

**REAL-TIME PATH CORRECTION ALGORITHM**

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**PROPRIETARY & CONFIDENTIAL TECHNICAL DOCUMENT**

**NaviFloor Robotics, Inc.**

*Document Version: 3.2.1*

*Last Updated: January 11, 2024*

**1. ALGORITHM OVERVIEW AND OWNERSHIP**

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1. This document describes the proprietary Real-Time Path Correction Algorithm.

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2. The RTPCA, including all constituent components, methodologies, and implementation details.

## **2. TECHNICAL SPECIFICATIONS**

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1. Core Components

a) Dynamic Surface Analysis Module (DSAM)

b) Predictive Trajectory Calculator (PTC)

c) Multi-sensor Fusion Engine (MFE)

d) Real-time Environmental Mapping System (REMS)

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## 2. Operating Parameters

- a) Minimum sampling rate: 240Hz
- b) Maximum latency: 12ms
- c) Accuracy tolerance:  $\pm 0.3\text{cm}$  at 2.5m/s
- d) Processing overhead: <4% CPU utilization

## 3. ALGORITHMIC METHODOLOGY

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1. The RTPCA employs a proprietary three-stage processing pipeline:

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- 1.1. Stage 1: Environmental Data Acquisition

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LiDAR point cloud processing (1000 points/scan)

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Depth sensor data integration

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Surface texture analysis

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Obstacle detection and classification

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1.2. Stage 2: Path Vector Analysis

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Current trajectory calculation

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Dynamic obstacle prediction

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Surface friction coefficient estimation

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Speed-safety envelope computation

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### 1.3. Stage 3: Correction Implementation

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Real-time path optimization

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Motor control signal generation

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Stability maintenance protocols

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Emergency override procedures

## **4. IMPLEMENTATION REQUIREMENTS**

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## 1. Hardware Requirements

- a) Minimum processor: ARM Cortex-A78 or equivalent
- b) RAM: 4GB dedicated
- c) Storage: 128GB SSD
- d) Sensor array compatibility per Specification Sheet TD-2024-003

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## 2. Software Dependencies

- a) NaviFloor Core Framework v4.2 or higher
- b) Real-time Operating System: FreeRTOS 10.4.x
- c) Sensor Fusion Library v2.1
- d) Custom SLAM Implementation Package

## **5. SECURITY PROTOCOLS**

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1. The RTPCA implements the following security measures:

- a) 256-bit AES encryption for all data transmission
- b) Secure boot verification
- c) Runtime integrity checking
- d) Tamper detection mechanisms

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2. Access Control

- a) Role-based authentication required
- b) Audit logging of all system modifications
- c) Secure parameter updating protocols

d) Remote kill-switch capability

## **6. PERFORMANCE METRICS**

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1. Baseline Performance Requirements:

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Path correction accuracy: 99.99%

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System availability: 99.995%

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Mean time between failures: >10,000 hours

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Recovery time: <50ms



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## 2. Environmental Operating Parameters:

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Temperature range: -10°C to 45°C

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Humidity: 10% to 90% non-condensing

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Dust tolerance: IP65 rated environments

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Vibration resistance: 2G continuous

## 7. CONFIDENTIALITY AND RESTRICTIONS

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1. This document contains trade secrets and confidential information of Navi

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2. No part of this algorithm or its implementation may be reproduced, modified,

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3. Unauthorized access, reproduction, or distribution may result in civil and criminal

## **8. VERSION CONTROL**

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1. This document supersedes all previous versions of the RTPCA documentation.

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2. Change History:

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v3.2.1 (Current): Enhanced security protocols

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v3.2.0: Added multi-surface adaptation

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v3.1.2: Improved error handling

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v3.1.1: Performance optimization

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v3.1.0: Initial release

## 9. CERTIFICATION

The undersigned hereby certifies that this document accurately represents the current implementation of the Real-Time Path Correction Algorithm as of January 11, 2024.

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