AI-9

Fuzzy Logic Systems (FLS) produce acceptable but definite output in response to incomplete, ambiguous, distorted, or inaccurate (fuzzy) input.

## What is Fuzzy Logic?

Fuzzy Logic (FL) is a method of reasoning that resembles human reasoning. The approach of FL imitates the way of decision making in humans that involves all intermediate possibilities between digital values YES and NO.

The conventional logic block that a computer can understand takes precise input and produces a definite output as TRUE or FALSE, which is equivalent to human’s YES or NO.

The inventor of fuzzy logic, Lotfi Zadeh, observed that unlike computers, the human decision making includes a range of possibilities between YES and NO, such as −

|  |
| --- |
| CERTAINLY YES |
| POSSIBLY YES |
| CANNOT SAY |
| POSSIBLY NO |
| CERTAINLY NO |

The fuzzy logic works on the levels of possibilities of input to achieve the definite output.

### Implementation

* It can be implemented in systems with various sizes and capabilities ranging from small micro-controllers to large, networked, workstation-based control systems.
* It can be implemented in hardware, software, or a combination of both.

## Why Fuzzy Logic?

Fuzzy logic is useful for commercial and practical purposes.

* It can control machines and consumer products.
* It may not give accurate reasoning, but acceptable reasoning.
* Fuzzy logic helps to deal with the uncertainty in engineering.

## Fuzzy Logic Systems Architecture

It has four main parts as shown −

* Fuzzification Module − It transforms the system inputs, which are crisp numbers, into fuzzy sets. It splits the input signal into five steps such as −

|  |  |
| --- | --- |
| LP | x is Large Positive |
| MP | x is Medium Positive |
| S | x is Small |
| MN | x is Medium Negative |
| LN | x is Large Negative |

* Knowledge Base − It stores IF-THEN rules provided by experts.
* Inference Engine − It simulates the human reasoning process by making fuzzy inference on the inputs and IF-THEN rules.
* Defuzzification Module − It transforms the fuzzy set obtained by the inference engine into a crisp value.

