

Intelligent Control

Fuzzy Logic (3a)

by

Dr. Nor Maniha Abdul Ghani
(Credit to D.Pebrianti)

FKEE

normaniha@ump.edu.my



Introduction to Artificial
Intelligent by N.M.A Ghani

Chapter Description

At the end of this topic , student should be able to:-

- Understand basic concept of fuzzy sets which is the basis of fuzzy logic system.



Contents

3.1 Overview of Fuzzy Concepts and Fuzzy Logic Systems

3.2 Definition of Fuzzy Sets

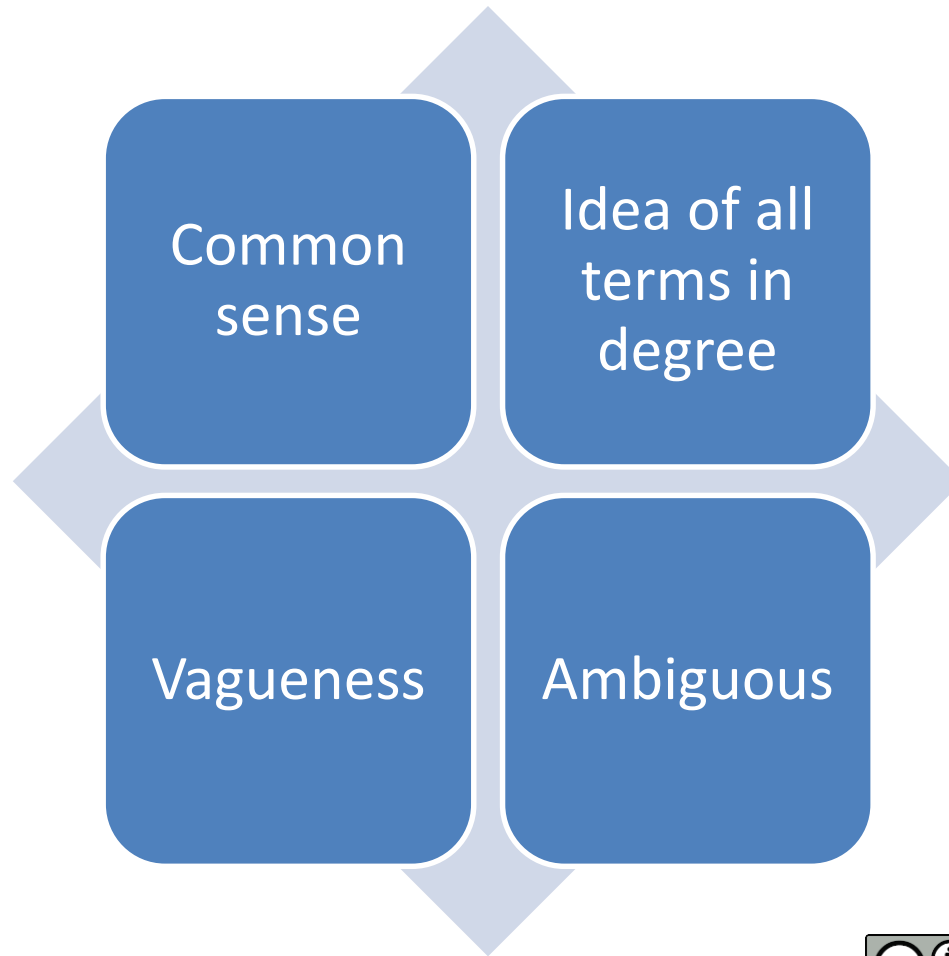


Overview of Fuzzy Concepts and Fuzzy Logic Systems

3.1



Introduction



Knowledge represented
in degree membership.

Fuzzy
Logic

Language term.

No crisp value.



Which one comes first?

