



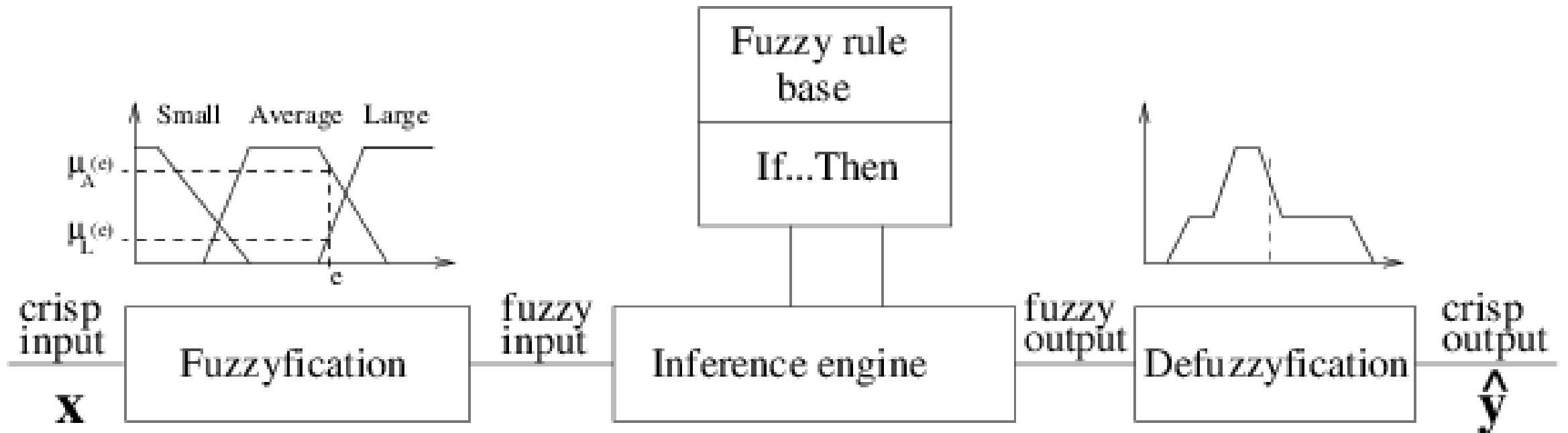
Internetul lucrurilor

Control Fuzzy

Sistem de control Fuzzy

Un sistem de control fuzzy este bazat pe logica Fuzzy – logica nuanțată, vagă.

