MECHATRONIC SYSTEMS ENGINEERING

SEMESTER PROJECT

TEAM UNKNOWN

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Task

Collecting the bales of straw and bringing them to a certain location using different type of vehicles autonomously

Server-Side Duty
- Server know about the field
- Server decide the need for the vehicle type change
- Server update the vehicle with bale's node coordinate

Vehicle Duty
- Vehicle decides the path
- Vehicle avoid obstacles

Used types of vehicles

- 1 Small vehicle
- 1 Medium vehicle
- 1 Large vehicle
- 1 Weed Vehicle

CONSENS

Environment analysis

Active structure

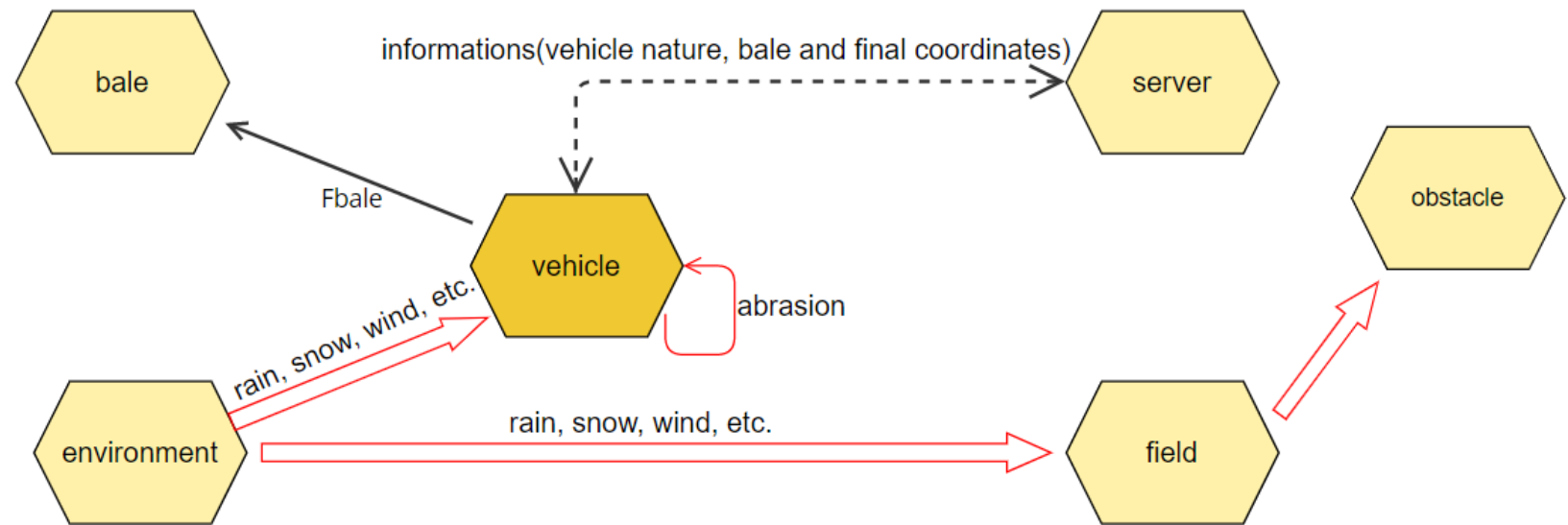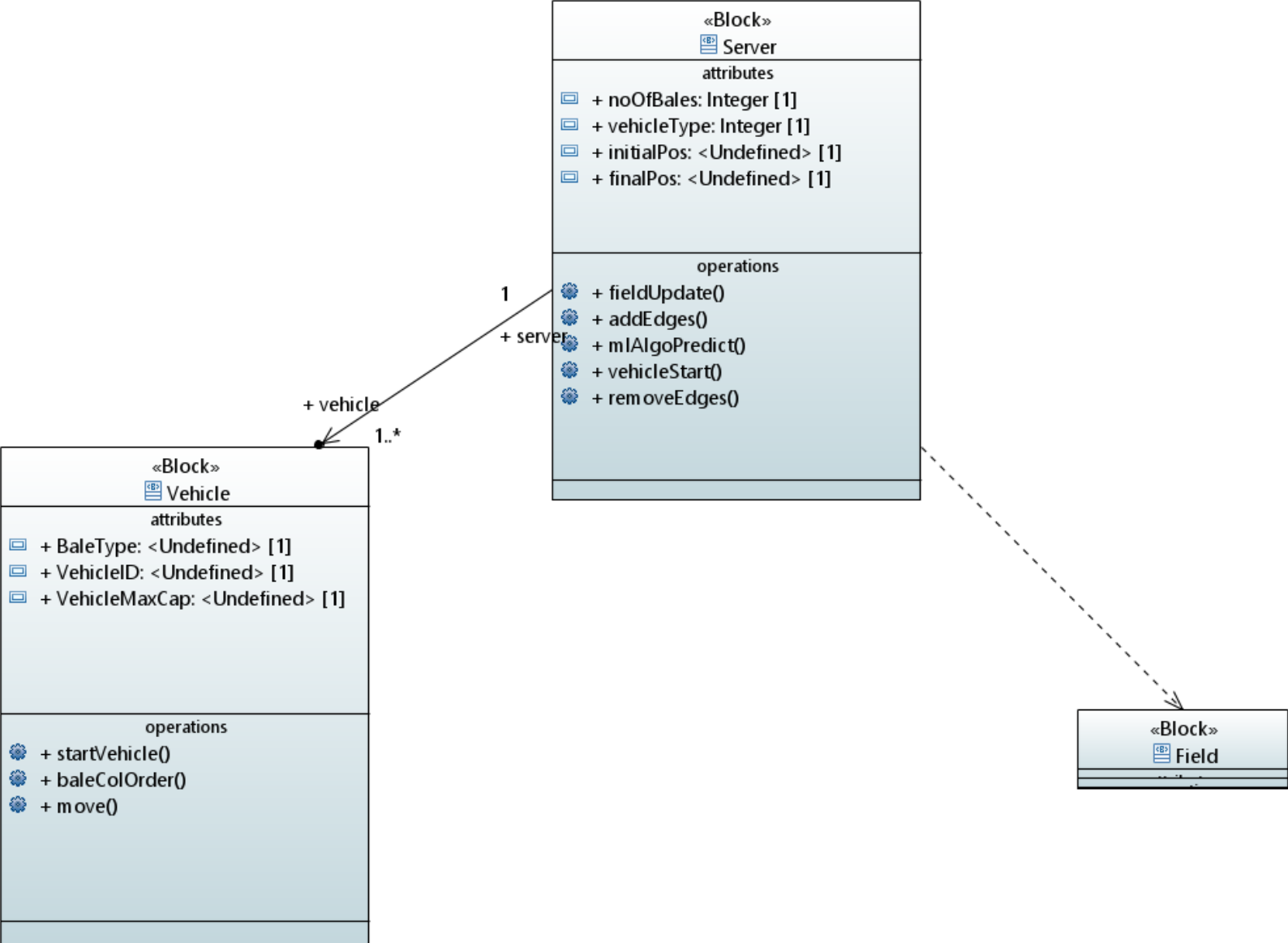Requirements