FUZZY

LOGIC

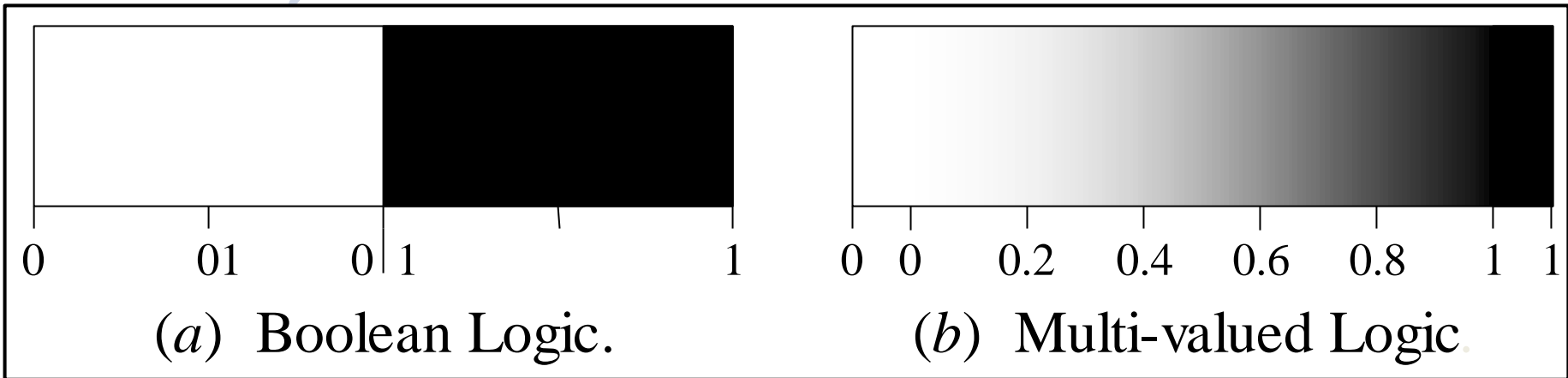
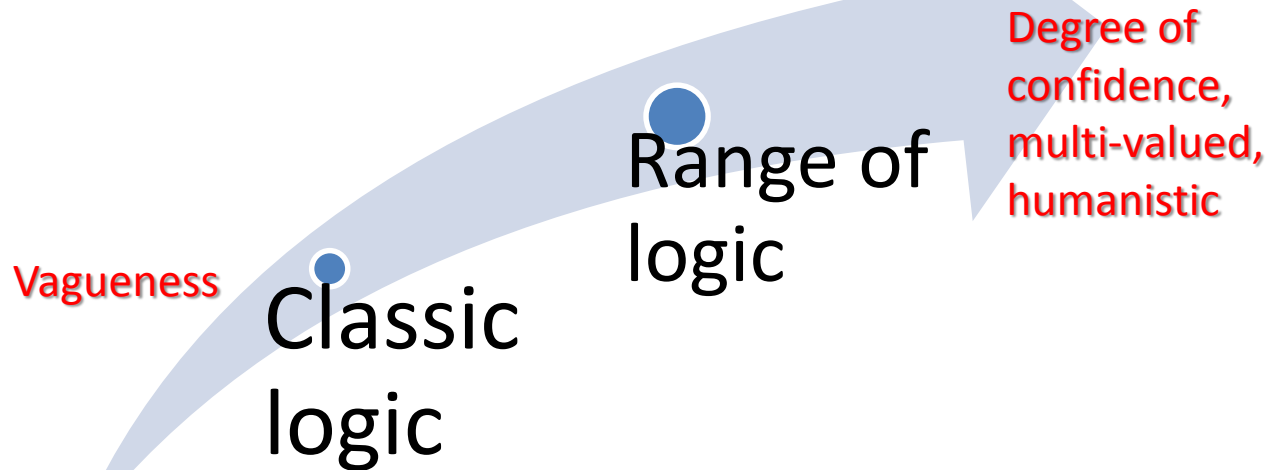
Bicycle tyre pressure :
Expert knows how to measure and human may understand on when to re-pump the pressure. But how about computer interpretation?

Existence of
**Degree or
Level**

IC supply voltage :
Expert knows a considerable average of voltage stability and range to be supplied, but can system or software define properly as we expect?



