Save and Secure Robotics

Hints for the final specification

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Target

- Cleaning robot

- Freedom to chose field of application

- Considerable size, so that it might hurt people seriously in case of an accident oder failure
  - ◆ Actual size depending on application field

- No focus on the cleaning function itself but on the avoidance of accidents / failures

Proposed Structure

- Functional robot name
  - Group (Names)
- Short description application field
  - Environmental specifications, functional descriptions, risk analysis
- from this deducted
  - application requirements
  - functional requirements
  - appropriate risk reduction measures (technical & non-technical)
- design description
  - Modularisation
  - Hardware & software
- test specification
  - Hardware & software
  - From Modules to system
- development process
  - ☞ Documentation, (un)solved problems, ...
- (short) manual / instructions for users (and maintenance)

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Example Scanarios

- Cleaning robot in

  - ◆ Factory at night time / at day time

  - ◆ Public building (school, administration, ...)

  - ◆ Private building: common infrastructures in tenement house with many flats

  - ◆ Shopping mall at night time / at day time

  - ◆ Open place (market place, stadium, concert hall, ..)

- Risk assessment (risk graph & explanations)

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Examples for operation environment properties

- Floor properties
  - ☞ Materials (concrete, wood, rubber, carpet, mixed, friction values, roughness, ...)
  - ☞ Area (minimum, maximum widths/ heights, corners)
  - ☞ Plain ground, rugged ground, slopes
- Properties of (endangered) people
  - ◆ Special trainings, „normal", handicapped, children
- Properties of obstacles
  - ◆ Min./ max. widths/hights
  - ◆ Allowed touches / forces
  - ◆ Special obstacles (stairs, emergency exits,)

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Construction hints

- Controller
  - ◆ I/O (Sensors/actuators)
  - ◆ Initialisation, Energy supply, „Watch dog", ..
  - ◆ User Interface (Display, sounds, ...)
  - ◆ Redundancy?

- Sensors
  - ◆ What kind of obstacle they can detect
  - ◆ Sensor tests, redundancy, diversity
    - ☞ Tests at startup or during operation

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Construction hints

- Mechanics

  - ◆ Wheels, chains, motors ?

  - ◆ (virtual) accident protection means

  - ◆ Wiring and Plugs

    - ☞ mounting / maintenance / repair

    - ☞ Guidance vs. defects

  - ◆ *Mechanical loads / stress , wear out, maintenance, checks, failure rate, ..*

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Construction hints

- Software
  - ◆ Behavior description, models and other appropriate means
  - ◆ Flow chart,
  - ◆ Comments in code, ...
  - ◆ Simple configuration management (Software version, hardware version, wiring, ...)
  - ◆ Test procedures and test documentation

- Upload as Open Source Code
  - ◆ Tested modules only

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Final presentation / competition

- Jury decides, which group is next
- Groups come to the front, give a short verbal introduction of the robot and it's features
    - Presentation to be uploaded with the specification; max. 3 slides
- Groups show regular function of the robots
- Jury tests the robot

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