Hierarchy of functions
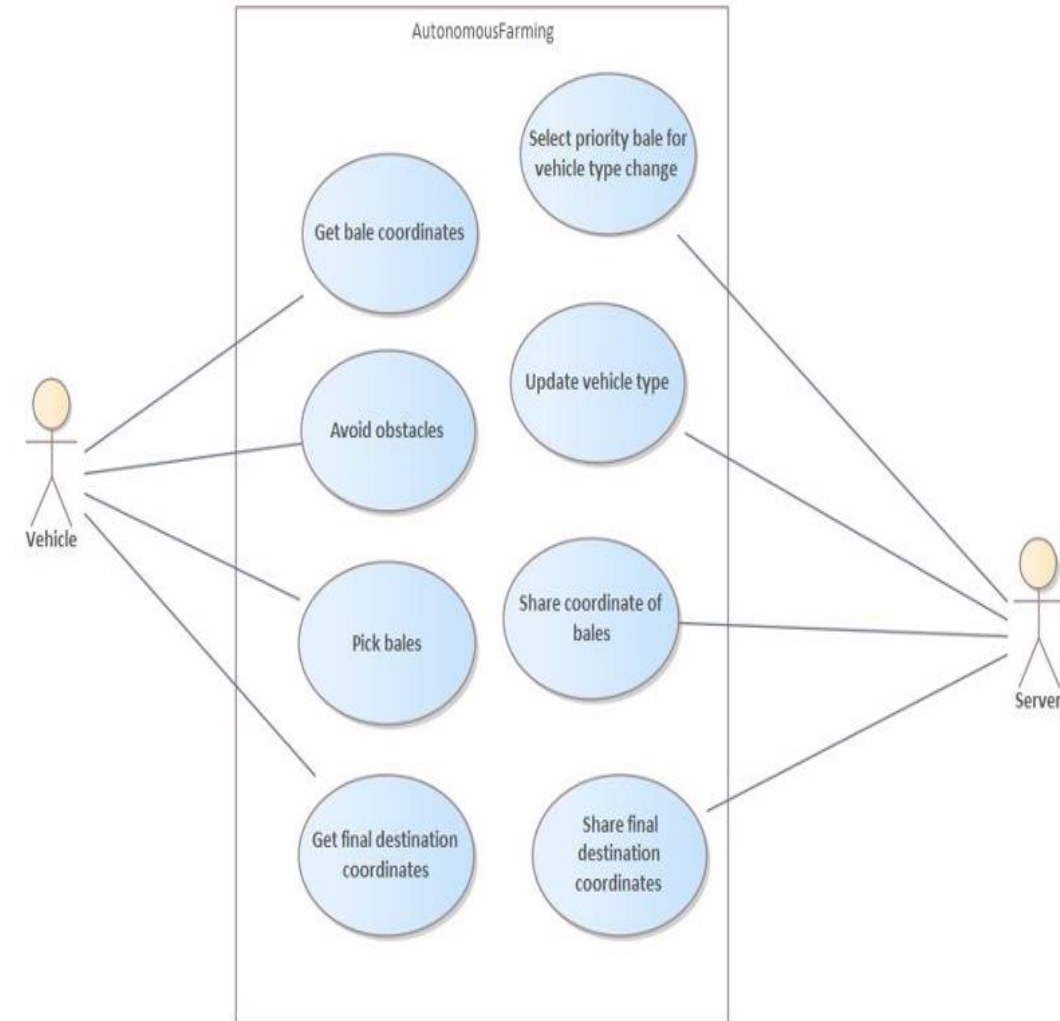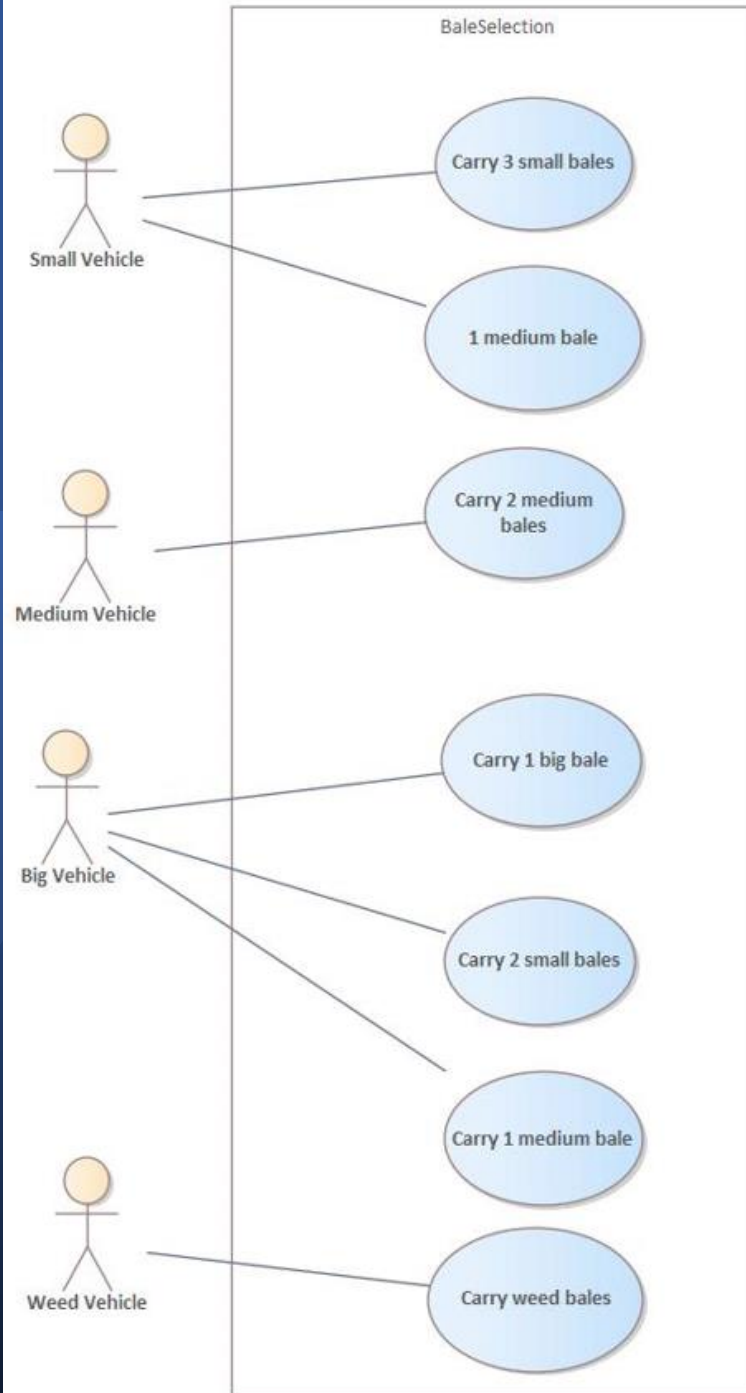
