
- Multiple sensors — Multiple participants or head plus hand tracking
- No metal/sound interference — Requires no modification of the environment
- Accurate every-where — Consistent tracking near edges of space as well as in center

HiBall-3100 Specifications and Performance

Hardware Components

HiBall Optical Sensor(s)	2 7/8" tall, 2 1/8" diam, 6 oz
Beacon Array Module (BAM)	Six 23.75" x 1" x 1" strips, 11.7 oz each, 8 sq. ft. coverage
PC-based Controller	Includes CIB interface hardware
Connections	Ethernet (VRPN)

Software Components

VR Peripheral Network (VRPN) support	Integrate system with other VR devices
HiBall Tracker Toolkit	Tools for set up, configuration and testing
HiBall Tracker Library	Low-level system access
Output	Stream or point mode; XYZ coordinates; quaternion, Euler angles or rotation matrices

Performance

Degrees of Freedom	6 per HiBall Sensor
Max Update Rate (position and orientation)	
1 HiBall Sensor	2000 Hz
2 HiBall Sensors	1000 Hz each
4 HiBall Sensors	500 Hz each
Resolution	
Position (X/Y/Z)	0.2mm RMS
Orientation (Rx/Ry/Rz)	0.01˚ RMS
Absolute Accuracy/Stability	
Position (X/Y/Z)	0.4mm RMS
Orientation (Rx/Ry/Rz)	0.02˚ RMS
Latency	Less than 1 ms.
Max Tracking Volume	Greater than 40' x 40' x 10' (200 Beacon Array Modules)
Angular Range	± 180˚ azimuth; 0-90˚ elevation

Environment

Operating Temperature	0 - 45˚ C
Power	110-130 VAC, 60 Hz

*specifications subject to change without notice

Standard HiBall Tracker Configurations

HiBall-3100 C18 — Entry configuration:

18 Beacon Array Modules (144 sq. ft. range)
1 6DOF HiBall Sensor
1 pc-based controller with CIB and HiBall Tracker s/w
1 precision 6DOF stylus with HiBall Sensor mount

HiBall-3100 C50 — Wide-area configuration

50 Beacon Array Modules (400 sq. ft. range)
1 6DOF HiBall Sensor
1 pc-based controller with CIB and HiBall Tracker s/w
1 Precision 6DOF Stylus with HiBall Sensor mount

Options

Additional 6DOF HiBall Sensors (up to 4 total)
Additional BAMs

The HiBall-3100 Wide-Area Optical Tracker combines industry-leading performance with easy installation. It integrates with your existing systems for virtual reality, augmented reality, simulation, training, and measurement applications. It enables new applications requiring range, accuracy and performance never before possible. What can it do for you?

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