TOWARDS AN UNDERSTANDING OF ARTIFICIAL INTELLIGENCE

Lightweight Model for Collision Avoidance of AGVs in Crowded Environments

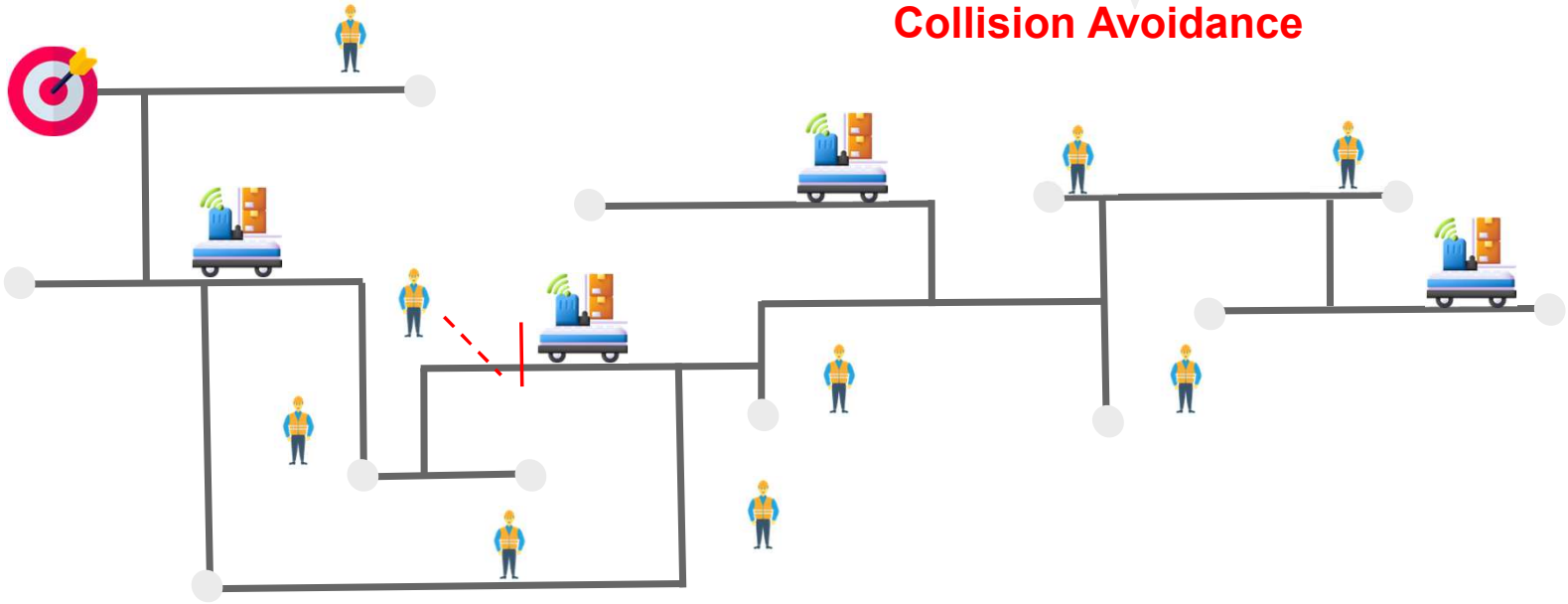
Automated Guided Vehicles (AGVs)

- AGVs are driverless vehicles widely used to transport raw materials, components, or finished products in industrial settings such as factories and warehouses.
- AGVs enhance productivity, minimize operational time, improve workplace safety, reduce costs, and offer scalable solutions in Industrial Environments.

The problem

- In real-time.
- With lightweight models.
- Without affecting AGV's efficiency.

Collision Avoidance



Research Questions

How can data be fused from different sensors for resource-constrained AGVs?

What techniques and approaches can be used to design a lightweight model that enhances AGVs collision avoidance while maintaining efficiency in dynamic environments?

How can explainable AI techniques increase operator trust and transparency in AGV decision-making?

Objectives

- **Establish Data Management and Evaluation Plan:** Covering what types of data are collect, formats, storage/access, and success metrics.
- **Propose a lightweight real-time perception and prediction approach:** An ML-based model that detects nearby obstacles, estimates motion, and interfaces cleanly with the AGV.
- **Enable safe navigation decisions:** By connecting the intent output to a planner (slow/stop/detour policies).