Application scenarios
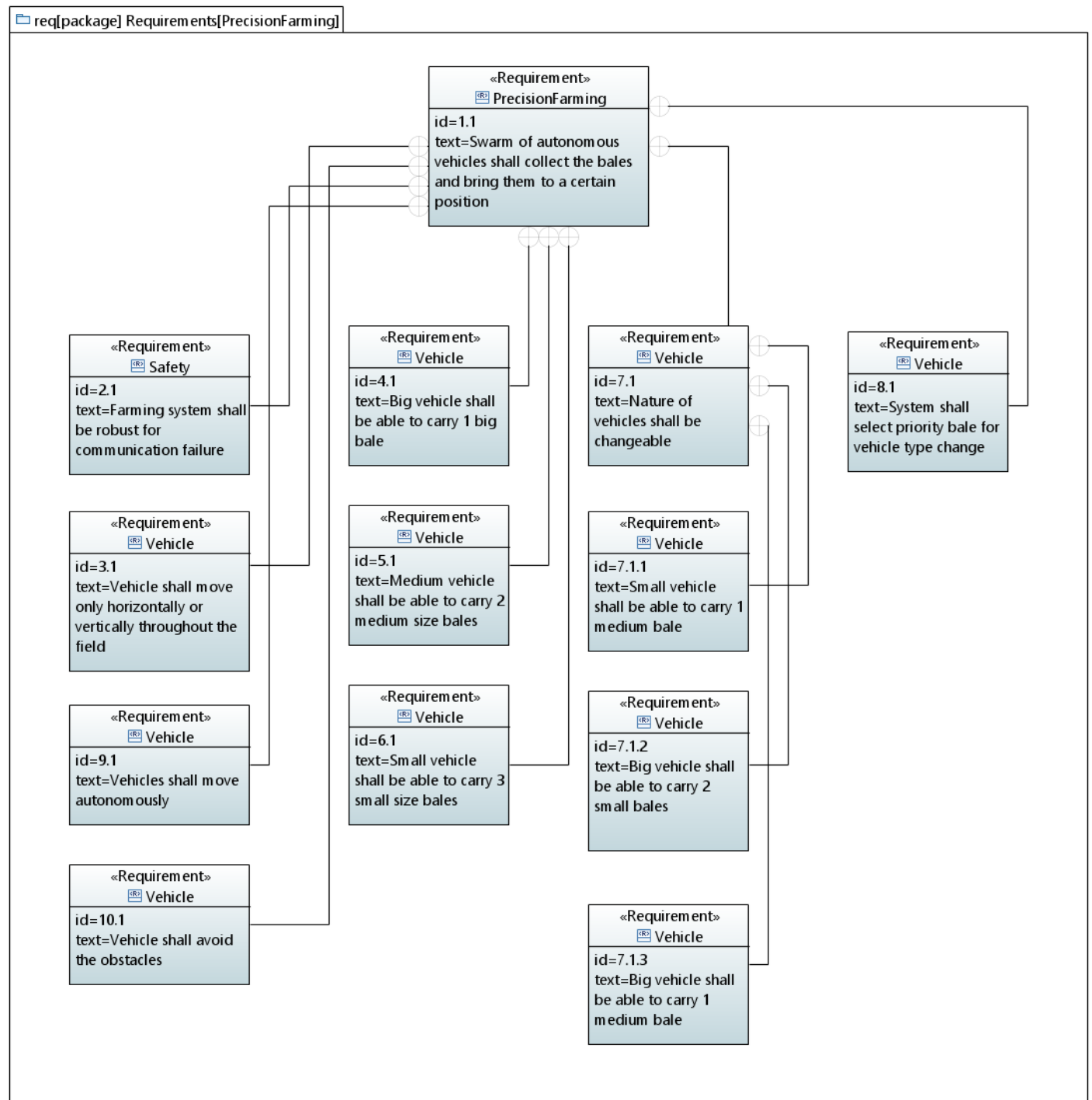
Behaviour definition