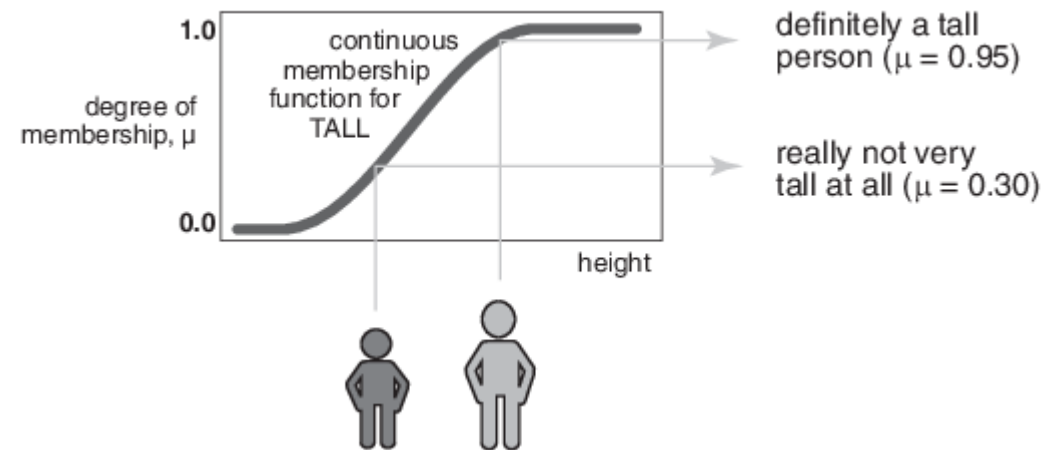
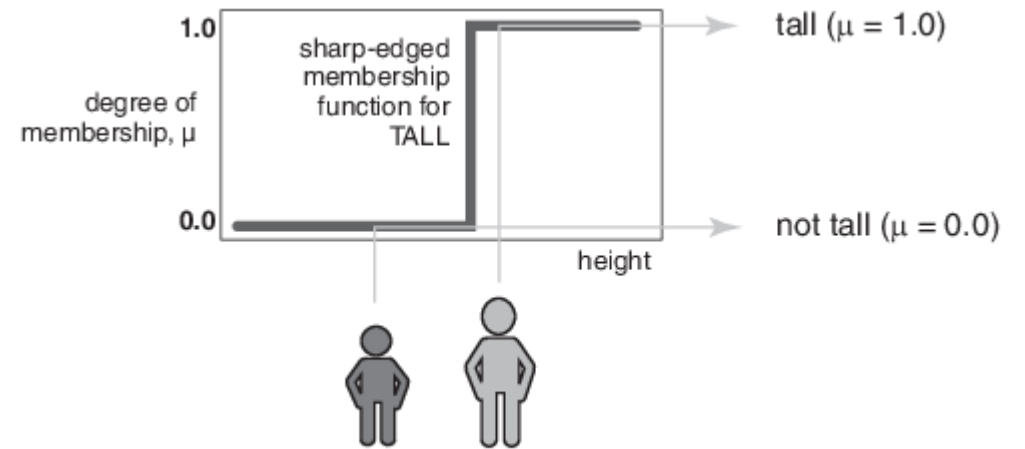
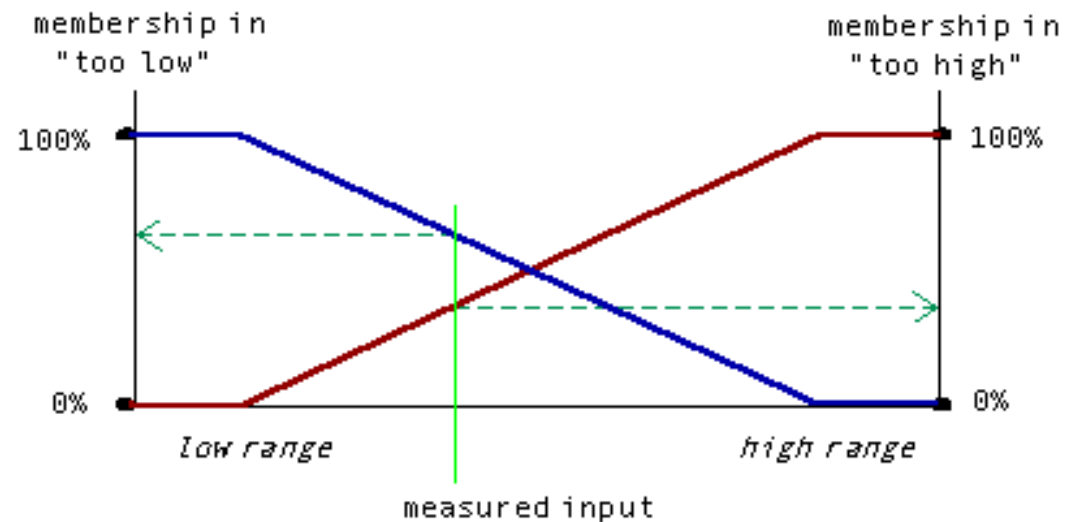
Logica Fuzzy – un sistem matematic care analizează valorile de intrare analogica in termeni de variabile logice care iau **valori continue intre 0 și 1**, spre deosebire de logica clasica sau digitala.



