
RoboCon System Specification SRS

liewgary2017_csci568Project (Requirements Management)

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<i>RoboCon System Specification SRS</i>	3
□□	3
□□	3
<i>1 Introduction</i>	4
<i>1.1 Purpose</i>	4
1.1.1 Describes the high-level characteristics and function of a proposed robotic convoy system called RoboCon	4
<i>1.2 Scope</i>	4
1.2.1 RoboCon consists of a variable number of robots that form a convoy and follow a leader robot to a specified destination. RoboCon will provide a demonstration and experimentation platform for CS568 Systems image processing and artificial intelligence algorithms. This type of autonomous convoy is a common use-case for CS568 Systems algorithms, having applications in transportation, inventory management, automated farming, and other areas.	4
<i>2 System Overview</i>	4
<i>2.1 StakeHolder</i>	4
<i>2.2 StakeHolder's Goal</i>	5
<i>3 Detailed Requirements</i>	6
<i>4 Experimentation and Demonstration Use Cases</i>	9
<i>5 Software and Hardware Architecture of System</i>	10
<i>6 Routes of System</i>	13
<i>7 Message Exchange Of System</i>	14
<i>8 Operation And Modes Exchanged Of System</i>	15
<i>9 Relative Terms and Concepts</i>	15
<i>9.1 Terms And Concepts</i>	16
<i>9.2 Acronyms</i>	18

RoboCon System Specification SRS

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1 Introduction

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1.1 Purpose

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1.1.1 Describes the high-level characteristics and function of a proposed robotic convoy system called RoboCon

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1.2 Scope

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1.2.1 RoboCon consists of a variable number of robots that form a convoy and follow a leader robot to a specified destination. RoboCon will provide a demonstration and experimentation platform for CS568 Systems image processing and artificial intelligence algorithms. This type of autonomous convoy is a common use-case for CS568 Systems algorithms, having applications in transportation, inventory management, automated farming, and other areas.

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2 System Overview

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2.1 StakeHolder

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RoboCon Development Team
is responsible for building the RoboCon System

ID 95059

CS568 Systems algorithm developers will be the primary users of RoboCon.

ID 95060

CS568 System Management will oversee the planning and funding of the RoboCon development.

ID 95062

CS568 System customer will view RoboCon demonstrations that showcase the performance of CS568 Systems algorithms.

ID 95065

2.2 StakeHolder's Goal

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[CS568 Systems customers'](#) goals is Gain an understanding of how they can incorporate CS568 Systems algorithms into their own products to provide their customers with more value.

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[CS568 Systems management's](#) goals is the system has low maintenance costs over time.
and the system can be used to provide compelling demonstrations to customers of the value of RoboCon algorithms.

ID 95063

[RoboCon Development Team's](#) Goals is Successfully complete the project on-time and on-budget.

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[CS568 System Algorithm Developers'](#) goals is be easy to extend with new image processing and artificial intelligence algorithms.
and be simple to configure for different experiments.
and provide rich, meaningful metrics of algorithm performance

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3 Detailed Requirements

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Convoy should include at least two robots.

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RoboCon system should be finished and could be used before the required deadline.

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RoboCon System should be completed without exceed the initial budget.

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RoboCon System should be extensible and can include new algorithm.

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One Convoy should have one [Leader](#)

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Each Robot should have three ways to follow the [guide](#) to reach the [waypoints](#)

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The way to configure experiment parameter for the system should be easily understandable by user.

ID 101899

Each RCU should knows when to move when it is in the convoy form mode.

ID 102001

leader should have way to detect and compute path to [waypoint](#)

ID 102002

[Leader](#) should have way to navigate around the obstacle.

ID 102005

Each RCU should be able to detect Charging station's location.

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Convoy should know when to change to recharging mode and stops to go to charge in station.

ID 102013

The convoy should know when to back to movement mode again.

ID 102024

Convoy should have algorithm to designate one robot as leader.

ID 102397

Alternative and New Algorithm should be testable in experimentation by [developer](#).

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The system to be used for experimentation to test alternative algorithm should be configurable for initiative parameter at the beginning

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All the Performance Metrics should no worse than the initialed defined value.

