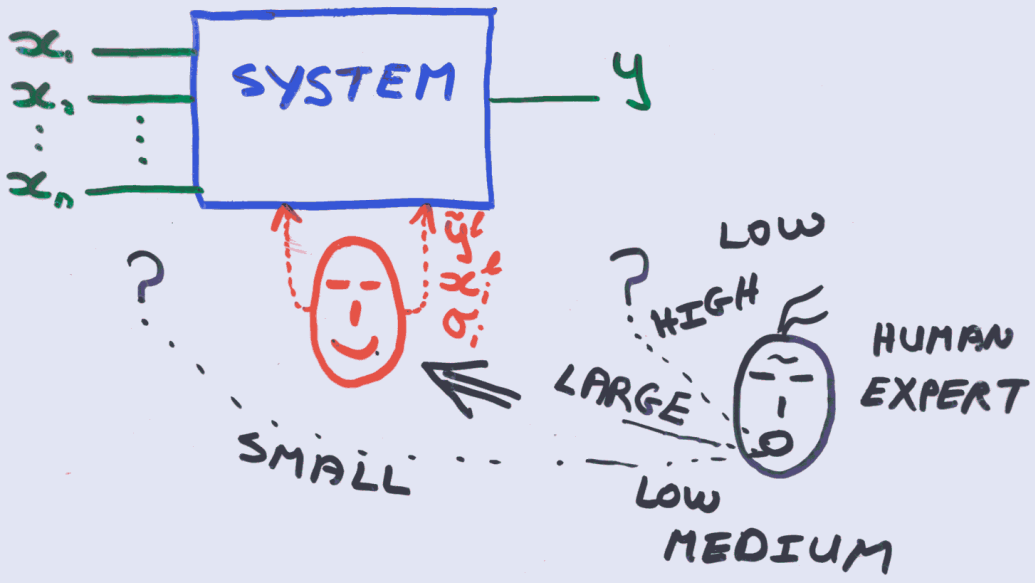
FUZZY SYTEMS



PRACTICAL SYSTEM:

IMPORTANT INFORMATION COMES FROM HUMAN EXPERTS

NOT PRECISE: SMALL, LARGE

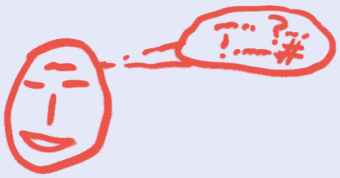
→ LINGUISTIC INFO

VOORBEELD: VASMEER VAN BOOT

EIG VOORBEELDE ?

TWO WORLDS

PHYSICAL
[NUMERICAL INFO]



HUMAN WORLD
[EXPERT INFO]

MAN
MACHINE
INTERACTION
[MIXTURE]

COMMON FRAMEWORK NEEDED TO
ANALYSE AND REPRESENT
A MIXED WORLD

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ADAPTIVE FUZZY SYSTEMS

1965 Dr Zadeh - Seminal paper on fuzzy sets.

1965-1975 Theoretical developments in USA, EUROPE, JAPAN.

MID 1970→ JAPAN PRIMARY FORCE

POPULARITY - JAPAN

Numerous applications in the East.

- Videography
- Air conditioners
- Washing Machines
- Sendai 16 station subway system.

WORD: FUZZY

English meaning: Imprecision / Disorganisation.

Western world: Right/Wrong, Yes/No world.

Japanese meaning: Not negative connotation

Eastern world: Grey areas exist

ADAPTIVE FUZZY SYSTEM

FUZZY SYSTEM EQUIPPED WITH A TRAINING ALGORITHM

FUZZY SYSTEM : COLLECTION OF IF-THEN RULES

TRAINING : ADJUST FUZZY SYSTEM PARAMETERS TO MATCH INPUT OUTPUT PAIRS

CONCEPT : AFS COMBINE NUMERICAL & LINGUISTIC INFO

LINGUISTIC INFO : IF THEN RULES

NUMERICAL INFO : TRAINING FROM I/O PAIRS

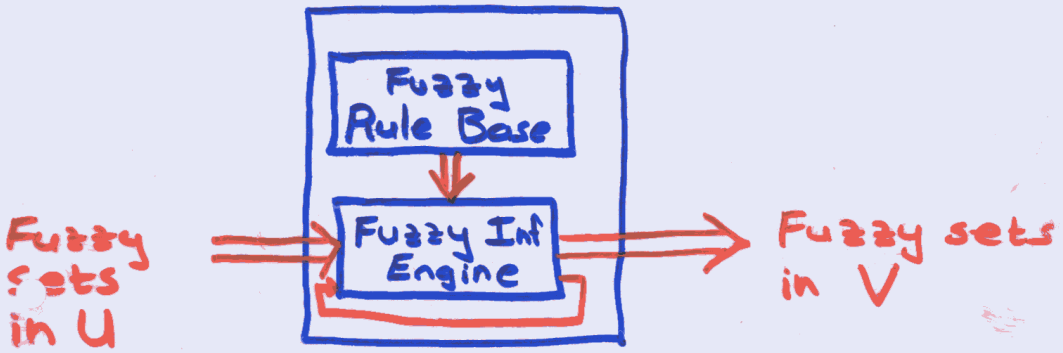
TYPICAL PROCESSES :

1. LING INFO → INITIAL FUZZY SYS → ADJUST PARAMETERS (I/O PAIRS)
2. LING INFO → FUZZY SYS 1.
   NUMERICAL INFO → FUZZY SYS 2.
   → AVERAGE SYS 1 & 2

CLASSIFICATION OF FUZZY LOGIC SYSTEMS

1. PURE FLS
2. TAKAGI & SUGENO'S FLS
3. FLS with FUZZIFIER & DEFUZZIFIER

1. PURE FLS



Fuzzy Rule Base:

$R^{(l)}$: IF x_1 is $F_1^{(l)}$ and ... x_n is $F_n^{(l)}$ THEN y is $G^{(l)}$

Fuzzy Inf Engine:
Mapping from fuzzy sets in the input universe of discourse $U \subset R^n$ to fuzzy sets in the output universe of discourse $V \subset R$ based on fuzzy logic principles.