NorthStar®

Low-cost, Indoor Localization

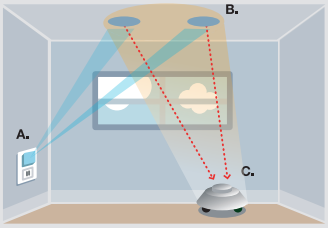
NorthStar® is a technological breakthrough, signifying world-leading advances in localization performance and cost. NorthStar cost-effectively enables position and heading awareness in mobile robots, and can be applied to many position tracking applications in a variety of indoor situations. NorthStar breaks the "line-of-sight" barrier of previous light beacon systems with simplicity, reliability and low cost.

How It Works

The NorthStar detector uses triangulation to measure position and heading in relation to IR light spots that can be projected onto the ceiling (or other visible surface). Because each IR light spot has a unique signature, the detector can instantly and unambiguously localize.

Because the NorthStar detector directly measures position and heading, a localization result is intrinsically robust. A NorthStar-enabled product does not require prior training or mapping to measure its position. There is no need for expensive computational capabilities to use NorthStar.

Flexible – Many configurations are possible
Compact – NorthStar Detector is smaller than a matchbox
Expandable – Large scale environments, multiple mobile devices
Low cost – World's most cost-effective localization solution
Simple – Serial interface, no SLAM needed
Robust – Excellent line of sight
Fast – 100 msec update cycle
Accurate – On the order of a few centimeters in many applications

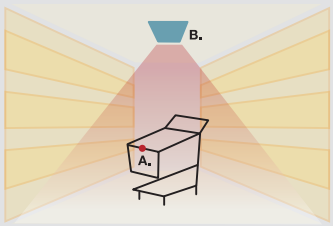


Mobile Device Navigation

A. NorthStar Projector in environment
B. Invisible light spots
C. NorthStar Detector on product

Applications

- Reliable and direct return to a re-charging station
- Multi-room systematic navigation
- Instantaneous recovery from "kidnapping"
- Efficient and thorough floor coverage

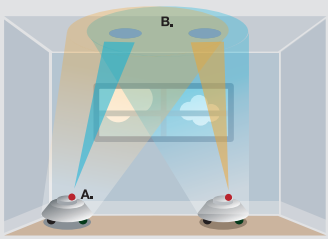


Asset Tracking

A. NorthStar light (IR LED) on mobile product
B. NorthStar Detector on ceiling

Applications

- Asset tracking in warehouses, malls, stores, etc.
- Motion tracking of people
- Mobile consumer devices



Multiple Device Navigation

A. Each device has a NorthStar Detector and Projector
B. Invisible light spots

Each mobile device knows its position in the environment. Each device knows the relative position of the other device(s).

Applications

- Parallel coverage, patrol, and surveillance
- Clandestine inter-robot communications
- Navigational coordination

evolution robotics®

Making everyday products smarter

Ease of Integration

The NorthStar system is simple to integrate into any product. The detector is small, uses a simple electronic interface and serial communications protocol. All signal conditioning and geometrical calculations are performed by the detector. The IR projectors use low-cost LEDs, and can be small and unobtrusive. They can be designed to plug into an outlet like an air freshener, be built into a recharging station, stand alone on a bookshelf, or be embedded into a mobile product.

The NorthStar system can also be applied to large-scale, indoor environments such as large department stores, factories and shopping malls. Consult with Evolution Robotics regarding the specifics of your application.

Product Details (Detector)

Basic Specifications

- Dimensions: 3 cm X 4 cm X 1 cm [1.2" X 1.6" X 0.4"]
- Weight: 0.4 oz [12.5 g]
- Power: 3.3 VDC, 200 mA
- Communications: Serial in and out, 19200 – 115200 baud, 5V tolerant interface
- Ambient Lighting Conditions:
  - o Max ambient light, point source: 600 LUX
  - o Max ambient light, diffuse conditions: 2500 LUX
- Max Distance from Detector Plane to Light Plane: 6 m [20 ft]
- Field of View (FOV):
  - o Square Shaped Area, with width w
  - o Recommended FOV:
    - w = 1.4 X distance from detector plane to light plane
    - Example: 2.5 m Ceiling, FOV = 3.6 m X 3.6 m [12 ft X 12 ft]
  - o Max FOV:
    - w = 2.4 X distance from detector plane to light plane
    - Example: 2.5 m Ceiling, FOV = 6 m X 6 m [20 ft X 20 ft]
- Single Measurement Time: 100 msec
- Room ID Codes: 10
- Spot ID Codes: 20

Localization Performance for Mobile Robots *(assuming typical household environment)*[1]

Repeatability – Enables return to a previous position and orientation or creating a map for planned navigation (e.g., return to charging station, multi room navigation, etc.)

(these values assume a stable environment)

Metric	Within Recommended FOV	Within Max FOV
Position*	1 cm - 4 cm	10 cm - 40 cm
Heading*	1 deg - 2 deg	2 deg - 8 deg

Heading Consistency – Enables travel parallel to previous passes (e.g., efficient & thorough floor coverage)

Metric	Within Recommended FOV	Within Max FOV
Heading*	< 1 - 2 deg	< 2 - 8 deg
Heading (bidirectional, 100 ms)	Unidirectional + 2 deg	Unidirectional + 5 deg

*Based on an average of 1 to 10 readings per second. Values represent one sigma error.

Heading Accuracy – Enables capability to aim in a particular global direction (e.g., toward a charging station)

Metric	Within Recommended FOV	Within Max FOV
Heading	< 2 deg	< 5 deg

Position Linearity – Enables capability to measure true distances or create a uniformly spaced and orthogonal map

Metric	Within Recommended FOV	Within Max FOV
Position	< 6% distance from origin (typical)	< 25% distance from origin (typical)

Localization Performance for Asset Tracking *(assuming a typical commercial environment)*[2]

Position Repeatability – To ascertain an asset is located at a previously defined position, e.g., in front of a potato chip display in aisle 12

Metric	Within Recommended FOV	Within Max FOV
Position	<15 cm	< 1 m

All specifications subject to change without notice. Contact Evolution Robotics for a current product specification.

[1] 2.5 m [8 ft] ceiling, low luster white paint, 6 m X 6 m [20 ft X 20 ft] room, static & stable environment
[2] Fixed detector, light source on moving asset, 6 m distance between detector and light planes

Contact Us

Please contact us for a demonstration, more product details, or purchasing information.

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