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Performance Metrics to record should include 8 different important items.

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System Performance Metrics should be comparable to compeling system

ID 102462

RCU should take right action among moving,stop and turn according to the sensor analyze's data

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System should have Maintenance costs less than initialized defined Maintenance costs

ID 102463

RCU should change the equipment among camera,IR,GPS according to sensor's sensing of outside enviroment

ID 102505

Follower and guide should perform identity operation to coordinate activities.

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ACU should be worked together with RCU and perform opration of configuration and receive data

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Each RCU should knows the way to form a convoy automatically.

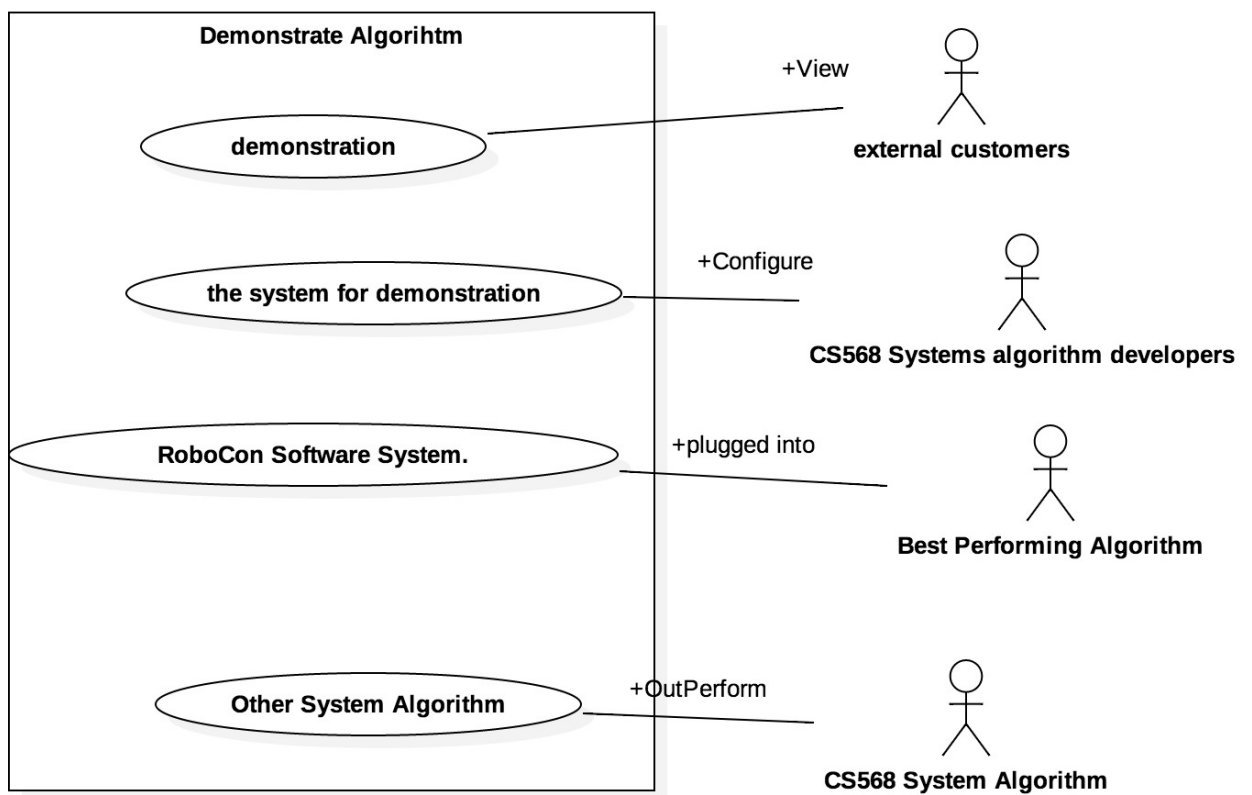
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Each RCU should have one guide(except the leader) and one tail(except the last one).

