Situation Calculus
Assignment I
WS 2015/2016

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Organizational Issues

• Dates
  – 10.11.2016 8:45-11:00 (HS i12) lecture and first assignment
  – 17.11.2016 8:45-11:00 (HS i12) lecture and programming assignment
  – 23.11.2016 18:00-18:45 (HS i11) practice
  – 30.11.2016 18:00-18:45 (HS i11) practice and solution for first assignment
  – 28.11.2016 12:00 submission first assignment
  – 07.12.2016 23:59 submission programming assignment
Rescue Robots

https://www.youtube.com/watch?v=mL6EN8ZJgoE
(RoboCup Rescue)

https://www.youtube.com/watch?v=3saJYPzuV8
(RoboCup Junior Rescue)
Assignment

- model the domain of a simple rescue robot
- search for victims in a maze
- init: robot start at [1,1], no information about maze
- goal: find all victims and return to the origin
Rescue Robot Domain

- **entities:**
  - robot - is able to take actions
  - walls – block the way on a grid world
  - victims – placed on walls, represent by 2 signs of life (color, heat)
  - false victims – represented by only one sign of life

- **actions:**
  - only the agent is able to execute actions as long it is alive
  - turn left - changes the heading 90° left
  - turn right - changes the heading 90° right
  - move forward - moves one square in the direction of the actual heading, unless the agent faces a wall
  - report – reports a victim, +30 points if facing a real victim, -15 points if not
  - leave – leaves the maze, only possible at [1,1], +30 points
Rescue Robot Domain

- **knowledge and percepts:**
  - `loc(x,y)` – robot is at square \([x,y]\)
  - `heading(x)` – robot looks in the direction \(x\) (east, south, west, north)
  - `feel_heat()` – the robot feels heat in front
  - `see_color()` – the robot sees color in front
  - `sense_wall()` – the robot senses a wall in front

- position of victims (real or false) and walls is **not known** by the robot!
Task 1 – Model the Rescue Robot Domain

• model the domain in the Situation Calculus
• all definitions have to be expressed in proper First Order Logic
• define predicates, fluents and actions if necessary
• define for all actions proper preconditions
• define for all fluents successor state axioms
• define the initial database $D_{S_0}$ for the situation shown on slide 4

• hints
  • assume a logical theory for natural numbers and addition/subtraction/comparison
Task 2 - Regression

- use your basis action theory to prove the following properties by using regression:

\[
\text{Poss}(\text{forward}(), \text{do}(\text{forward}(), S_0))
\]

\[
\text{heading}(\text{east}, \text{do}(\text{left}(), \text{do}(\text{forward}(), S_0))))
\]
Submission

- on paper with \textit{student’s name} and id
- multiple sheets have to be \textit{stapled}
- solve the assignment \textit{individually} – no group work
- submission box in front of IST office
- deadline: 28.11.2016, \textbf{12:00} – firm!

- \textit{discussion} of the solution during 2. practice hour
- selected students will be asked to explain their solution on the blackboard
- selected students not \textit{present} or not able to explain will get \textit{no points}
## Credits

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<th>Points</th>
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Questions ?