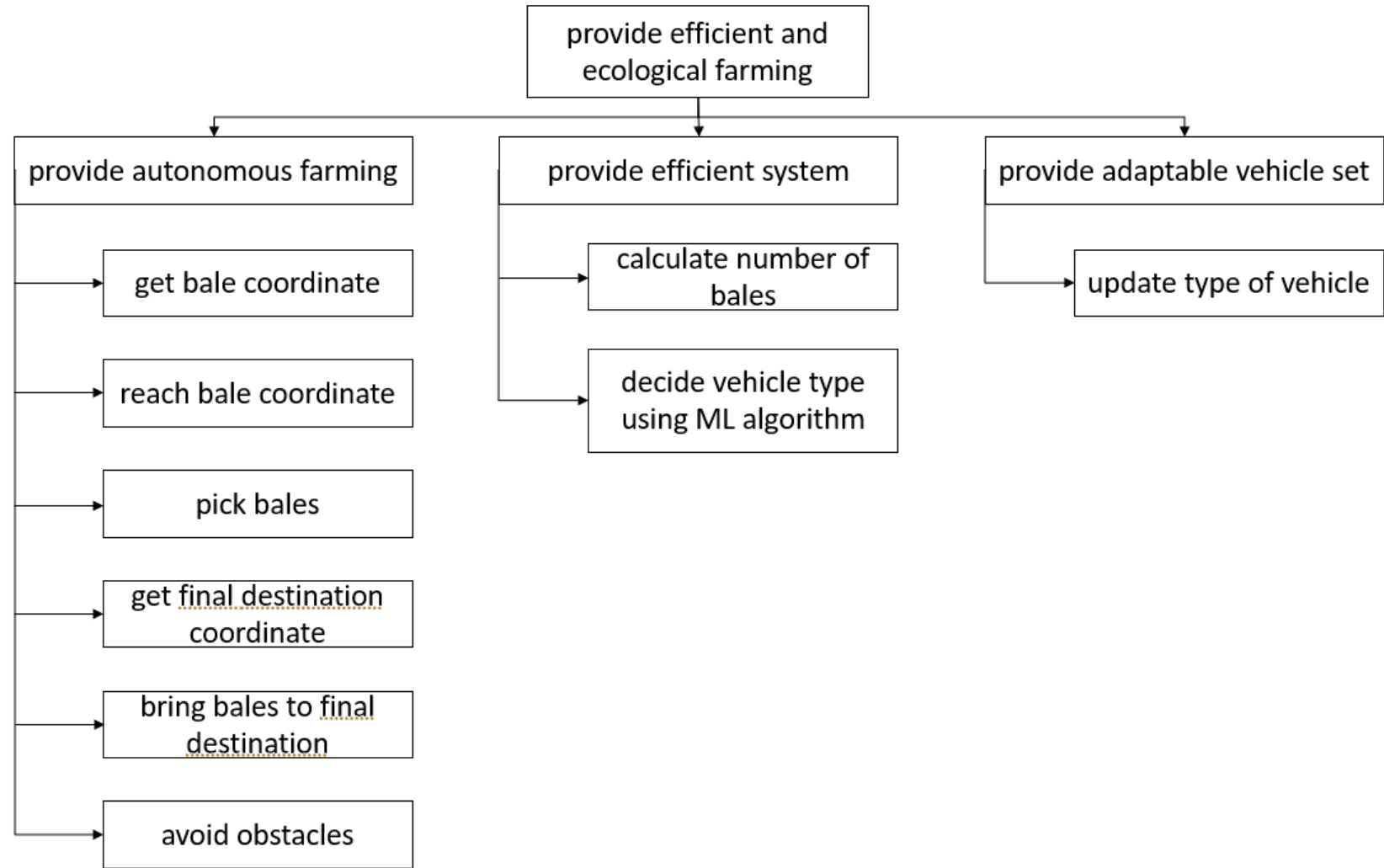# Environment Analysis

Active Structure

«Block»
Server

attributes
+ noOfBales: Integer [1]
+ vehicleType: Integer [1]
+ initialPos: <Undefined> [1]
+ finalPos: <Undefined> [1]

operations
+ fieldUpdate()
+ addEdges()
+ mlAlgoPredict()
+ vehicleStart()
+ removeEdges()

«Block»
Vehicle

attributes
+ BaleType: <Undefined> [1]
+ VehicleID: <Undefined> [1]
+ VehicleMaxCap: <Undefined> [1]

operations
+ startVehicle()
+ baleColOrder()
+ move()