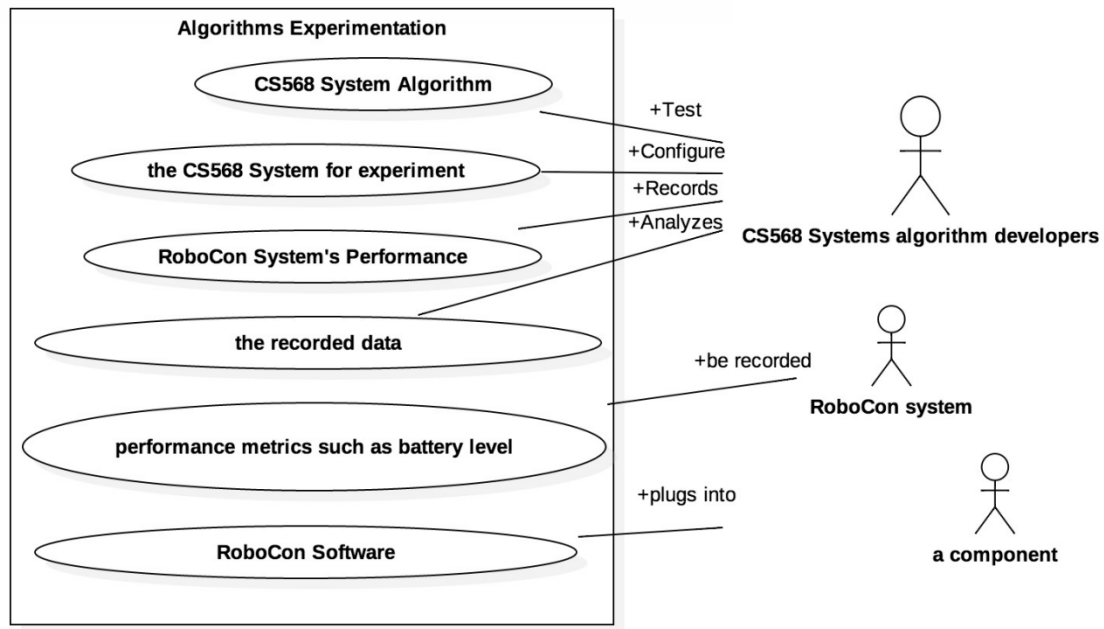
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4 Experimentation and Demonstration Use Cases

