MULTI-ROBOT TASK ALLOCATION FRAMEWORK

PROPRIETARY AND CONFIDENTIAL

Polar Dynamics Robotics, Inc.

Document Version: 2.4

Effective Date: January 11, 2024

1. OVERVIEW AND PURPOSE

1. This Multi-Robot Task Allocation Framework ("Framework") establishes the governing principles and operational protocols for the coordination and allocation of tasks among autonomous mobile robots ("AMRs") manufactured and deployed by Polar Dynamics Robotics, Inc. ("Company") utilizing the IceNav(TM) AI navigation platform.

2. This Framework is incorporated by reference into all deployment agreements and operational specifications for the Company's cold-environment AMR systems.

2. DEFINITIONS

1. "Task Allocation System" or "TAS" means the proprietary software system that manages the distribution and coordination of tasks among multiple AMRs.

2. "Cold-Environment Operations" refers to automated operations conducted in environments maintained at or below 0 C (32 F).

3. "Mission-Critical Tasks" means operations designated as essential for maintaining cold chain integrity or facility operations.

4. "IceNav(TM) Platform" means the Company's proprietary navigation and control system designed for cold-environment operations.

3. TASK ALLOCATION PRINCIPLES

1. Priority Assignment

a) Mission-Critical Tasks shall receive highest priority allocation

b) Tasks shall be assigned based on:

- AMR proximity to task location

- Current AMR workload
- Battery status and thermal conditions
- Task urgency classification
- System-wide optimization parameters

2. Conflict Resolution

a) The TAS shall employ proprietary algorithms to resolve competing task assignments

b) Resolution protocols shall prioritize:

- System stability
- Energy efficiency
- Completion time optimization
- Cold chain maintenance requirements

4. OPERATIONAL PARAMETERS

1. Temperature Monitoring

a) Each AMR shall continuously monitor:

- Internal component temperatures
- Ambient environment temperature
- Actuator thermal status
- Battery thermal conditions

2. Performance Thresholds

a) AMRs shall maintain operational capability at temperatures down to -30 C (-22 F)

b) Task allocation shall account for temperature-related performance degradation

c) System shall implement automatic thermal management protocols

5. SAFETY AND FAILSAFE PROTOCOLS

1. Emergency Operations

a) TAS shall maintain redundant task allocation capabilities

b) System shall implement immediate reallocation of critical tasks upon any AMR failure

c) Automated failover protocols shall engage within 500 milliseconds of detected failure

2. Safety Interlocks

a) Collision avoidance systems shall maintain effectiveness in icy conditions

b) Emergency stop functions shall remain operational at all specified temperatures

c) Human override capabilities shall be maintained at all times

6. SYSTEM INTEGRATION

1. The Framework shall integrate with:

a) Warehouse Management Systems (WMS)

b) Environmental Control Systems

c) Facility Safety Systems

d) Cold Chain Monitoring Systems

2. API Integration Requirements

a) REST API endpoints for external system communication

b) Real-time data exchange protocols

c) Secure authentication mechanisms

d) Redundant communication channels

7. COMPLIANCE AND REPORTING

1. The Framework shall maintain compliance with:

a) ISO/TS 15066:2016 for collaborative robots

b) FDA 21 CFR Part 11 for regulated environments

c) ANSI/RIA R15.06-2012 safety requirements

d) Company's Cold Chain Compliance Protocol v3.2

2. Reporting Requirements

a) Real-time performance metrics

b) Temperature compliance logs

c) Task completion statistics

d) System optimization reports

8. PROPRIETARY RIGHTS

1. All aspects of this Framework, including but not limited to algorithms, protocols, and implementation methodologies, constitute proprietary and confidential information of the Company.

2. No part of this Framework may be disclosed, reproduced, or implemented without express written authorization from the Company.

9. MODIFICATION AND UPDATES

1. The Company reserves the right to modify this Framework as required to maintain optimal system performance and safety.

2. All modifications shall be documented and version controlled according to Company's Change Management Protocol.

AUTHORIZATION

APPROVED AND ADOPTED by Polar Dynamics Robotics, Inc.

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