System Paradigm

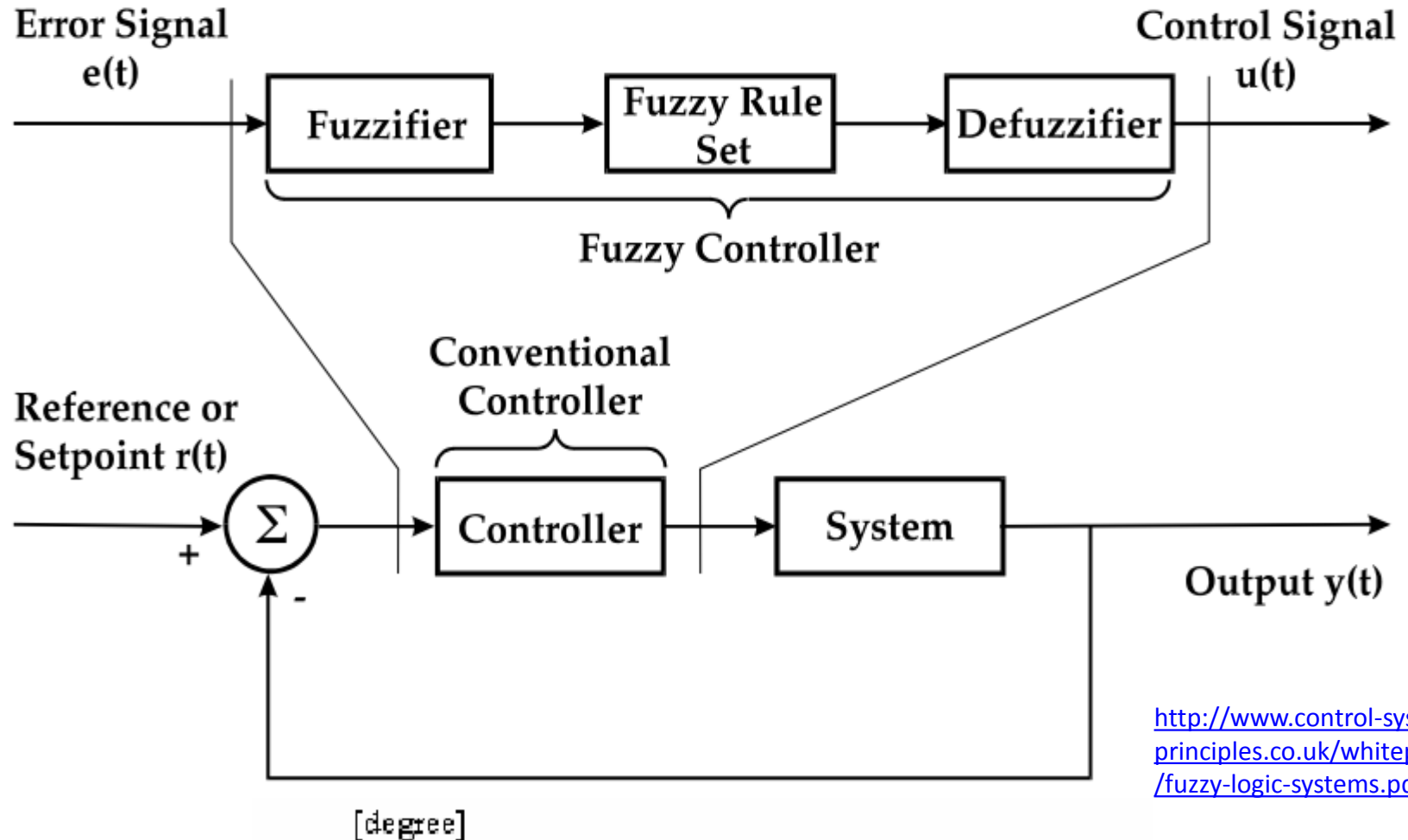


<http://slideplayer.com>



Introduction to Artificial
Intelligent by N.M.A Ghani

