PATENT SPECIFICATION

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EMERGENCY THERMAL PROTECTION SYSTEM FO

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ABSTRACT

An emergency thermal protection system for autonomous mobile robo

extreme temperature environments, particularly sub-zero conditions. T

comprises an integrated network of thermal sensors, a predictive anal

module, and a multi-stage emergency shutdown protocol that preserv

components during rapid temperature fluctuations or system failures.

BACKGROUND OF THE INVENTION

[0001] Autonomous mobile robots operating in cold storage environm

unique challenges related to thermal stress and component protection

solutions fail to adequately address sudden temperature changes that

sensitive electronics and mechanical systems.

[0002] This invention relates to Polar Dynamics Robotics' proprietary

BlueCore(TM) technology platform, specifically addressing emergency

management in extreme cold conditions below -30 C.

SUMMARY OF THE INVENTION

[0003] The present invention provides an emergency thermal protecti

comprising:

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A distributed network of high-precision temperature sensors

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Real-time thermal mapping and predictive analytics

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Multi-stage emergency shutdown protocols

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Thermal isolation chambers for critical components

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Automated heat redistribution systems

DETAILED DESCRIPTION

1. Sensor Network Configuration

[0004] The system employs a minimum of twelve (12) thermocouples positioned throughout the robot chassis:

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Four (4) sensors monitoring drive motor assemblies

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Three (3) sensors monitoring battery compartments

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Three (3) sensors monitoring main processing units

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Two (2) sensors monitoring navigation systems

[0005] Sensors communicate via redundant pathways to ensure reliab

transmission in extreme conditions.

2. Predictive Analytics Module

[0006] The system utilizes machine learning algorithms to:

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Process real-time temperature data

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Predict potential thermal failures

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Calculate optimal shutdown timing

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Manage power distribution during thermal events

3. Emergency Shutdown Protocol

[0007] The multi-stage shutdown sequence comprises:

Stage 1: Early Warning

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Activation threshold: -35 C

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Increased monitoring frequency

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Power redistribution to critical systems

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Alert transmission to central control

Stage 2: Critical Response

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Activation threshold: -40 C

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Partial systems shutdown

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Activation of heating elements

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Data backup initiation

Stage 3: Emergency Shutdown

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Activation threshold: -45 C

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Complete systems shutdown

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Thermal isolation engagement

Emergency beacon activation

CLAIMS

A method for protecting autonomous mobile robots operating in sub-z

a) Monitoring temperature conditions using distributed sensors

b) Processing thermal data through predictive analytics

c) Executing multi-stage shutdown protocols

d) Protecting critical components through thermal isolation

The method of claim 1, wherein the predictive analytics module emplo

The method of claim 1, wherein the shutdown protocol includes three

DRAWINGS

[Reference is made to accompanying drawings]

Figure 1: Sensor Network Layout

Figure 2: Thermal Isolation Chamber Design

Figure 3: Emergency Protocol Flowchart

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GOVERNMENT RIGHTS

[0008] This invention was made without government support.

PRIOR ART REFERENCES

US Patent 10,456,789 - "Thermal Management System for Industrial

US Patent 10,789,123 - "Cold Environment Navigation System"

EP Patent 3,456,789 - "Emergency Shutdown Protocol for Autonomou

The foregoing description of the invention has been presented for pur

illustration and description. It is not intended to be exhaustive or to lim

the invention to the precise form disclosed.

[END OF PATENT SPECIFICATION]