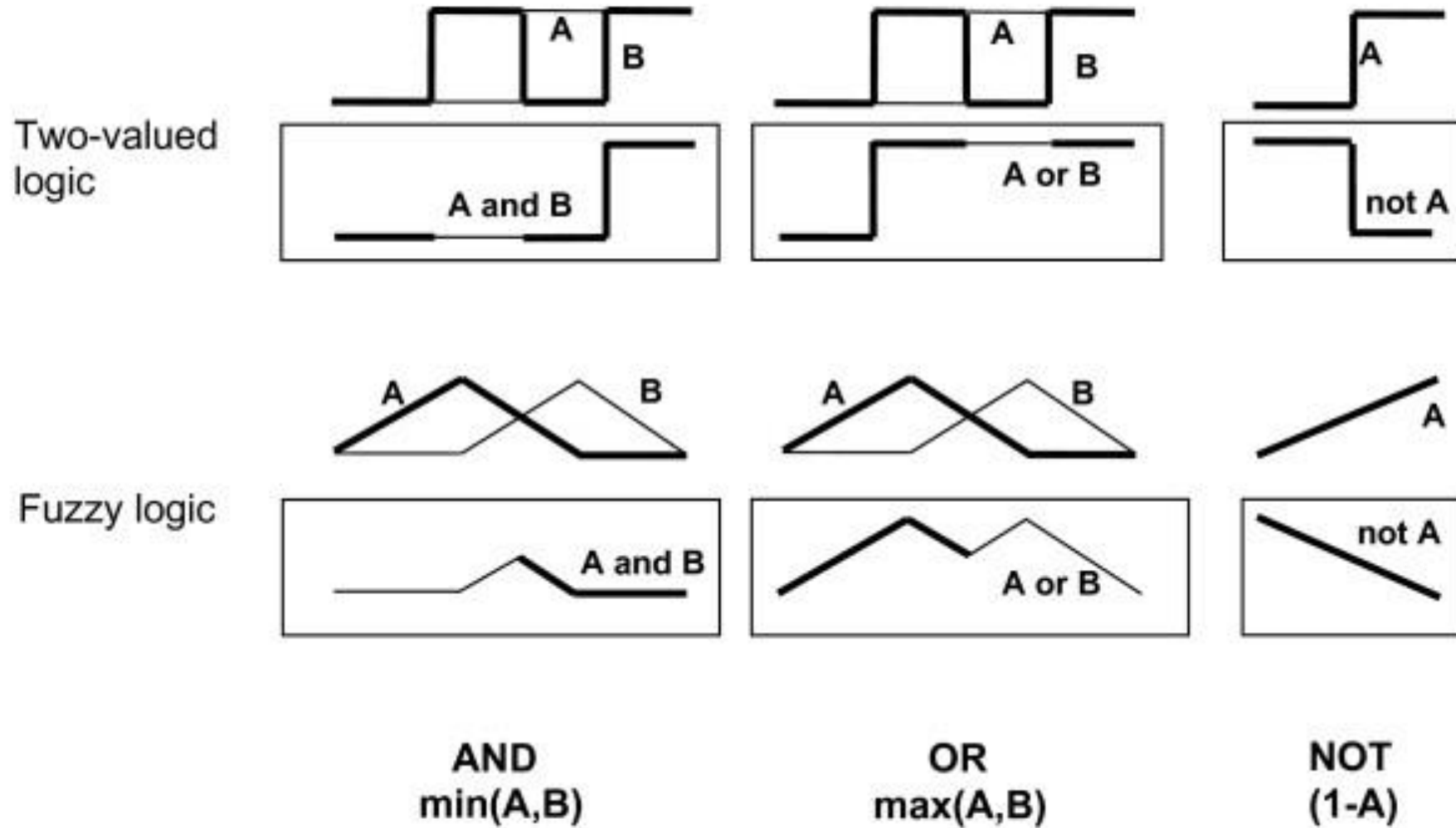
Mărimi Fuzzy

Fuzzyficare

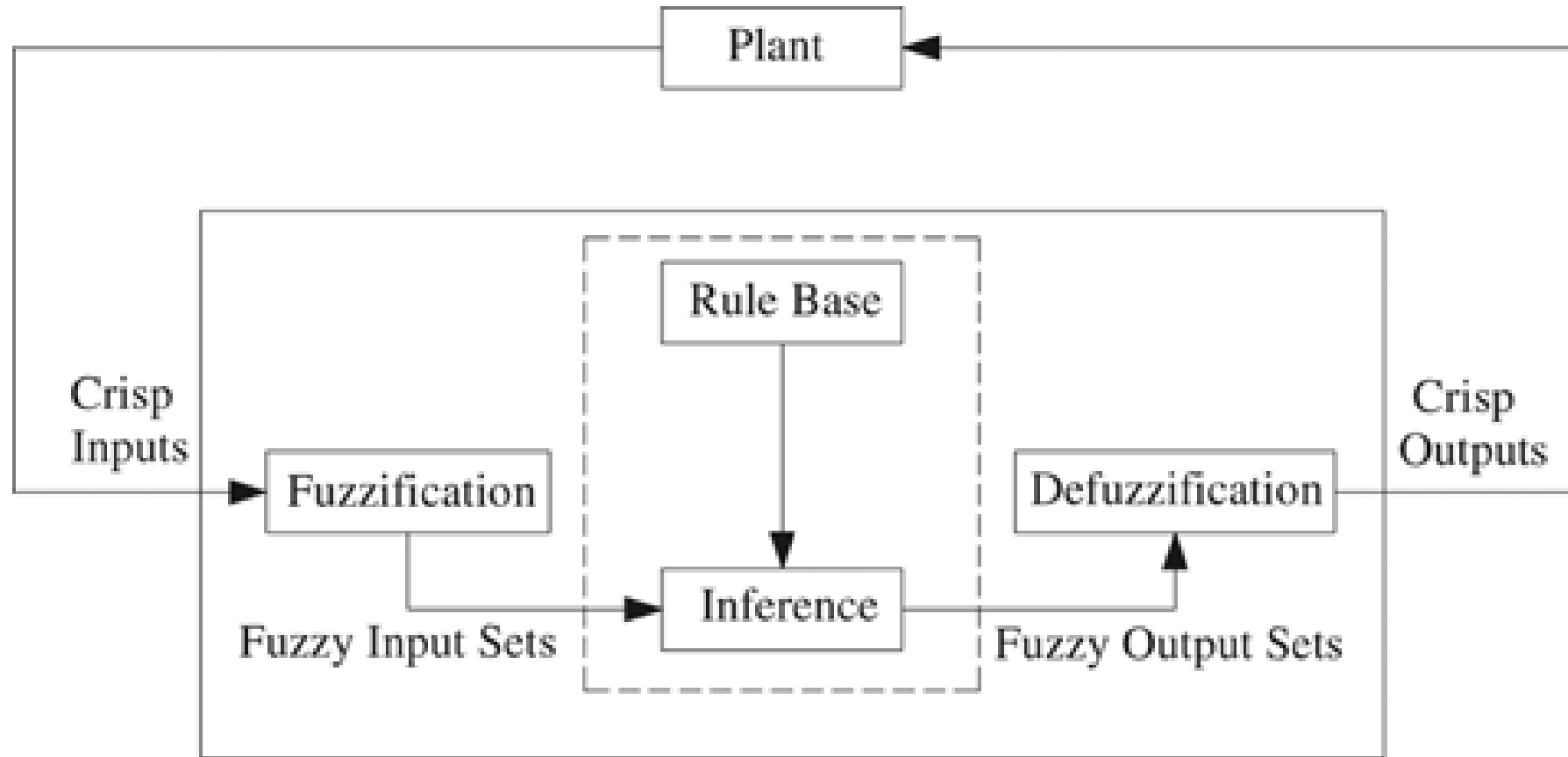
- Funcția de apartenență definește ponderea unei afirmații în domeniul de definiție a unui parametru
- Univers de discurs – totalitatea funcțiilor de apartenență / afirmații relevante aceluiași parametru
- Fuzzyficare – procesul de transformare a unei valori crisp într-un set fuzzy