«Block»
Field

1
+ server

+ vehicle
1..*

Application Scenarios

Requirements

Hierarchy of Functions

provide efficient and ecological farming

- provide autonomous farming
  - get bale coordinate
  - reach bale coordinate
  - pick bales
  - get final destination coordinate
  - bring bales to final destination
  - avoid obstacles
- provide efficient system
  - calculate number of bales
  - decide vehicle type using ML algorithm
- provide adaptable vehicle set
  - update type of vehicle
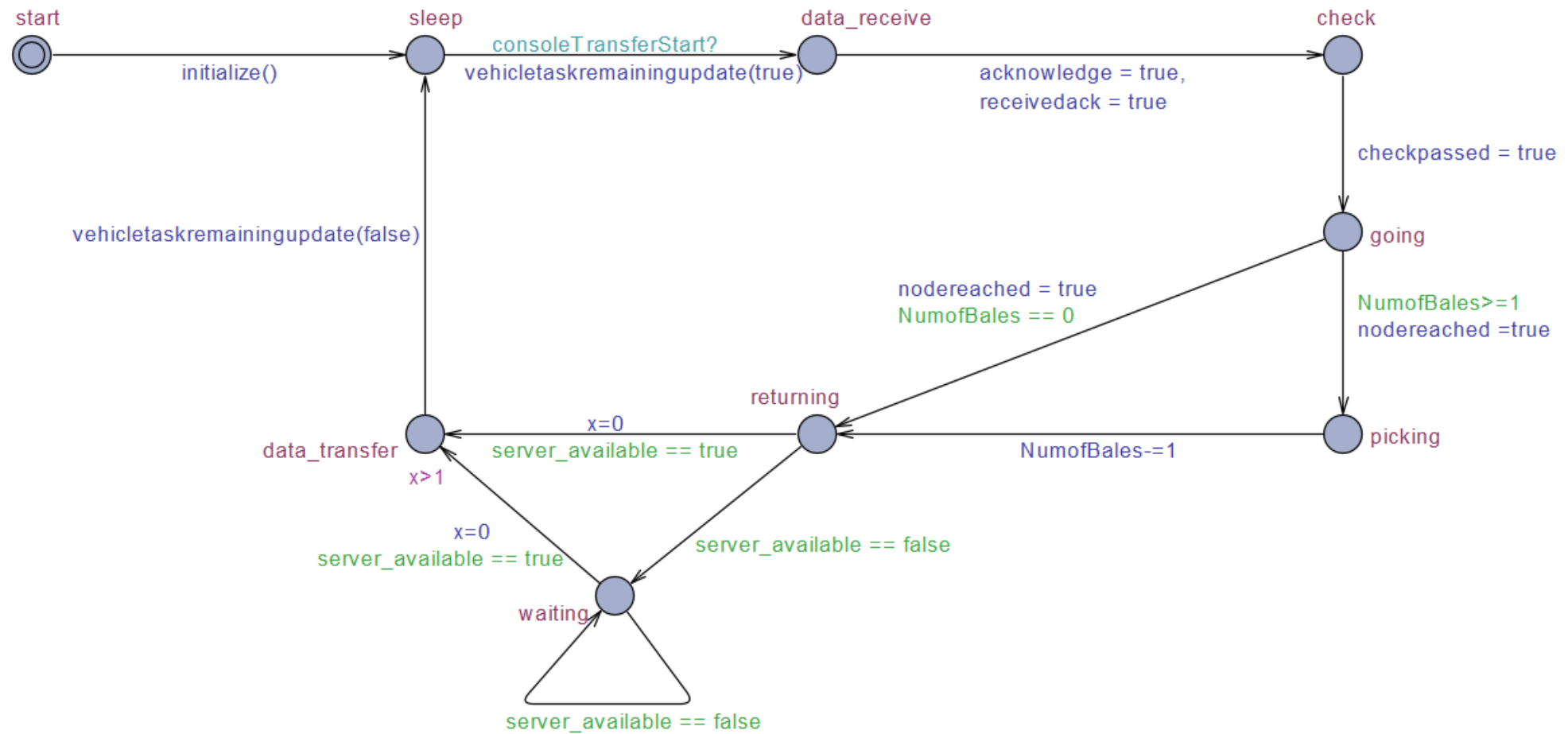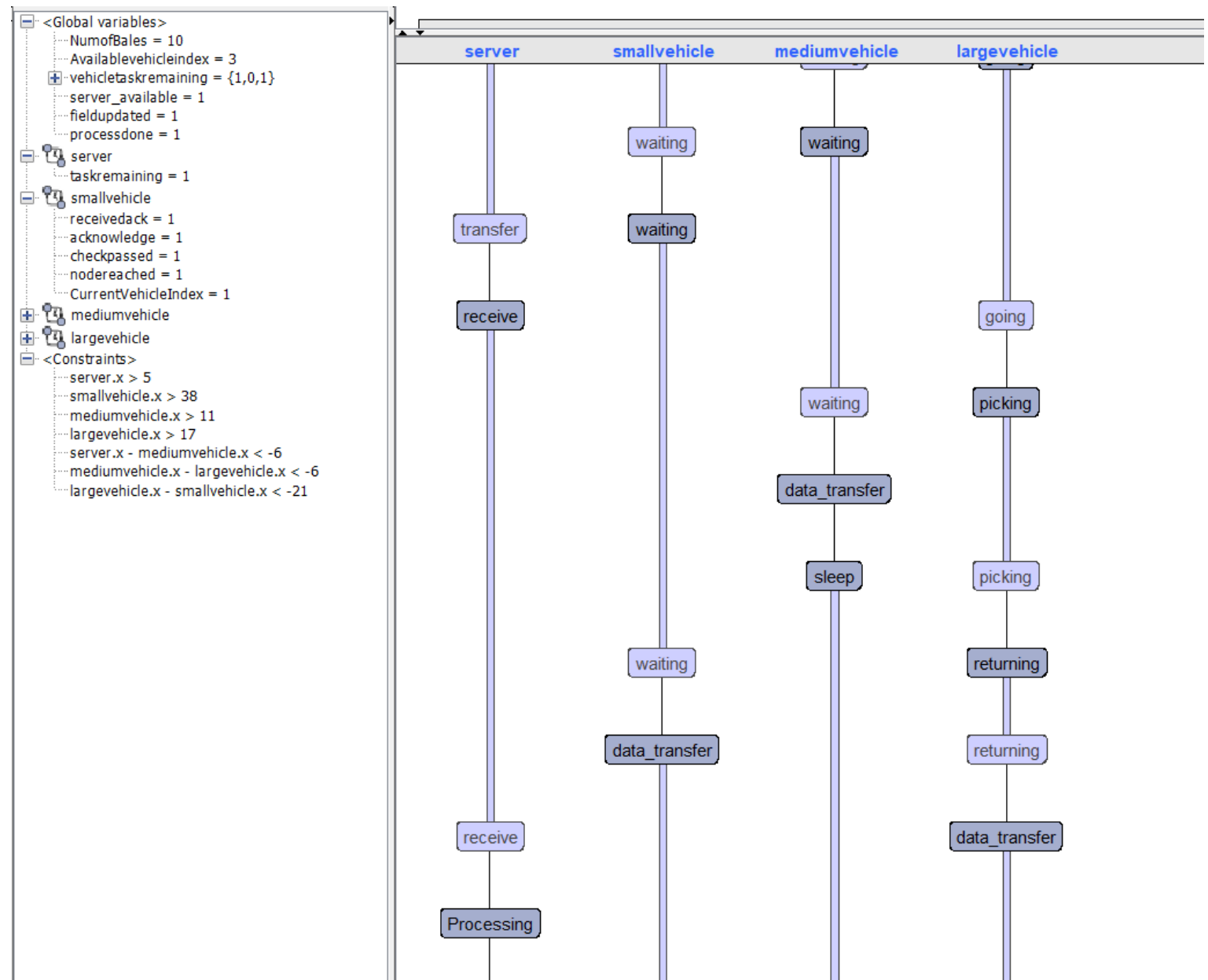
Behaviour Definiton
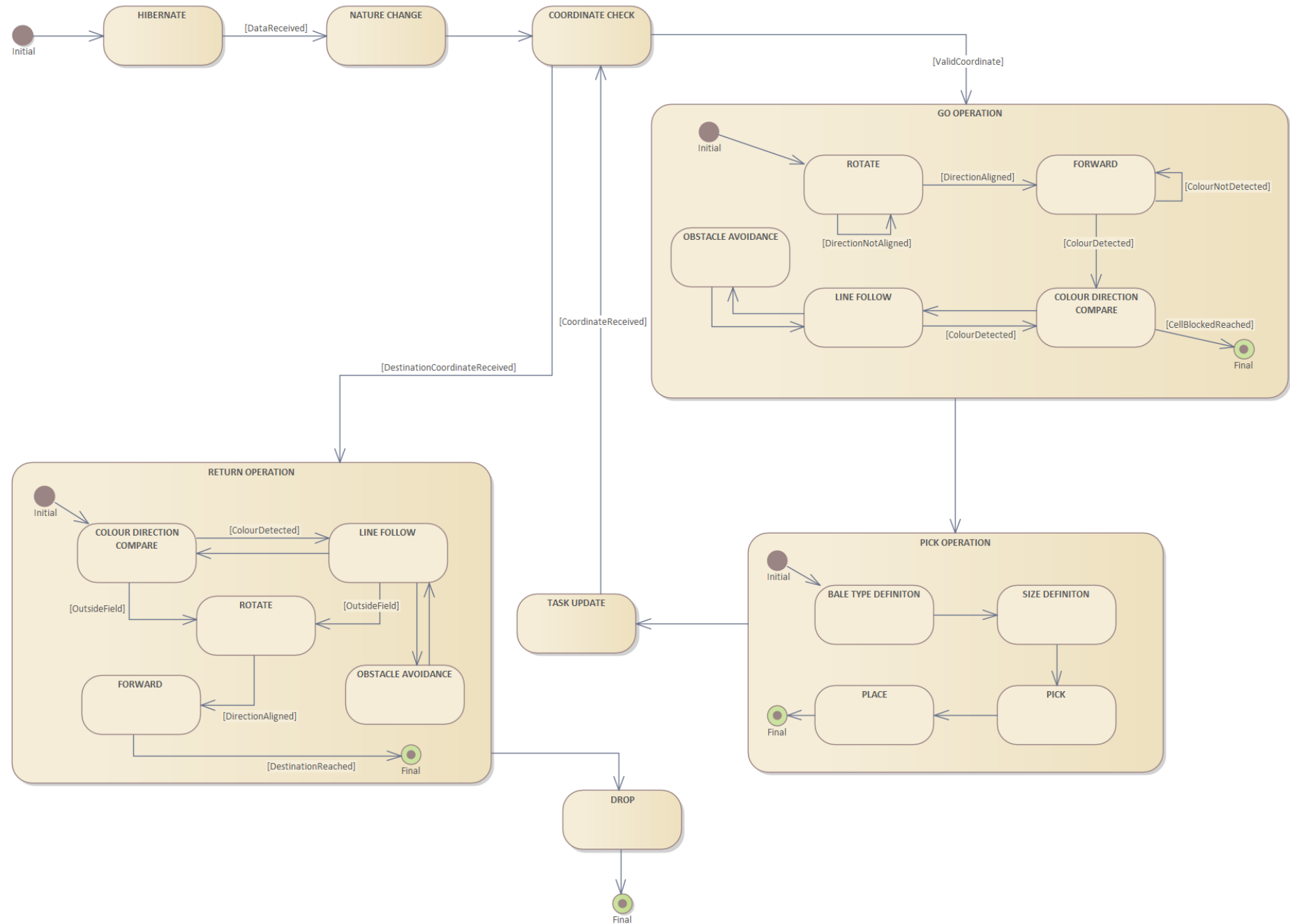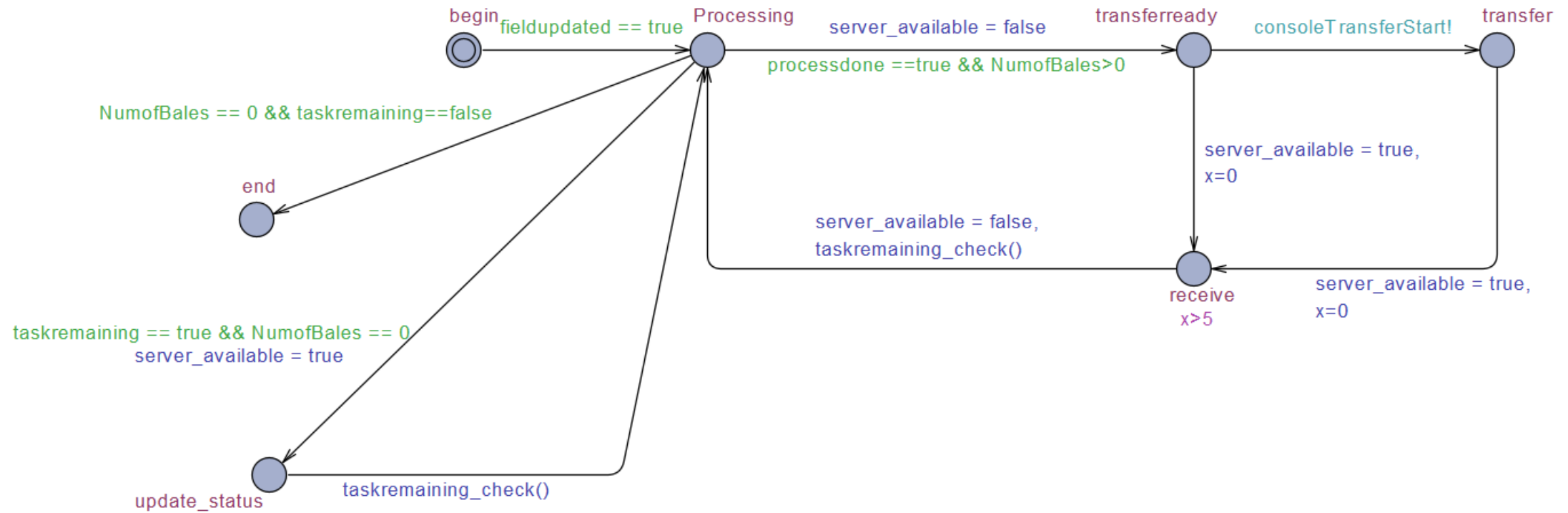
Server Model