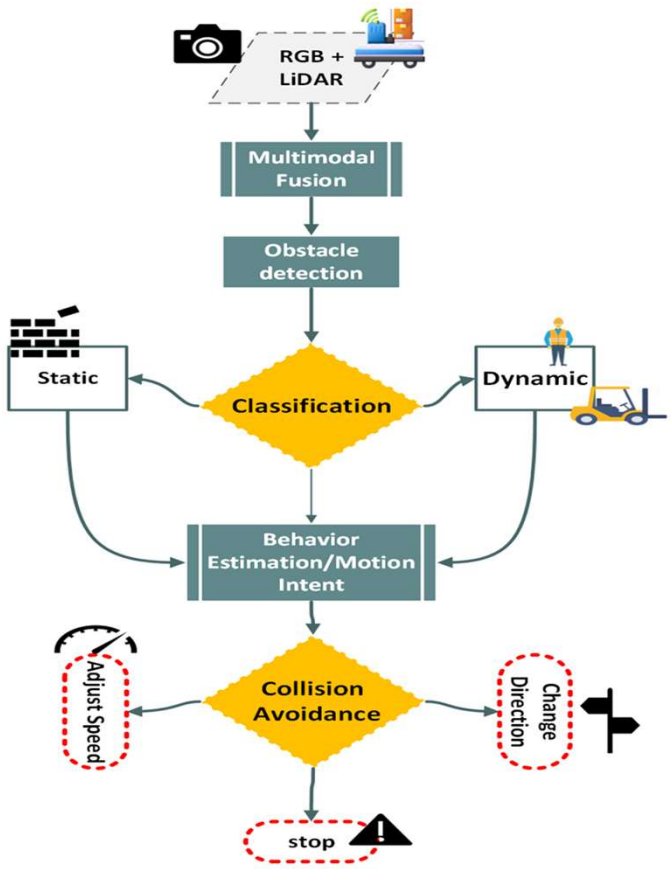
The Idea

- **Goal:** classify **motion intent** of nearby objects (moving-toward / moving-away / lateral / static)

  - Trustworthy Lightweight Model for Object Detection
  - Behaviour Forecasting
  - Rapid Trajectory Adaptation in dynamic Environments

- **Why:** If an object is moving toward the AGV's path, trigger route replanning (detour) instead of a hard stop, resulting in fewer unnecessary stops and smoother traffic flow.