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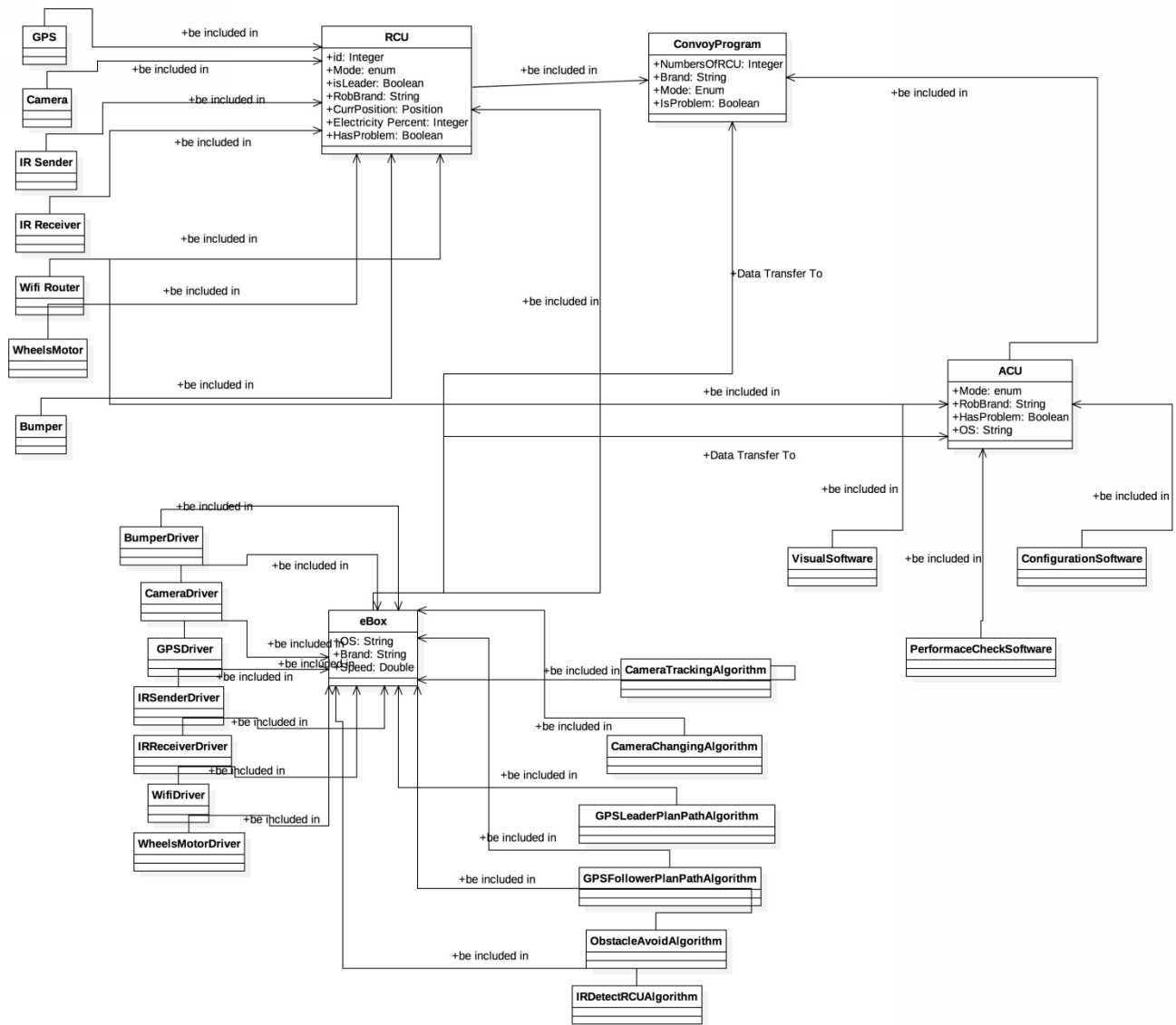
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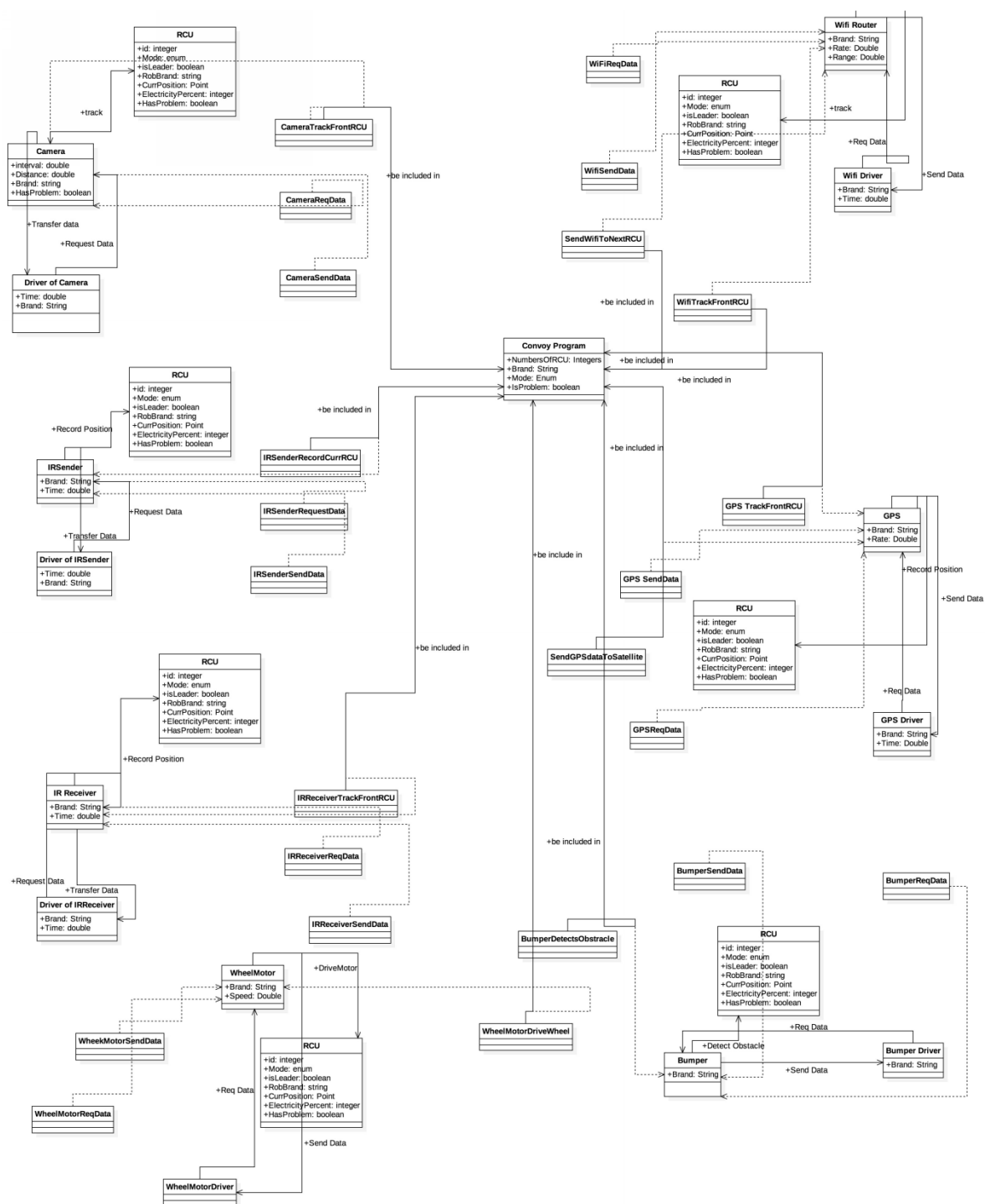
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5 Software and Hardware Architecture of System