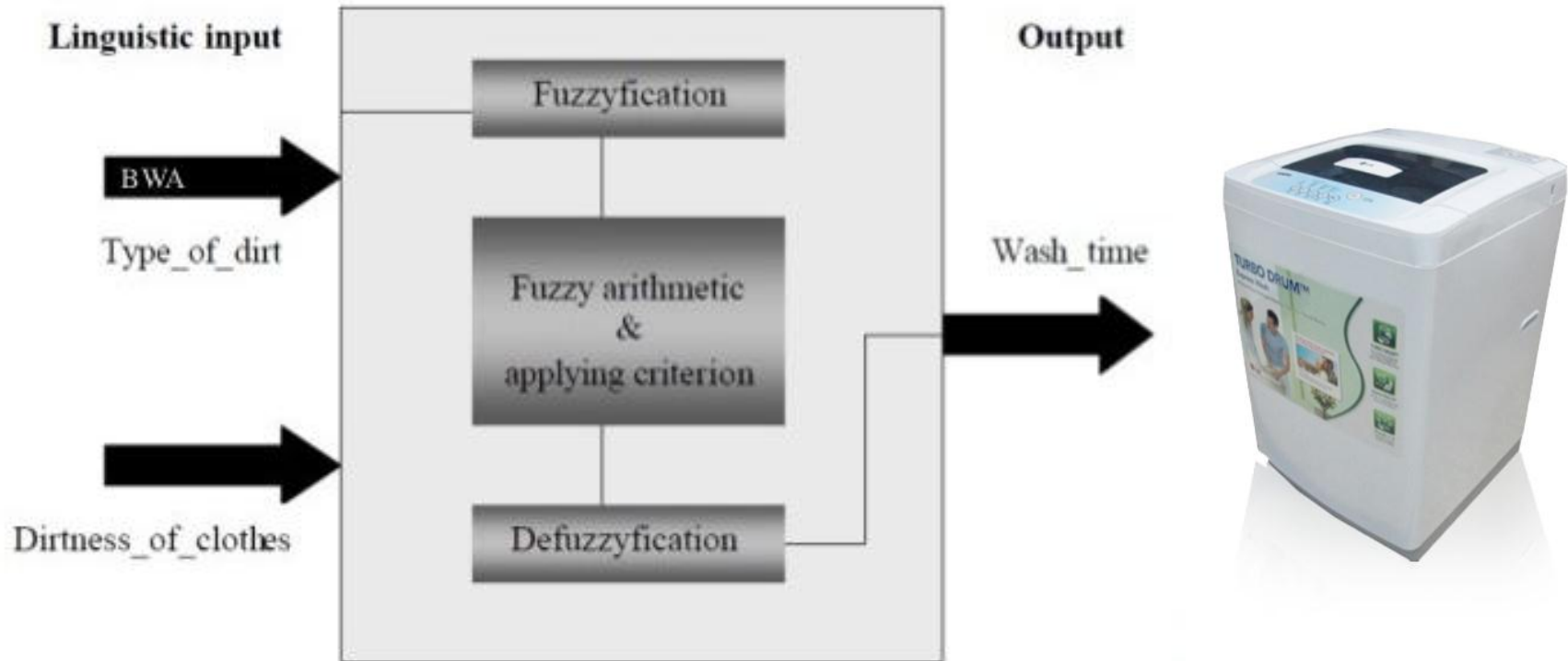
Fuzzy Logic Block Diagram



<http://www.control-systems-principles.co.uk/whitepapers/fuzzy-logic-systems.pdf>