Logica Fuzzy



Sistem de Control Fuzzy



Baza de cunoștințe

Reguli fuzzy

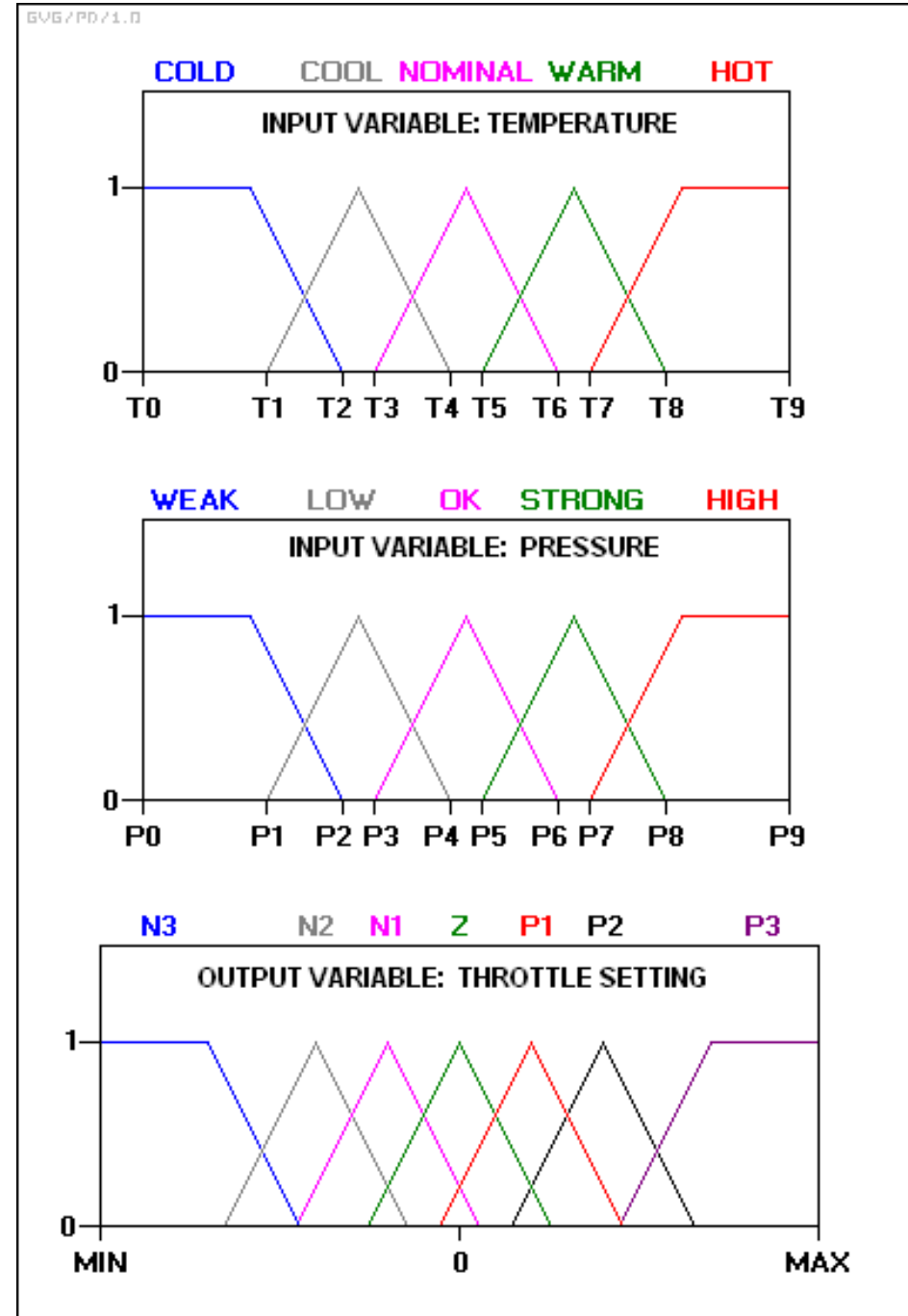
rule 1: IF temperature IS cool AND pressure IS weak,
THEN throttle is P3.

rule 2: IF temperature IS cool AND pressure IS low,
THEN throttle is P2.

rule 3: IF temperature IS cool AND pressure IS ok,
THEN throttle is Z.

