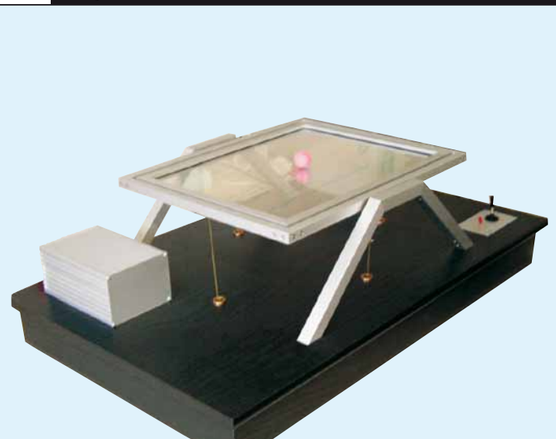
RT 121 – RT 124 TEACHING SYSTEMS FOR FUZZY METHODS IN AUTOMATION

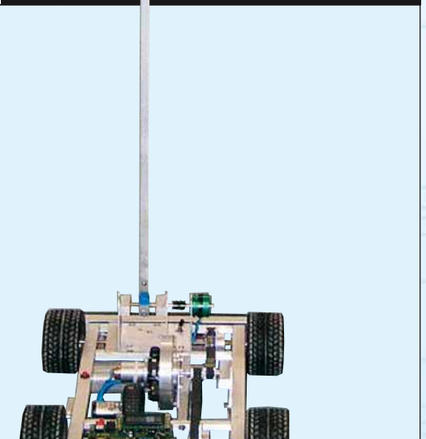
RT 121 *Fuzzy Control: Ball-on-Beam*

RT 122 *Fuzzy Control: Inverted Pendulum*

RT 123 *Fuzzy Control: Ball-on-Plate*



RT 124 *Fuzzy Control: Carrier Vehicle with Inverted Pendulum*



The illustrations show the models developed by the Harz University of Applied Studies and Research

INTRODUCTION TO FAST, DIGITAL REAL-TIME CONTROL BASED ON FUZZY METHODS

Fuzzy methods and microcontrollers have gained greatly in importance in automation over recent years. This has also increased the need for specific training. With its RT 121 to RT 124 systems, GUNT offers clearly laid-out and well-conceived teaching systems specially-developed for this future-oriented field.

Fuzzy methods are particularly suitable for processes which are difficult to describe mathematically, or which can only be described inadequately in such a way. These include, in particular, multi-variable systems, and non-linear or time-variant systems. Fuzzy methods are based on fuzzy logic. In fuzzy logic there is not only **right** or **wrong**, as in conventional logic, but there are also less sharply defined concepts such as **almost right** or a **little wrong**.

This special characteristic of fuzzy methods is similar to the workings of the human mind. Consequently, fuzzy methods are particularly well suited to the automation of processes in which manual control is to be replaced by automatic control.

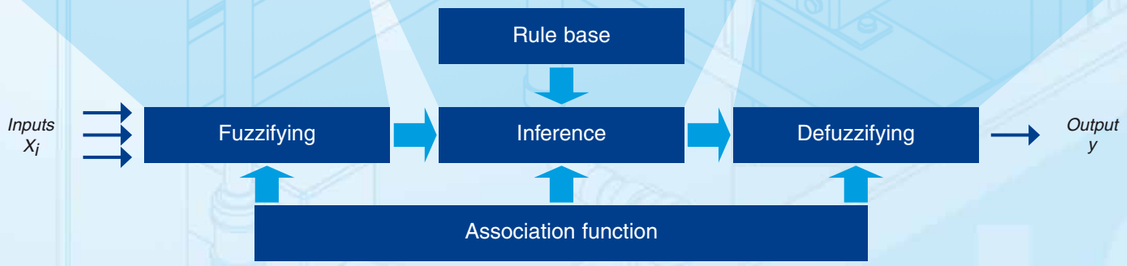
The advantage lies in simple process descriptions based on linguistically defined terms and rules. No complicated mathematical description is necessary.

The information processing in a fuzzy-based controller operates in three stages:

The input signals (physical variables) must first be converted into linguistic terms (fuzzifying)

The input signals are linked according to the rules of a rule base (inference)

The results of this linking must then be translated back into a physical output variable (defuzzifying)



Structure of a fuzzy-based controller

Four different training systems of increasing complexity

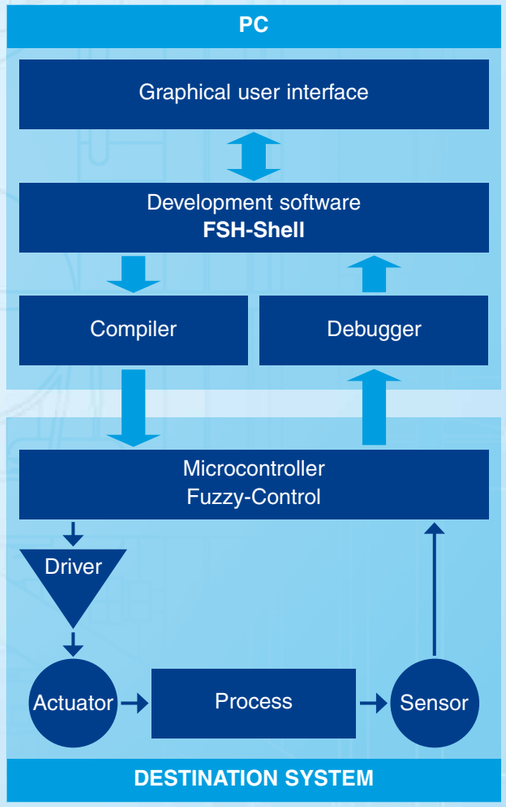
The training systems offer a clearly structured introduction to the design process for microcontroller-based process control systems which are of special relevance to industrial applications. As well as the application of fuzzy methods, they also permit other topics in the field of microcontroller systems to be covered.

The training systems have been produced in close co-operation with **Professor Dr. Kramer from the Department of Automation and Information Technology at the Harz University of Applied Studies and Research**, where the teaching concept and the **FSH-Shell** development software were also developed.

The training content and experimentation instructions contained in the training systems are graded by difficulty according to educational/didactic criteria, and have been successfully deployed in practical teaching at the University.

- Easy induction based on user-friendly development software **FSH-Shell** with graphical user interface
- Rapid implementation of the solution into the mechatronic system based on online compiling and downloading to the destination controller
- Test support by Fuzzy Debugger to visualise selected instrumentation and control variables
- Code- and time-optimised software development based on the special **FSH-Shell** compilation concept

Each training system comprises a mechatronics benchtop model (destination system) with the associated hardware (microcontroller, amplifier, sensors, actuators), the FSH-Shell development software and a detailed didactic guide to the experiments.



Structure of the training system