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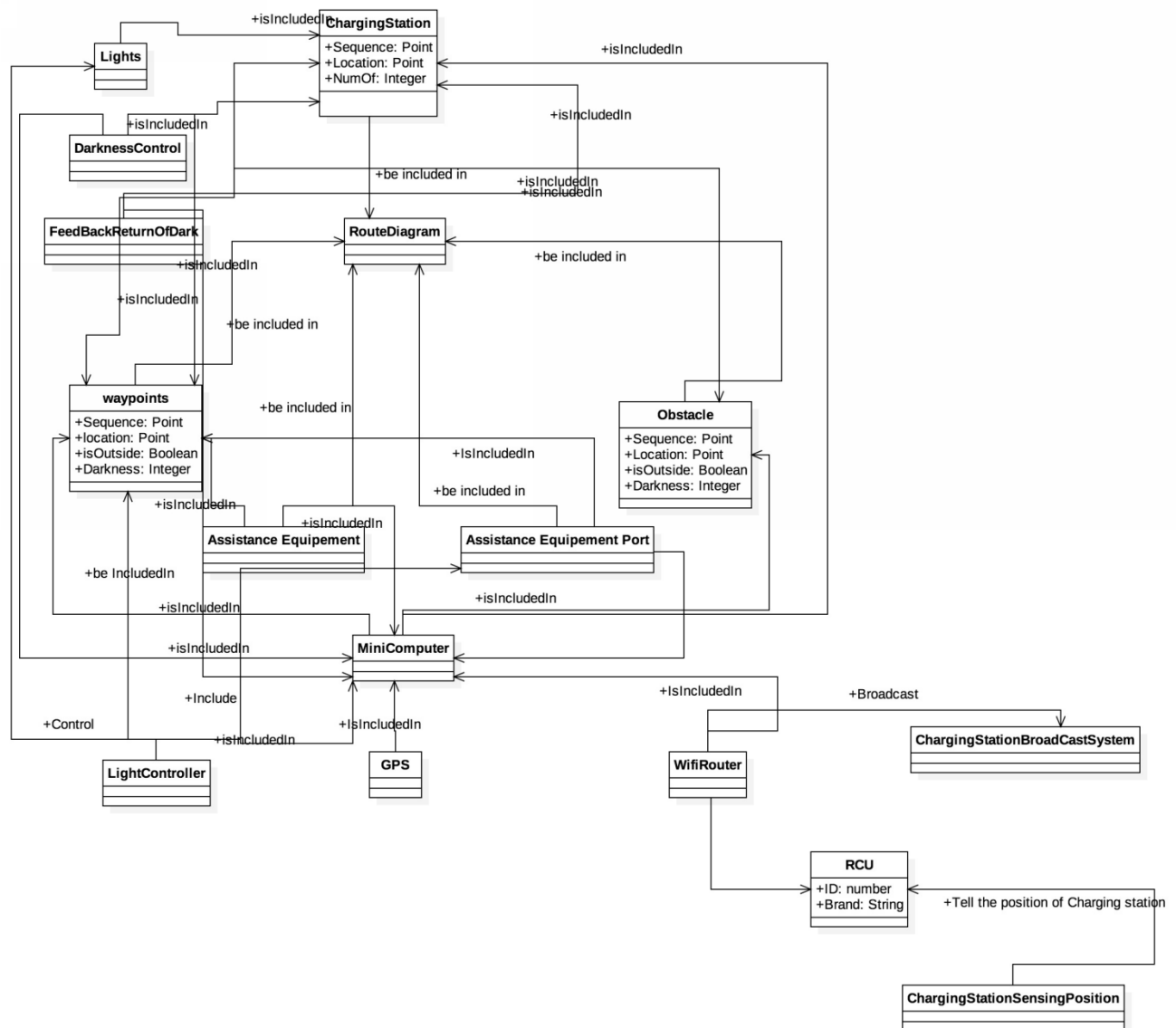
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6 Routes of System