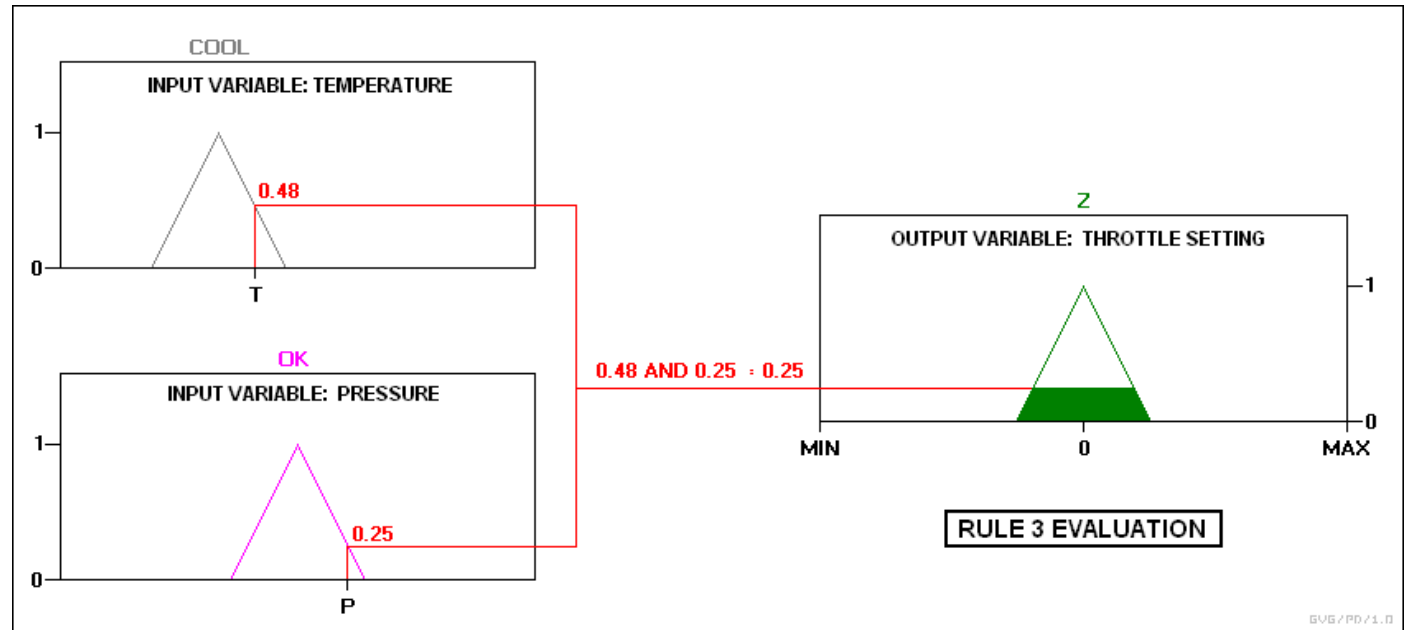
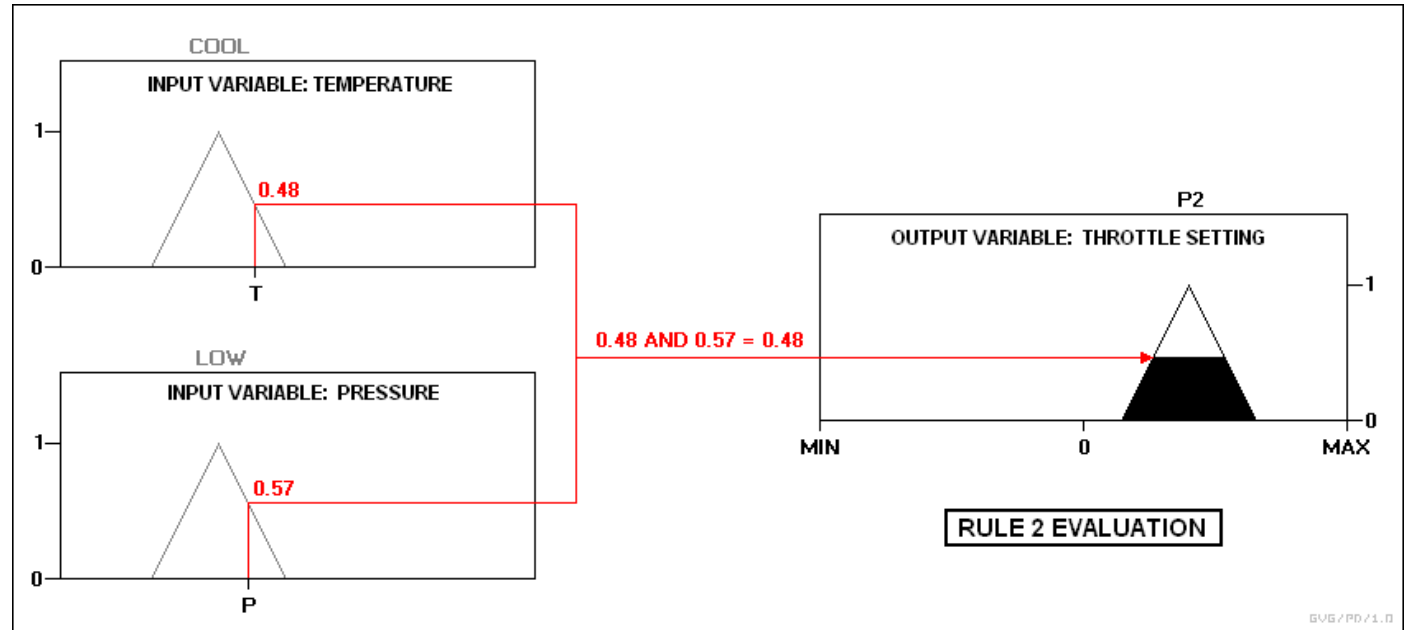
rule 4: IF temperature IS cool AND pressure IS strong,
THEN throttle is N2.

