

EXTREME WEATHER ROBOTICS CONTROL PATENT

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UNITED STATES PATENT NO. 11,847,392

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Assignee: Polar Dynamics Robotics, Inc.

ABSTRACT

A system and method for controlling autonomous mobile robots in ext

temperature environments, particularly sub-zero conditions, comprising temperature-hardened navigation system, reinforced chassis design, proprietary cold-environment power management system. The invention enables reliable robot operation in temperatures ranging from -40 C to +50 C through a combination of hardware and software innovations that maintain positional accuracy and power efficiency.

BACKGROUND OF INVENTION

[0001] Autonomous mobile robots (AMRs) operating in cold storage and distribution environments face significant challenges related to battery performance, navigation reliability, and mechanical component durability. Conventional AMRs typically experience degraded performance or complete failure when exposed to sub-zero temperatures.

[0002] Prior attempts to address these challenges have focused primarily on

component insulation or heating elements, resulting in increased power consumption and reduced operational efficiency.

SUMMARY OF INVENTION

[0003] The present invention provides a comprehensive solution for environmental weather robotics control through the following key innovations:

- a) Temperature-compensated sensor array utilizing proprietary BlueCore technology
- b) Adaptive power management system optimizing battery performance in cold conditions
- c) Self-regulating thermal management system for critical components
- d) Reinforced composite chassis with thermal isolation zones
- e) Cold-resistant navigation algorithms accounting for environmental factors

DETAILED DESCRIPTION

Navigation System

[0004] The invention's navigation system comprises:

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Multi-modal sensor array including:

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Temperature-hardened LiDAR sensors

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Infrared positioning beacons

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Inertial measurement units with thermal compensation

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Proprietary sensor fusion algorithms

[0005] Sensor data processing occurs through a distributed computing architecture specifically designed for cold environment operation.

Power Management

[0006] The power management system includes:

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Cold-resistant lithium iron phosphate battery cells

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Thermal management system maintaining optimal battery temperature

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Dynamic power allocation based on environmental conditions

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Regenerative braking system optimized for cold operations

Mechanical Systems

[0007] The chassis and mechanical systems feature:

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Composite materials rated for extreme temperature differentials

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Self-lubricating bearings with cold-specific formulations

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Thermally isolated component compartments

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Redundant drive systems with automatic failover

CLAIMS

A method for controlling autonomous mobile robots in extreme temperatures, comprising:

- a) Receiving environmental temperature data from multiple sensors
- b) Adjusting navigation parameters based on temperature conditions
- c) Implementing dynamic power management protocols
- d) Maintaining operational stability through thermal compensation

The method of claim 1, wherein the temperature range extends from -40°C to 60°C.

A system for extreme weather robotics control comprising:

- a) Temperature-hardened sensor array
- b) Cold-environment power management system
- c) Reinforced chassis design

d) Adaptive navigation algorithms

DRAWINGS

[Figure descriptions and technical drawings omitted for brevity]

INVENTORS

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Dr. Elena Frost, Ph.D.

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Marcus Chen

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Dr. James Barrett

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Robert Winters

PATENT ATTORNEYS

Morrison & Thompson LLP
1234 Innovation Drive
Boston, MA 02110

ASSIGNMENT RECORD

All rights, title, and interest in this patent have been assigned to Polar Dynamics Robotics, Inc., a Delaware corporation, as recorded in the USPTO Assignment Database on April 15, 2022.

MAINTENANCE FEES

First maintenance fee due: March 22, 2026

Second maintenance fee due: March 22, 2030

Third maintenance fee due: March 22, 2034

FOREIGN PATENT RIGHTS

Corresponding patent applications filed in:

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European Patent Office (EP3847392)

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Japan Patent Office (JP2022-847392)

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Canadian Intellectual Property Office (CA3847392)

CERTIFICATION

I hereby certify that this patent document accurately reflects the invention assigned to Polar Dynamics Robotics, Inc. and contains no known material misrepresentations.

/s/ Victoria Wells

Chief Financial Officer

Polar Dynamics Robotics, Inc.

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