Example : Fuzzy Logic Washing Machine

Fuzzy controller



<http://blog.onsitego.com>



Introduction to Artificial
Intelligent by N.M.A Ghani

Fuzzy Logic Rice Cooker



MICOM Fuzzy Logic Rice Cooker NS-LAQ05



- ✓ Capacity : 0.54L
- ✓ Keep Warm Function
- ✓ Detachable Inner Lid

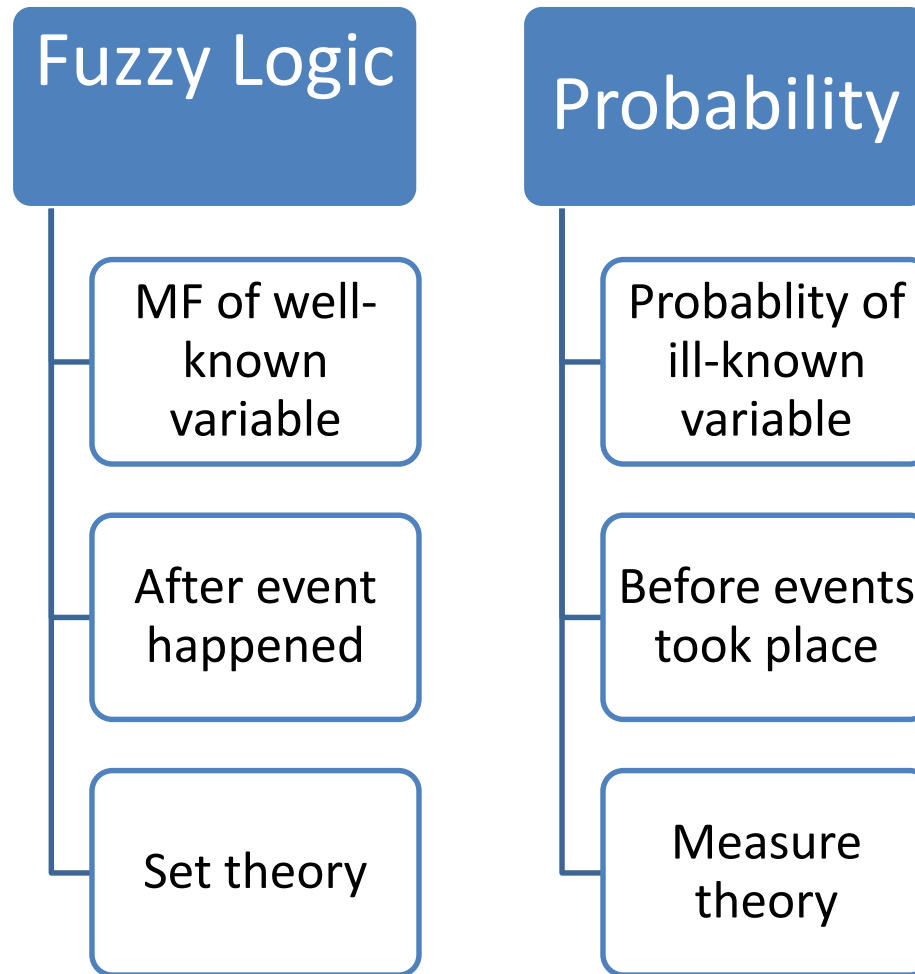


<http://list.qoo10.sg>



Introduction to Artificial
Intelligent by N.M.A Ghani

Fuzzy Logic vs Probability

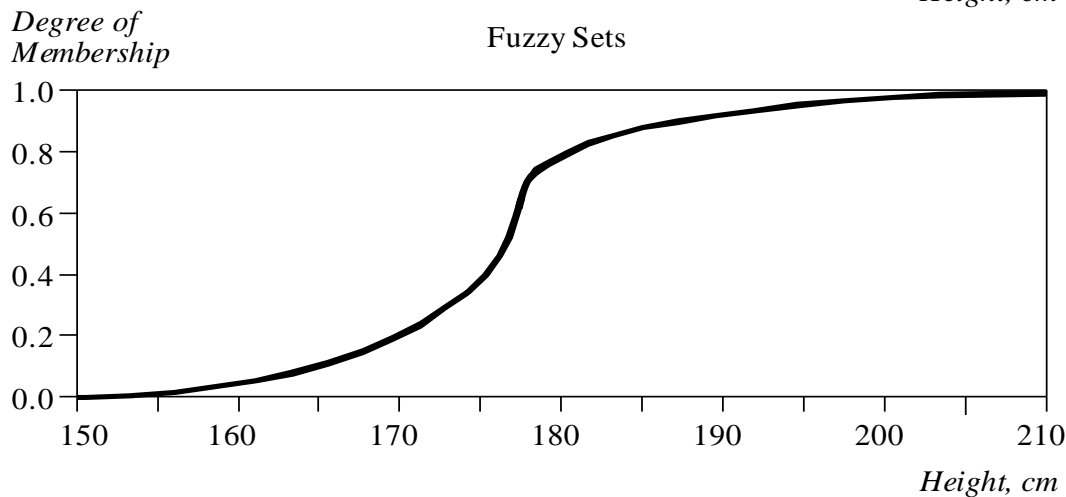
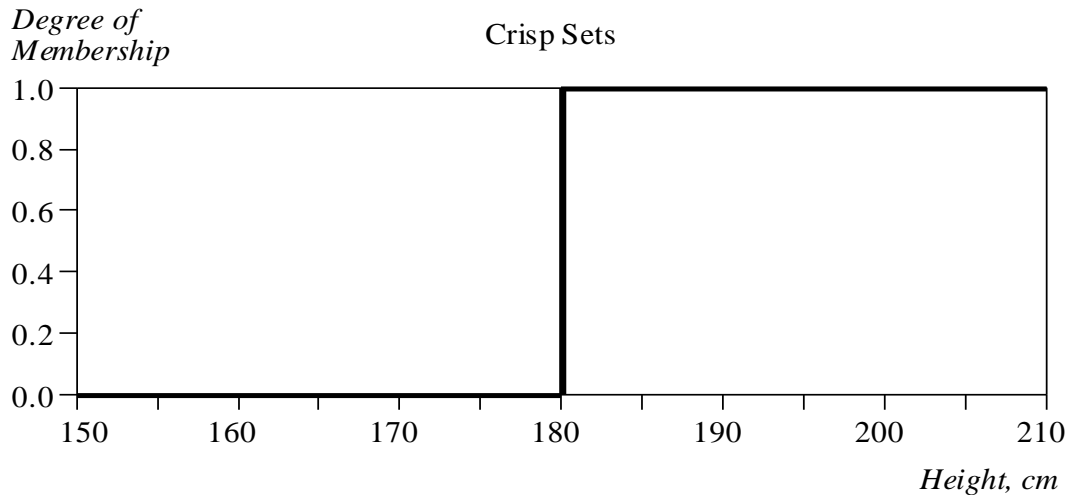