https://en.wikipedia.org/wiki/Fuzzy_control_system

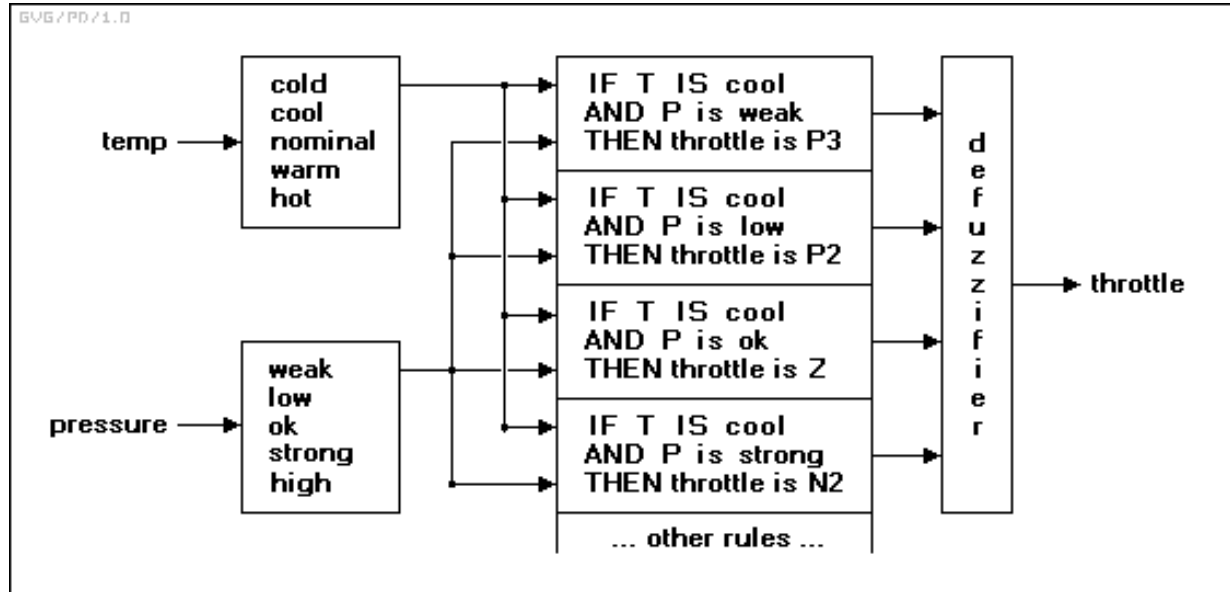


Evaluare Reguli

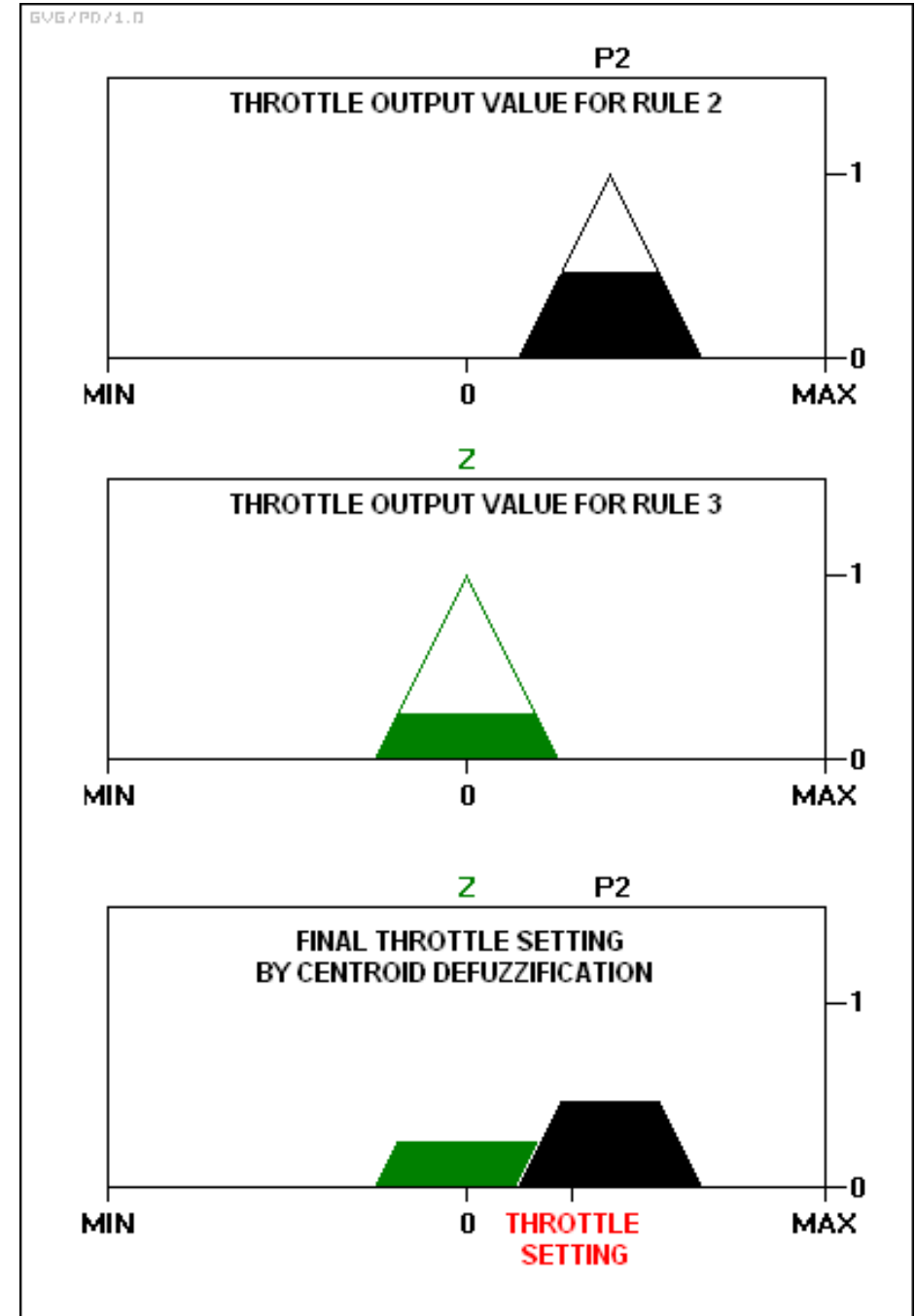
<http://www.fags.org/docs/fuzzy/>



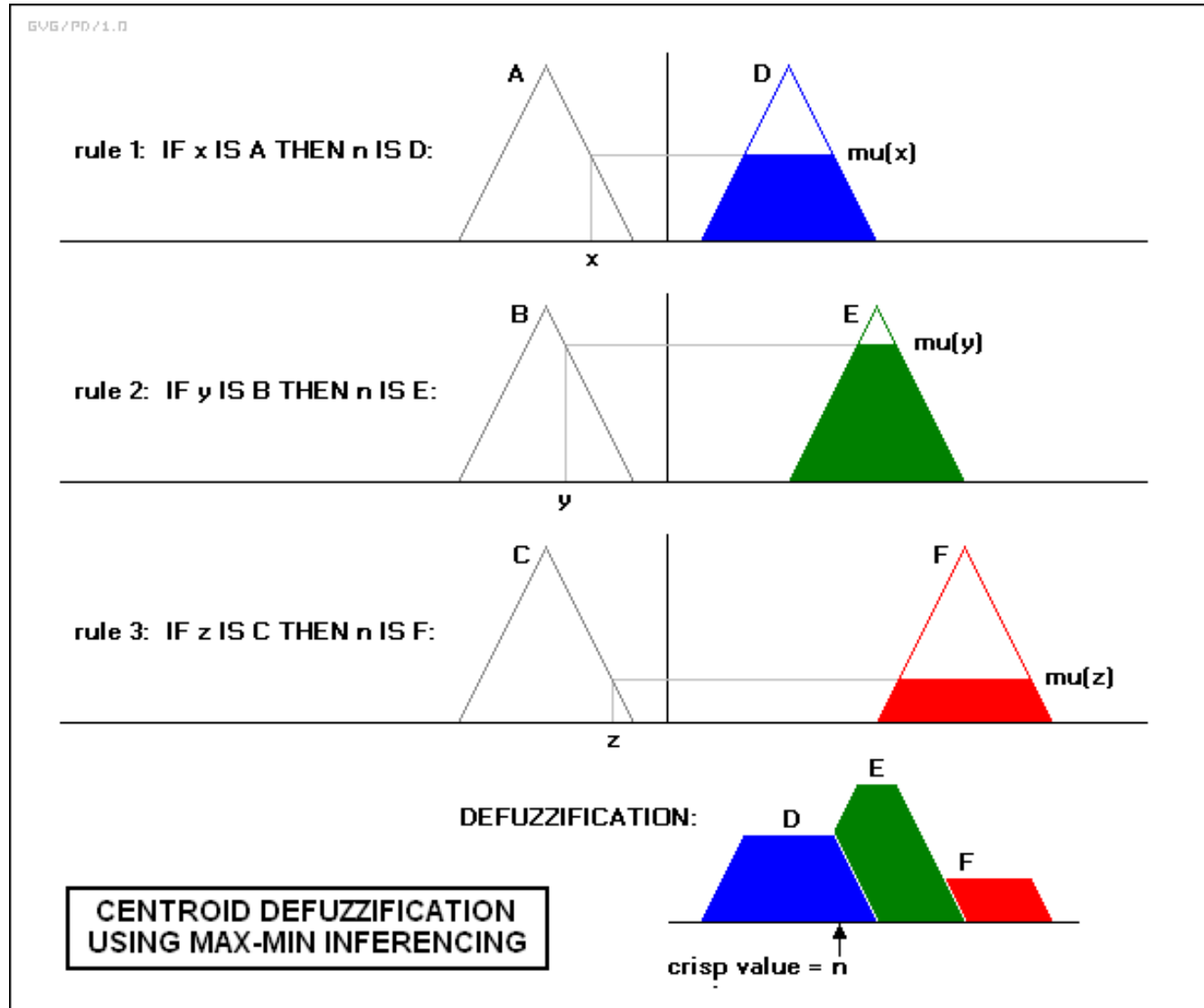
Defuzzyficare



<http://www.faqs.org/docs/fuzzy/>



Fuzzy control - Exemplan



Definire Reguli Fuzzy

(A) Voltage Error

	NL	NM	NS	ZR	PS	PM	PL
Speed Error							
PM	NL	NL	NM	ZR	PM	PL	PL
PS	NL	NM	NS	ZR	PS	PM	PL
ZR	NL	NM	NS	ZR	PS	PM	PL
NS	NL	NM	NS	ZR	PS	PM	PL
NM	NM	NS	NS	ZR	PS	PS	PM

Entry: Proportional Actuation

(B) Voltage Error

	NL	NM	NS	ZR	PS	PM	PL
Speed Error							
PM	NL	NL	NL	ZR	PS	PS	PM
PS	NL	NL	NL	ZR	PS	PS	PM