Vehicle Model
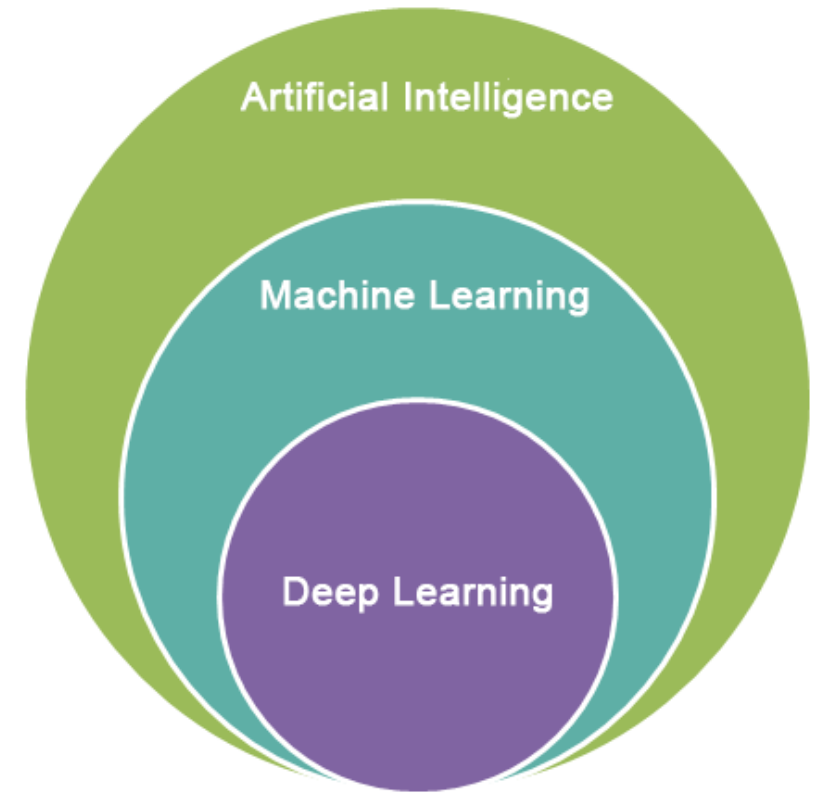
UPPAAL

Verification

- A[] not deadlock

Code Walkthrough

link

Implementation of ML Algorithm

- Goal of the Machine Learning is to build a computer system that can easily adapt and learn from data
- As it is increasing efficiency over time and in each iteration, it can be said like computer is learning
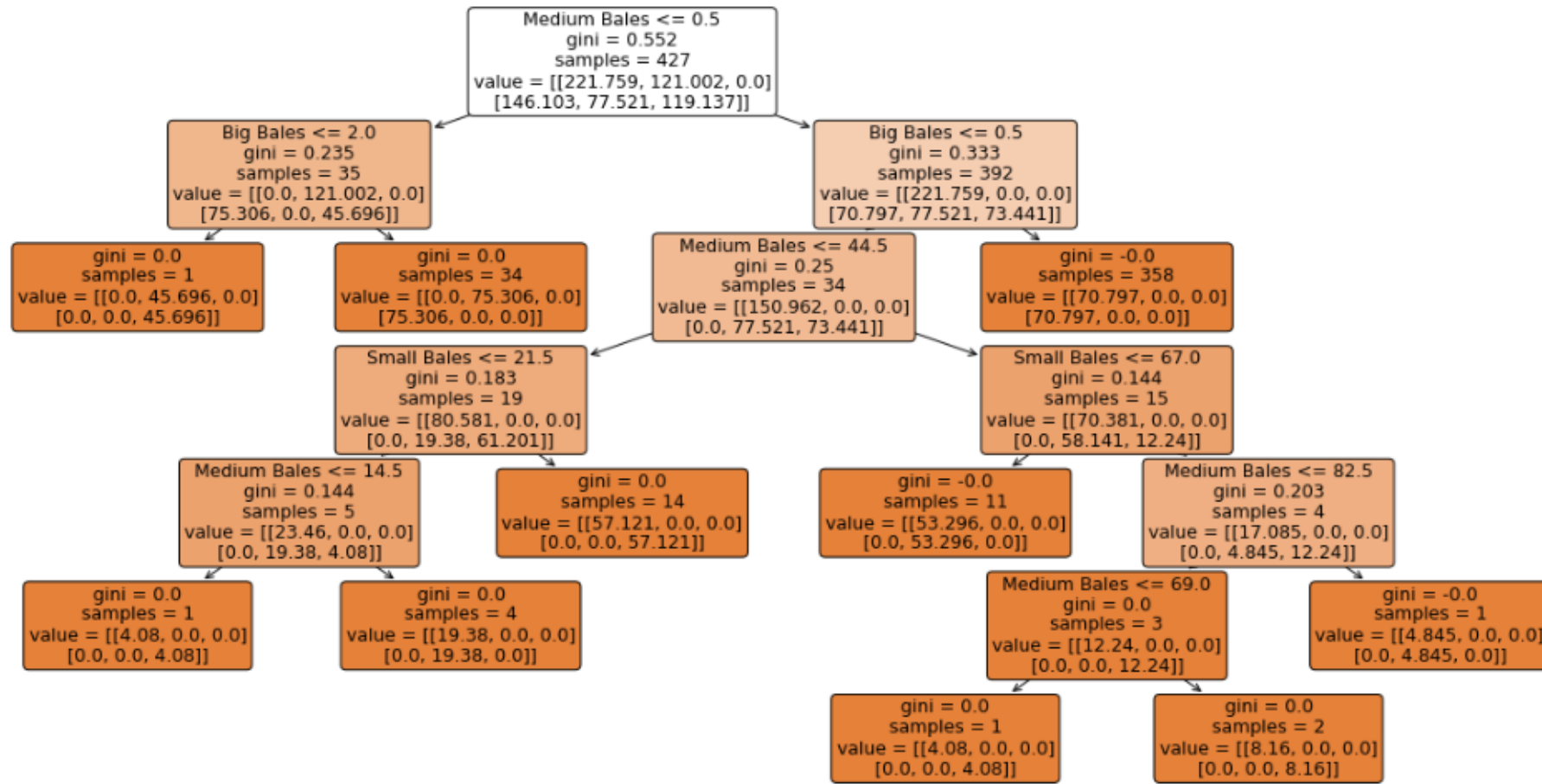
Decision tree is a algorithm that utilizes tree-like model to divide the data into clusters.
