

NAVIFLOOR SAFETY SYSTEMS TECHNICAL OVERVIEW

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1. INTRODUCTION

This Technical Overview document ("Overview") describes the safety protocols implemented in NaviFloor Robotics, Inc.'s ("NaviFloor") auto

mobile robot ("AMR") fleet management platform and associated hardware. This document is confidential and proprietary to NaviFloor.

2. SYSTEM ARCHITECTURE

2.1 Core Safety Components

The NaviFloor Safety System comprises three integrated layers:

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Primary Safety Control Unit (PSCU)

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Redundant Emergency Stop System (RESS)

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Distributed Safety Network (DSN)

2.2 Safety Certification Standards

All safety components are designed and certified to meet:

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ISO 13849-1:2015 Performance Level D

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IEC 61508 SIL 2

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ANSI/RIA R15.06-2012

3. COLLISION AVOIDANCE SYSTEM

3.1 LiDAR Configuration

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Primary LiDAR: 270° horizontal field of view

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Secondary LiDAR: 360° overhead scanning

- - 3 -

Minimum detection range: 0.05m

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Maximum detection range: 30m

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Scanning frequency: 50Hz

3.2 Safety Zones

The system maintains three dynamic safety zones:

Critical Zone (0-0.5m): Immediate emergency stop

Warning Zone (0.5-2m): Reduced speed protocol

Awareness Zone (2-5m): Path recalculation

4. EMERGENCY STOP FUNCTIONALITY

4.1 Hardware Implementation

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Redundant emergency stop circuits

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Dual-channel safety relays

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Monitored reset function

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Emergency stop buttons positioned at 45 intervals

4.2 Response Times

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E-Stop activation to motor power cut: <100ms

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Safety zone violation to speed reduction: <50ms

- - 5 -

System fault detection to safe state: <200ms

5. TERRAIN MAPPING AND NAVIGATION

5.1 Surface Analysis

The proprietary NaviFloor Terrain Mapping System(TM) includes:

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Real-time surface coefficient measurement

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Dynamic friction assessment

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Slope and elevation monitoring

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Surface irregularity detection

5.2 Navigation Parameters

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Maximum operating gradient: 15%

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Minimum turning radius: 0.8m

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Maximum traversable step height: 20mm

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Surface texture resolution: 0.5mm

6. FLEET MANAGEMENT SAFETY PROTOCOLS

6.1 Traffic Management

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Dynamic path allocation

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Real-time fleet position monitoring

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Automated congestion prevention

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Cross-traffic management system

6.2 Load Management

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Maximum payload monitoring

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Center of gravity calculation

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Dynamic stability control

- - 8 -

Load shift detection

7. MAINTENANCE AND INSPECTION

7.1 Required Safety Inspections

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Daily visual inspection requirements

-

Weekly system diagnostics

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Monthly comprehensive safety audit

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Quarterly certification validation

7.2 Documentation Requirements

All safety-related events must be logged including:

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Emergency stop activations

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Safety zone violations

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System fault occurrences

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Maintenance activities

8. COMPLIANCE AND CERTIFICATION

8.1 Regulatory Compliance

The system maintains compliance with:

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OSHA 29 CFR 1910.212

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CE Machinery Directive 2006/42/EC

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EN 1525 Safety of Industrial Trucks

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ANSI B56.5 Safety Standard

8.2 Testing and Validation

All safety features undergo:

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Factory Acceptance Testing (FAT)

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Site Acceptance Testing (SAT)

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Annual recertification

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Post-modification validation

9. DISCLAIMER AND PROPRIETARY NOTICE

This document contains confidential and proprietary information belonging to NaviFloor Robotics, Inc. The safety systems described herein must be installed, tested, and maintained according to NaviFloor's specifications and requirements. NaviFloor assumes no liability for improper implementation or unauthorized modifications to the described systems.

10. DOCUMENT CONTROL

Approved By:

Dr. Elena Kovacs

Chief Research Officer

NaviFloor Robotics, Inc.

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