ZR	NL	NL	NL	ZR	PS	PS	PM
NS	NL	NL	NL	ZR	PS	PS	PM
NM	NL	NL	NL	ZR	PS	PS	PM

Entry: Integral Actuation

(A) Error

	NL	NM	NS	ZR	PS	PM	PL
Derived Error							
PL	ZR	PS	PM	PL	PL	PL	PL
PM	NS	ZR	PS	PM	PL	PL	PL
PS	NM	NS	ZR	PS	PM	PL	PL
ZR	NL	NM	NS	ZR	PS	PM	PL
NS	NL	NL	NM	NS	ZR	PS	PM
NM	NL	NL	NL	NM	NS	ZR	PS
NL	NL	NL	NL	NL	NM	NS	ZR

Entry: Actuation

(B) Error

	NL	NM	NS	ZR	PS	PM	PL
Derived Error							
PL	NS	NS	NS	PS	PL	PL	PL
PM	NS	NS	NS	PS	PL	PL	PL
PS	NM	NS	NS	PS	PM	PL	PL
ZR	NL	NM	NS	ZR	PS	PM	PL
NS	NL	NL	NM	NS	PS	PS	PM
NM	NL	NL	NL	NS	PS	PS	PS
NL	NL	NL	NL	NS	PS	PS	PS

Entry: Actuation

Aplicații logică Fuzzy

a. Automotive Systems

- Automatic Gearboxes
- Four-Wheel Steering
- Vehicle environment control

b. Consumer Electronic Goods

- Hi-Fi Systems
- Photocopiers
- Still and Video Cameras
- Television

c. Domestic Goods

- Microwave Ovens
- Refrigerators
- Toasters
- Vacuum Cleaners
- Washing Machines

d. Environment Control

- Air Conditioners/Dryers/Heaters
- Humidifiers

Exemplu Aplicație de Control Fuzzy



[https://www.researchgate.net/publication/313288559 Intelligent Control Based Fuzzy Logic for Climate Control of Livestock Buildings](https://www.researchgate.net/publication/313288559_Intelligent_Control_Based_Fuzzy_Logic_for_Climate_Control_of_Livestock_Buildings)