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Model design in context of TSM system architecture and CP

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Where innovation starts

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Goal and requirements

- Goal
  - Robot shall find its way out of the maze as fast as possible, in an autonomous and safe manner

- Requirements
  - Robot is able to find way out of the maze
  - Robot should avoid bumping into walls or doors

Functions

- Two categories
  - Actions
  - Skills
- Actions
  - Drive, turn, scan, wait
- Skills
  - Drive to location
  - Check for doors
  - Locate obstacles
  - Map the environment

Specifications

- Objectives that software should be able to accomplish

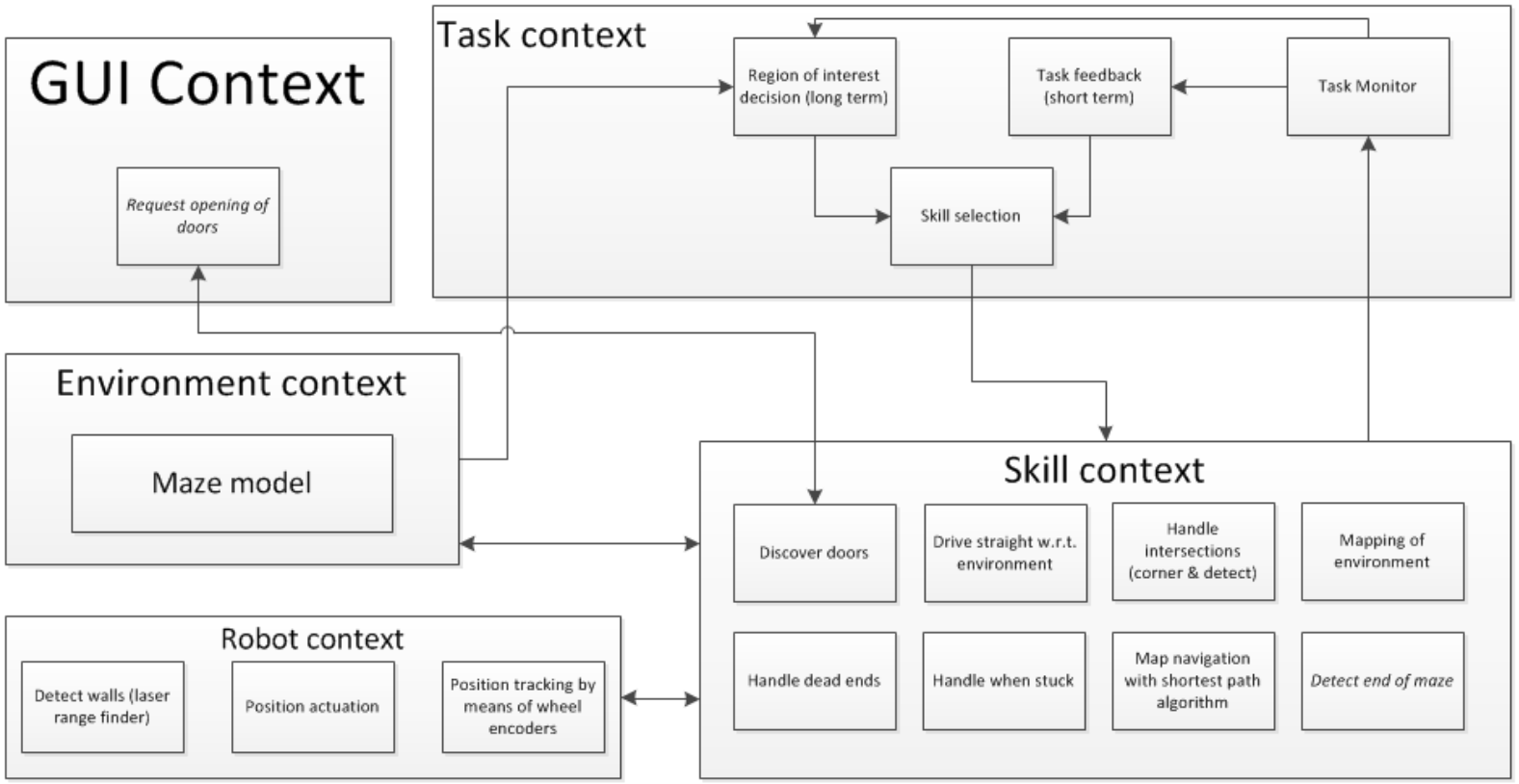
- 1st specification
  - Driving without bumping into walls or doors
  - Derived from the second requirement

- 2nd specification
  - Record the map and solve maze based on it

Specifications

- 3rd specification
  - Algorithm needs to deal with dynamic doors
  - At beginning, assuming no door at all
  - If no solution, considering case 1, 2, 3 and 4 in sequence

Behaviour model



Structural model

Interconnection of Behaviours and Activities.

