

Tutorial for

Introduction to Computational Intelligence in Winter 2009/10

Günter Rudolph, Nicola Beume

<http://ls11-www.cs.tu-dortmund.de/people/rudolph/teaching/lectures/CI/WS2009-10/lecture.jsp>

Sheet 8, Block B

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Exercise 8.1: Fuzzy Controller for a vehicle (10 Points)

Implement a Mamdani controller for a car. The car shall drive speedily towards a wall and come to a standstill as close as possible to the wall without crashing into it.

The car gives the measured values of its current speed and its current distance to the wall. The actuating variable is the thrust that accelerates the car forwards or backwards. The driving of the car shall be simulated in discrete time steps.

- a) Model the membership functions for the linguistic variables *speed*, *distance to wall*, and *thrust*.
- b) Setup an appropriate fuzzy rule system for a Mamdani controller.
- c) Implement the control loop for the Mamdani controller using the center of gravity method for defuzzification.
- d) Give a short documentation of your source code.
- e) Start the car in big distance to the wall with low, middle and high initial speed. Report for each initial speed a successful run of the car. Do this by plotting distance, speed and thrust over time.

Hand in the solutions to the subtasks as usual as an offprint or a pdf file. Send your source code by e-mail to Nicola including instructions how to compile and execute your program.