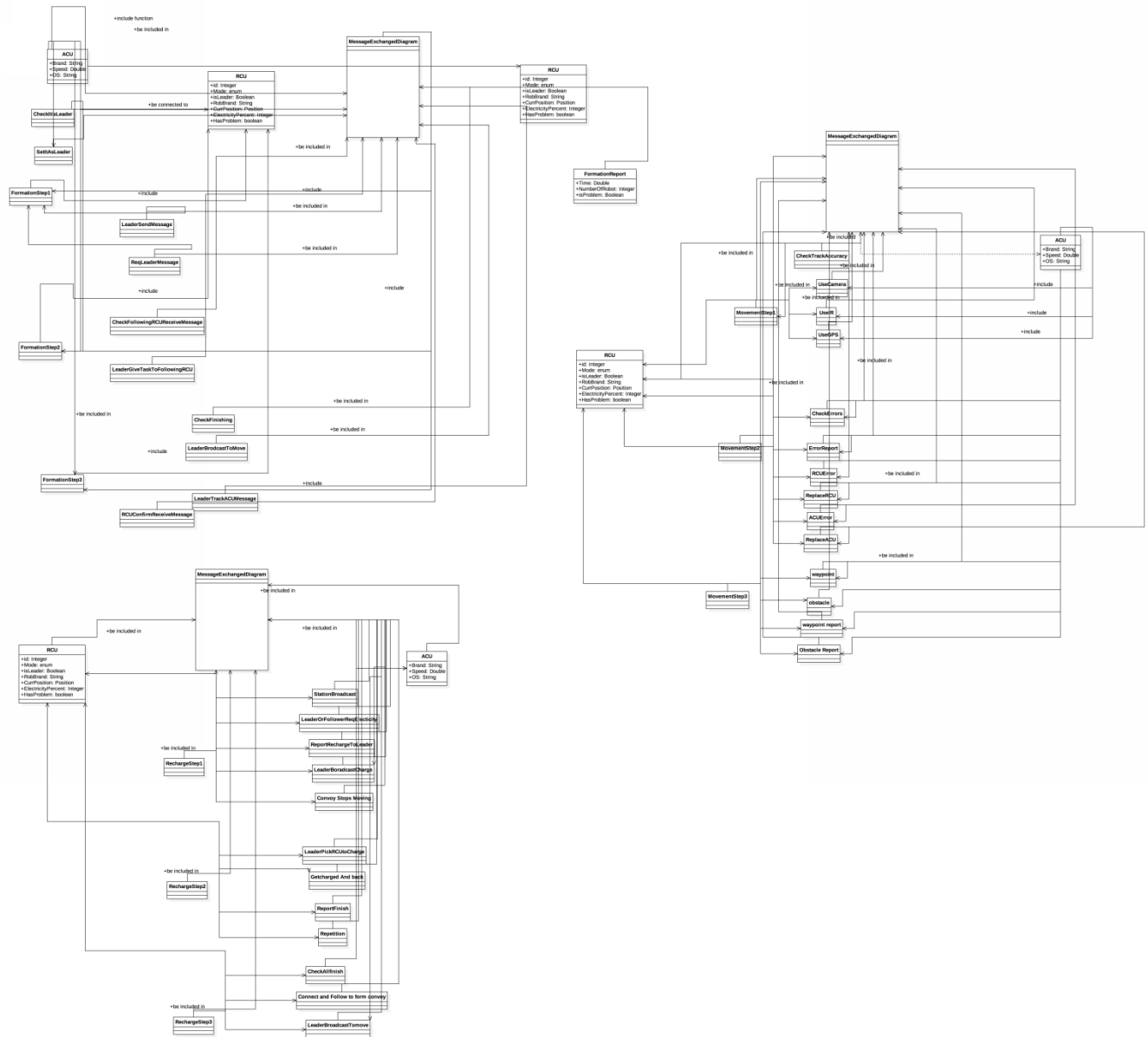
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7 Message Exchange Of System