Flow diagram



Simulation tools

Webots™
robot simulatio

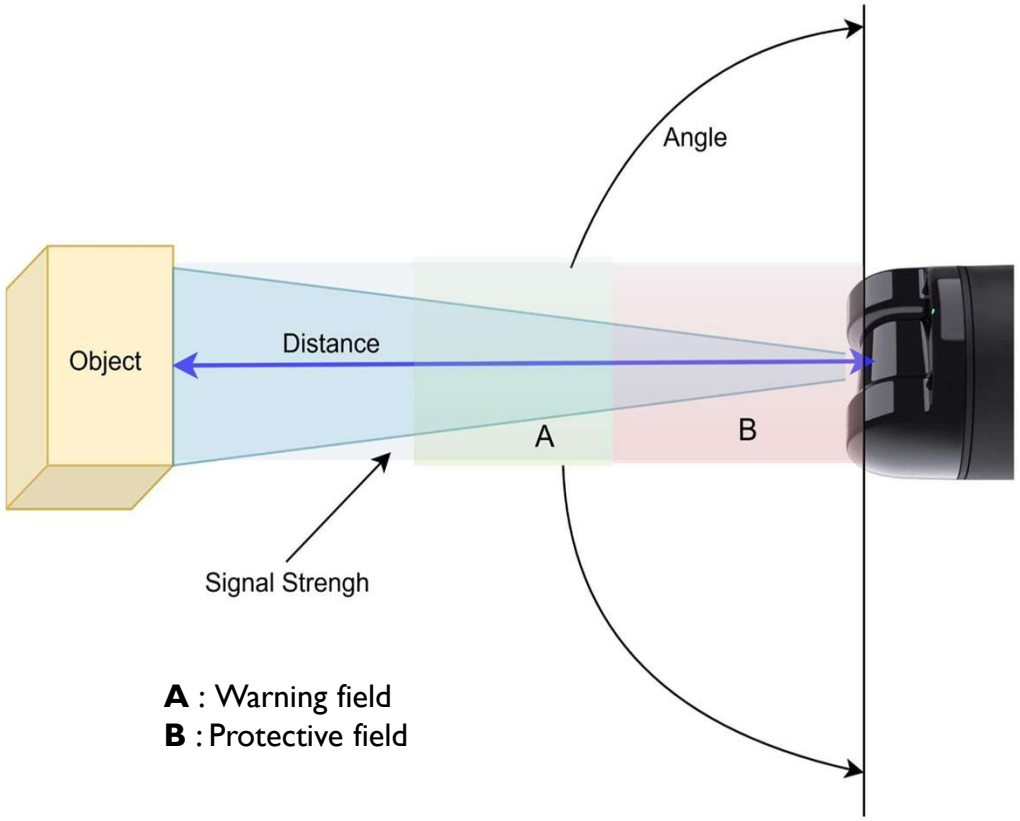
GAZEBO

ROS

Framework

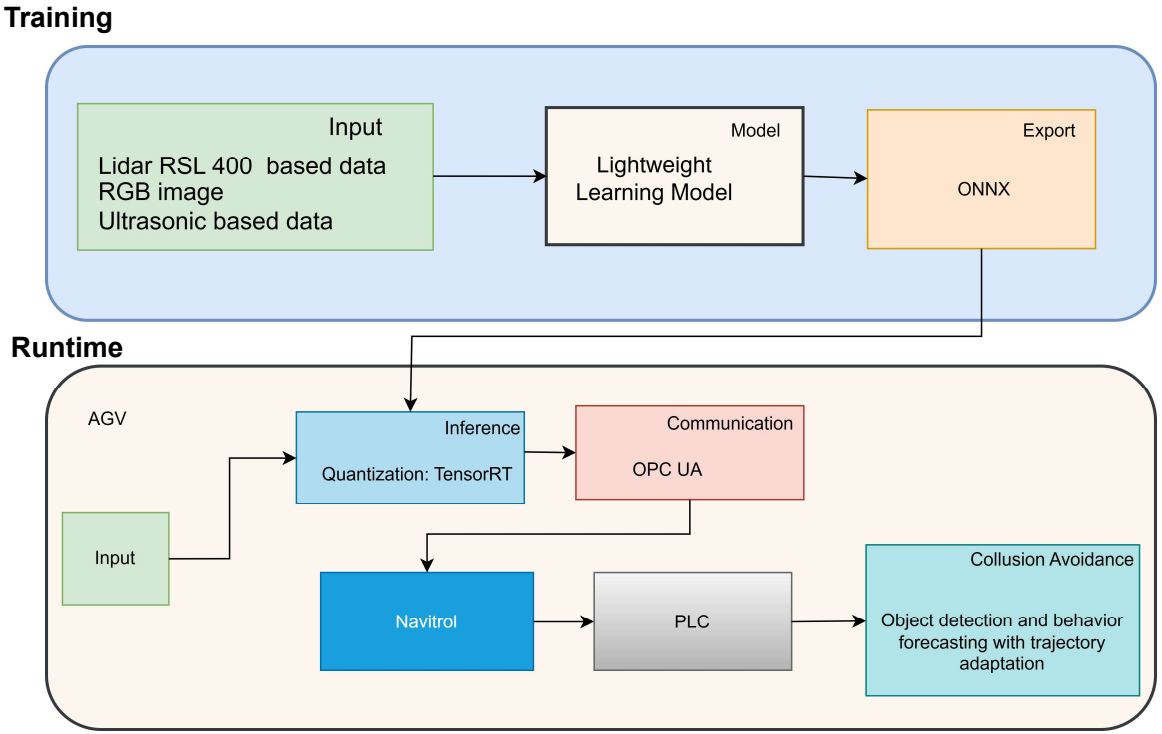
CoppeliaSim
from the creators of V-REP

LIDAR RSL 400 Data type



A : Warning field
B : Protective field

Block diagram



Thank you for your attention!