It has following components:
- Root nodes
- Sub-Tree
- Decision Nodes
- Leaf Nodes ---> main component.
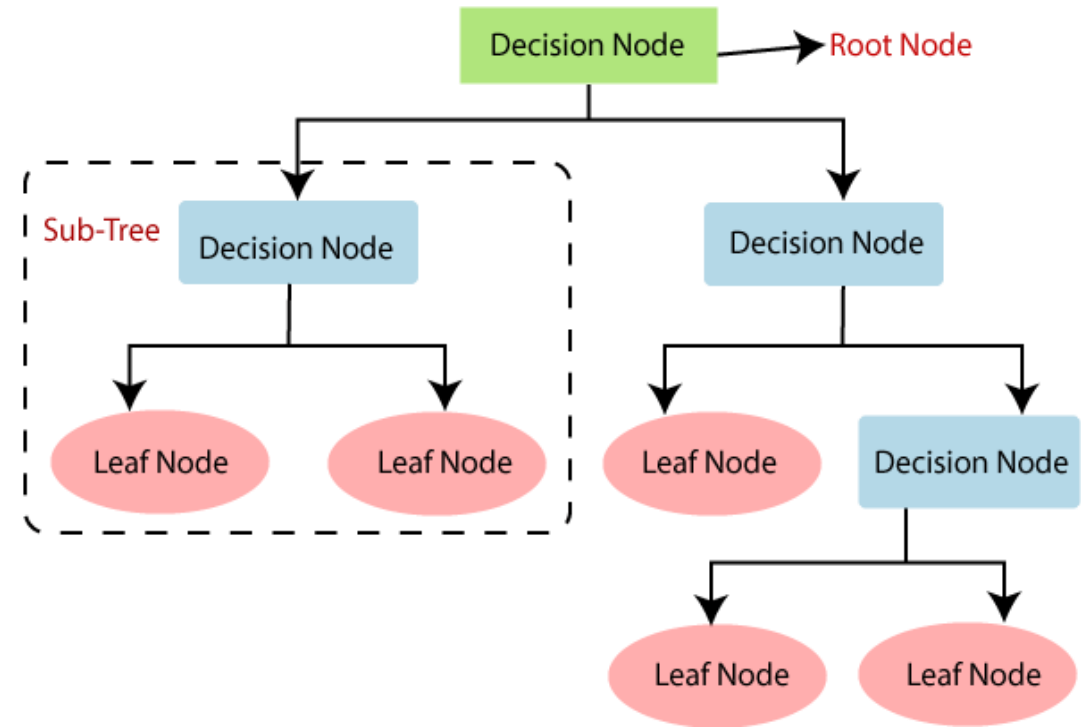
Implementation of ML Algorithm

References

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[1] Gausemeier (2014), *Design Methodology for Intelligent Technical Systems ,Develop Intelligent Technical Systems of the Future.*

[2] J.Gausemeier , U.Frank , J.Donoth,S.Kahl, (2009), *Specification technique for the description of selfoptimizing mechatronic systems*

THANK YOU!