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9.1 Terms And Concepts

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CS568 System customer will view RoboCon demonstrations that showcase the performance of CS568 Systems algorithms.

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CS568 System Management will oversee the planning and funding of the RoboCon development.

ID 95062

CS568 Systems algorithm developers will be the primary users of RoboCon.

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RoboCon Development Team
is responsible for building the RoboCon System

ID 95059

RoboCon consists of multiple robots called RoboCon Units
Each RCU consists of a [robotic hardware platform](#) and a [software controller](#).

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RoboCon includes one Administrative Control Unit.
The ACU consists of a standard [PC](#) and an administrator application.
Admin provides a typical Windows [GUI](#) for performing various RoboCon management functions.

ID 95356

The **RCU** hardware platform will be assembled from **OTS** components, which includes an **iRobot** Create mobile programmable robot, an **eBox** 3854 computer running Fedora Linux, a video camera, a **GPS** receiver, an **IR** receiver, an **IR** transmitter.

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contains all standard computer components, such as a processor, memory, flash storage, etc.

The eBox also includes an 802.11 wireless local area **LAN** adapter.

ID 95361

Has wheels and a motor that can turn and move the robot.

Also includes a front bumper sensor that detects when the robot has run into an obstacle.

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Each **RCU** is controlled by a Controller software component that runs on the **eBox** with the Linux **OS**.

The Controller provides the core logic.

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RCUs placed in a staging area assemble themselves into a convoy.

ID 95395

RCUs travel along a route in convoy formation.

ID 95396

one or more **RCUs** recharge their batteries while the rest of the convoy waits.

ID 95398

The **RCU** immediately in front of a **follower** is known as the follower's guide.

The RCU tracked and followed by a follower. A guide may be the convoy [leader](#) or a follower. All followers have exactly one guide.

ID 95401

The RCU immediately behind a given RCU in the convoy. An [RCU](#) is the [guide](#) of its tail.

ID 95402

An [RCU](#) that does not know the [waypoints](#) of the route; uses on-board sensors to follow another RCU immediately preceding it in the convoy

ID 95413

The [RCU](#) that is provided with the route [waypoints](#). The leader proceeds first in the convoy.

ID 95422

A set of spatial coordinates indicating a position that the convoy must pass through on its way to the destination of the route.

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9.2 Acronyms

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Global Positioning System

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graphical user interface

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infrared

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local area network

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operating system

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off-the-shelf

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personal computer

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