Every Task, Skill, RHAL, World model is a separate CP

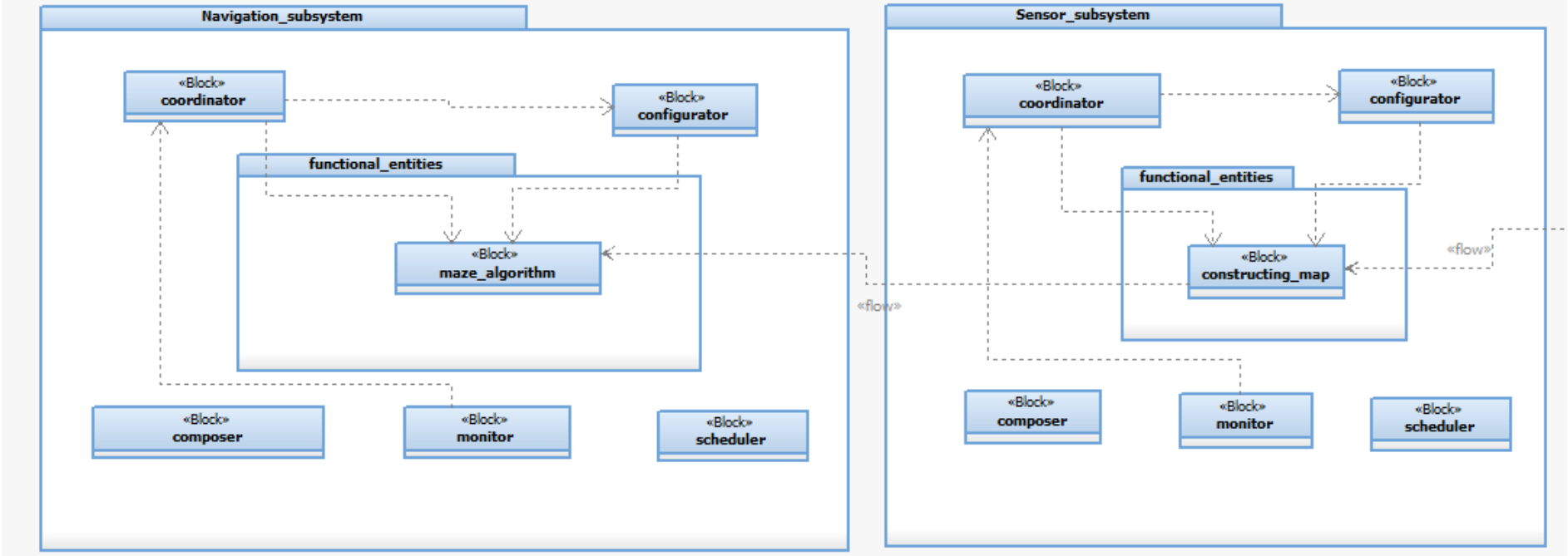
- Motion control subsystem (Decoupled 5Cs)
  - Has to stay stable in motion
- Mapping Maze subsystem
  - Has to map the maze using data presented by sensors
- Navigation subsystem
  - Has to compute the fastest safe trajectory through maze using mapping data
- Sensor subsystems
  - Gathering data from its sensors and communicating them
- Kill-switch subsystem
  - Manual input sequence that kills the robot in case of emergency
- Door detection subsystem
  - Has to show the outside world that is sees a door, using one of the actuators

Structural model

Interconnection of Behaviours and Activities.

CP model examples

- Navigation subsystem and Sensor subsystems including connection between them



Activity model

Executing the code

Serialized execution of Behaviour in an Activity.

- Using triggers to activate sequences of Behaviour in a certain Activity. If the trigger is triggered, multiple functions are called sequencially. In general they will include:
  - Communicate() → get latest relevant data
  - Coordinate() → respond to data
  - Configure() → possible need to reconfigure
  - Schedule() → realise behaviour
  - Coordinate() → execution could trigger new events
  - Communicate() → communicate new events
  - Log() →log all above

Problems