

PATENT APPLICATION

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UNITED STATES PATENT AND TRADEMARK OFFICE

Application No. 2021-453

TITLE OF INVENTION

System and Method for Temperature-Hardened Robotic Navigation and
Architecture (BlueCore(TM))

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims priority to U.S. Provisional Application No. 62/900,000 filed March 12, 2021.

FIELD OF THE INVENTION

[001] The present invention relates generally to autonomous mobile robots (AMRs) and systems, and more particularly to temperature-resistant navigation and control architectures for autonomous mobile robots operating in extreme cold environments.

BACKGROUND

[002] Autonomous mobile robots (AMRs) operating in sub-zero environments face unique challenges related to sensor reliability, battery performance, and navigation accuracy. Existing solutions fail to adequately address the effects of extreme cold on critical robot subsystems.

[003] Traditional AMR control architectures experience significant degradation in temperatures below -20 C, including sensor malfunction, reduced battery life, and compromised navigation accuracy. There remains an unmet need for an integrated control architecture specifically designed for extreme cold environments.

SUMMARY OF THE INVENTION

[004] The present invention provides a temperature-hardened robotic control architecture (BlueCore(TM)) comprising:

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A cold-resistant sensor fusion system

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Adaptive power management algorithms

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Temperature-compensated navigation protocols

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Reinforced control loop architecture

[005] The system maintains operational integrity in environments ranging from -40 C to +25 C through novel implementations of:

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Multi-modal sensor redundancy

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Predictive thermal compensation

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Dynamic power allocation

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Cold-optimized path planning

DETAILED DESCRIPTION

[006] The BlueCore(TM) architecture comprises three primary subsystems:

Sensor Integration Module

[007] A distributed sensor network incorporating:

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Thermally-isolated LIDAR arrays

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Redundant IMU configurations

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Temperature-compensated wheel encoders

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Environmental monitoring sensors

Power Management System

[008] Advanced power distribution featuring:

- - 5 -

Dynamic voltage regulation

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Thermal load balancing

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Predictive battery management

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Cold-resistant power delivery

Navigation Control Unit

[009] Integrated navigation system including:

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Temperature-aware path planning

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Dynamic obstacle avoidance

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Real-time performance optimization

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Adaptive speed control

CLAIMS

A temperature-hardened robotic control system comprising:

- a) A sensor fusion module operating reliably between -40 C and +25 C
- b) An adaptive power management system
- c) A cold-optimized navigation controller
- d) Means for maintaining operational integrity in extreme cold environments

The system of claim 1, wherein the sensor fusion module comprises:

- a) Thermally-isolated sensor arrays

- b) Redundant measurement units
- c) Temperature compensation algorithms

The system of claim 1, wherein the power management system includes:

- a) Dynamic voltage regulation
- b) Thermal load balancing
- c) Predictive battery management

ABSTRACT

A temperature-hardened robotic control architecture (BlueCore(TM)) for autonomous mobile robots operating in extreme cold environments. The system maintains reliable operation between -40 C and +25 C through integration of sensor fusion, adaptive power management, and cold-optimized navigation algorithms.

INVENTORS

Dr. Elena Frost

Marcus Chen

Dr. James Barrett

ASSIGNEE

Polar Dynamics Robotics, Inc.

1000 Innovation Drive

Wilmington, DE 19801

POWER OF ATTORNEY

The undersigned hereby appoints Patent Law Group LLP, Registration
prosecute this application and transact all business in the Patent and

Office connected therewith.

DECLARATION

I hereby declare that I am the original inventor of the subject matter w
claimed and for which a patent is sought. I have reviewed and unders
contents of the above-identified specification, including the claims. I
acknowledge the duty to disclose information which is material to pate
as defined in 37 CFR 1.56.

Executed on: March 15, 2021

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Dr. Elena Frost, Ph.D.

CEO & Co-founder

Polar Dynamics Robotics, Inc.

VERIFICATION

State of Delaware

County of New Castle

Subscribed and sworn to before me this 15th day of March, 2021

—

Jane Smith

Notary Public

My Commission Expires: 12/31/2024

