

METHOD FOR DETECTING AND AVOIDING WET SURFACES

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Patent Application No. 16/789,432

Filing Date: March 15, 2022

TECHNICAL FIELD

[001] The present disclosure relates generally to autonomous mobile robot navigation systems and, more particularly, to methods and systems for detecting and avoiding wet surfaces during robot operation in industrial environments.

BACKGROUND

[002] Autonomous mobile robots (AMRs) operating in industrial environments frequently encounter wet surfaces that can impact navigation safety and efficiency. Traditional sensors and navigation systems may fail to adequately detect and respond to wet floor conditions, potentially leading to slip hazards or navigation errors.

SUMMARY

[003] The present disclosure describes methods and systems for detecting and avoiding wet surfaces using a multi-sensor approach combined with machine learning algorithms. The invention enables AMRs to identify wet surfaces with high accuracy and implement appropriate navigation adjustments in real-time.

DETAILED DESCRIPTION

1. System Overview

[004] The system comprises:

(a) A primary sensor array including:

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Near-infrared (NIR) spectroscopic sensors

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Multi-beam LiDAR sensors

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Thermal imaging cameras

(b) An onboard processing unit

(c) A machine learning model trained on wet surface characteristics

(d) A navigation control system

2. Detection Method

[005] The method for detecting wet surfaces includes:

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1. Primary Detection

(a) Continuous scanning of floor surfaces using NIR sensors

(b) Analysis of light reflection patterns

(c) Real-time surface composition analysis

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2. Secondary Verification

(a) LiDAR-based surface texture analysis

(b) Thermal gradient mapping

(c) Data fusion from multiple sensor inputs

3. Avoidance Algorithm

[006] The system implements a three-stage avoidance protocol:

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1. Risk Assessment

(a) Surface wetness classification (scale 1-10)

(b) Area mapping and boundary definition

(c) Path criticality evaluation

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2. Path Planning

(a) Dynamic route recalculation

(b) Alternative path generation

(c) Risk-weighted path selection

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3. Execution

(a) Speed adjustment protocols

(b) Traction control engagement

(c) Real-time path validation

CLAIMS

[007] What is claimed is:

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A method for detecting and avoiding wet surfaces comprising:

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Deploying multiple sensor types for surface condition analysis

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Processing sensor data through a trained machine learning model

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Implementing real-time navigation adjustments based on detection results

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The method of claim 1, wherein the sensor types include:

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Near-infrared spectroscopic sensors

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Multi-beam LiDAR sensors

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Thermal imaging cameras

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The method of claim 1, further comprising:

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Continuous surface monitoring during robot operation

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Dynamic path planning based on detected wet surfaces

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Automated speed and traction adjustments

ABSTRACT

[008] A method for detecting and avoiding wet surfaces in industrial environments using autonomous mobile robots. The method utilizes a multi-

approach combining near-infrared spectroscopy, LiDAR, and thermal imaging with machine learning algorithms to identify wet surfaces and implement appropriate navigation adjustments. The system enables real-time detection and avoidance of potentially hazardous wet surfaces while maintaining efficient robot operation.

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ASSIGNMENT

[009] The entire right, title, and interest in this invention has been assigned to NaviFloor Robotics, Inc., a Delaware corporation.

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NFR-2022-037-US

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