AGV Technology Document

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1. General solution

1.1. Requirements

1.2. Solutions

Solution 1: RFID + Beacon

Solution 2: Line following using computer vision

2. Technologies

2.1. Hardware

2.1.1. General configurations

Solution 1: RFID + Beacon

Solution 2: Line following using computer vision

2.1.2. RFID

Definition

Working principle

2.1.3. Bluetooth Low Energy

Definition

Working principle

2.1.4. Laser distance sensor

Definition

Working principle

2.1.5. Camera

Definition

Working principle

2.1.6. Battery changer station

Definition

Working principle

2.2. Software

2.2.1. Description

2.2.2. Environment setup

AGV

Individual installation

Raspberry Pi OS installation

Mosquitto MQTT installation

Firewall configuration

Running main control console application

Docker installation

Raspberry Pi OS installation

Running installation script

Dashboard server

Mosquitto MQTT installation

Firewall configuration

Nginx installation

Running installation script

API server

Firewall configuration

Nginx installation

Running installation script

MQTT broker

Mosquitto installation

Firewall configuration

Creating topics

2.2.3. Frontend

AGV Integrated Display User Interface

- Login screen
- Battery indicator
- Delivery request creating menu
- Delivery destination choosing menu
- Confirmation screen

Server Dashboard User Interface

- Control panel
- Main data display panel
- System panel
- Working principle
- Functions/Methods

2.2.4. Backend

AGV Backend

- Working principle
- Functions/Methods

API Server

API Endpoints

3. Operations explanation

3.1. Localizing method

Solution 1: RFID + Beacon

Solution 2: Line following using computer vision

3.2. Mapping method

Map structure

Dimension

Layer

Cell

Synchronizing visual map with real AGV position

Solution 1: RFID + Beacon

Solution 2: Line following using computer vision

3.3. Guiding method

Navigation methods

Navigation states

Solution 1: RFID + Beacon

Solution 2: Line following using computer vision

3.4. Manual mode

Controlling direction

Setting motor speed

Stopping emergency

Restarting AGV

3.5. Automated mode

Idle mode

Delivery mode

Creating delivery request

Processing delivery request

Planning path

Identify other AGVs which are in delivering mode

Calculating departure timestamp

Starting transporting

Returning home

3.6. Initial configurations

Map initializing and setting

Creating map

Setting map dimension

Identifying cell value

Beacon scanner setting

Scanning available around beacons

Reading beacon profile data

Assigning beacon name and coordinate to map

Laser sensor setting

Measuring distance

Setting avoiding distance

Executing board checking

4. Integration

5. Testing

6. Performance reviews

7. Upgrading

8. Updating

9. Troubleshooting