Definition of Fuzzy Sets

3.2



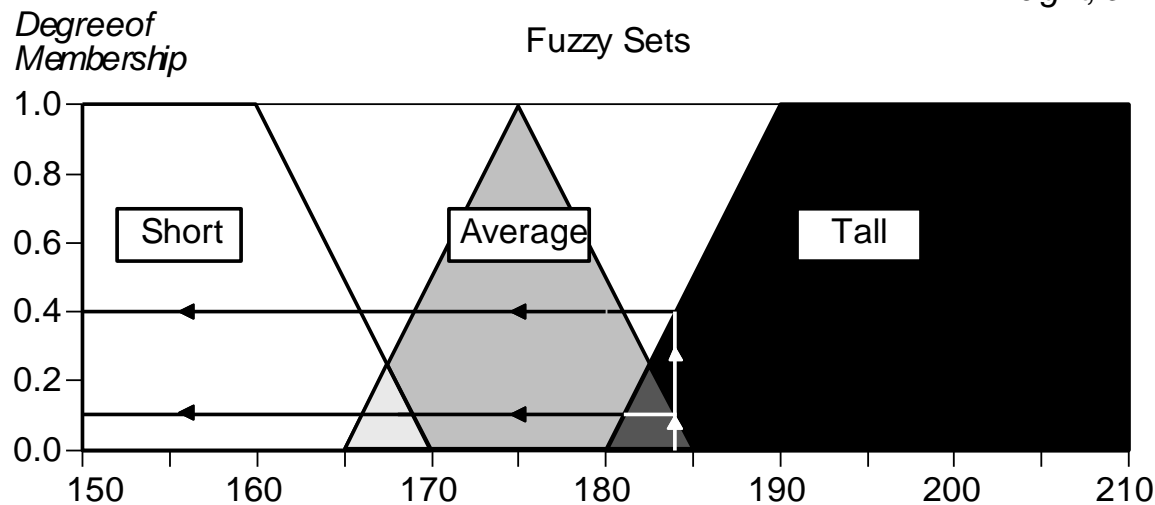
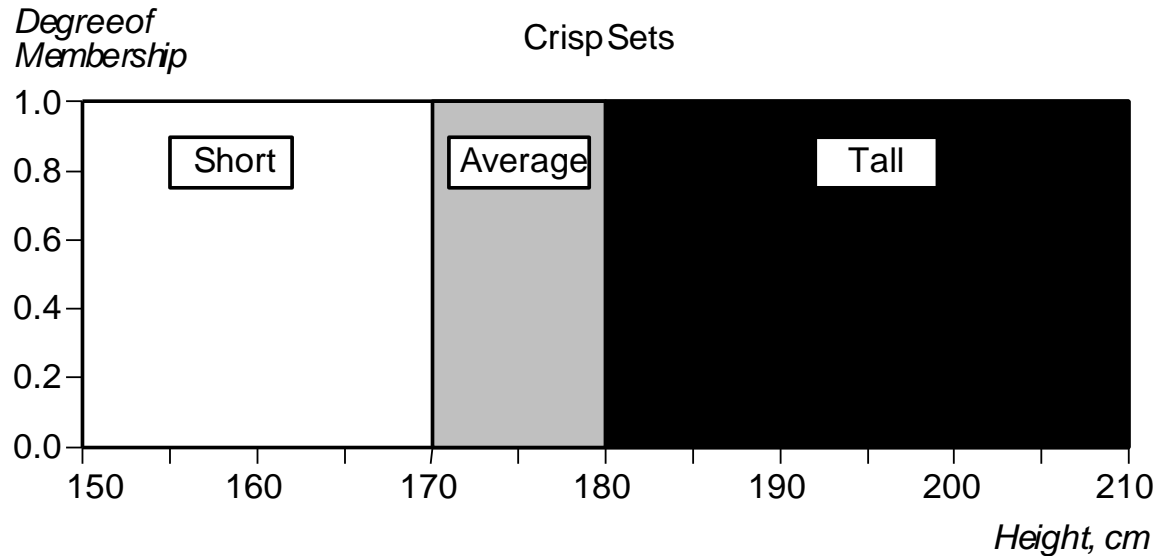
Crisp vs Fuzzy Set



| Name | Height, cm | Degree of Membership | |
|--------|------------|----------------------|--------------|
| | | <i>Crisp</i> | <i>Fuzzy</i> |
| Chris | 208 | 1 | 1.00 |
| Mark | 205 | 1 | 1.00 |
| John | 198 | 1 | 0.98 |
| Tom | 181 | 1 | 0.82 |
| David | 179 | 0 | 0.78 |
| Mike | 172 | 0 | 0.24 |
| Bob | 167 | 0 | 0.15 |
| Steven | 158 | 0 | 0.06 |
| Bill | 155 | 0 | 0.01 |
| Peter | 152 | 0 | 0.00 |



Crisp vs Fuzzy Sets of various men's height



Membership Representation

$$A = \{ (x_1, \mu_A(x_1)), (x_2, \mu_A(x_2)), \dots, (x_n, \mu_A(x_n)) \}$$

Membership association

$$A = \{ \mu_A(x_1)/x_1, \mu_A(x_2)/x_2, \dots, \mu_A(x_n)/x_n \}$$

Tall men = (0/180, 0.5/185, 1/190)

Short men = (1/160, 0.5/165, 0/170)





Dr. Nor Maniha Abdul Ghani

Faculty of Electrical and Electronics Engineering
Universiti Malaysia Pahang,
26600, Pekan, Pahang, Malaysia
Phone: +609-424-6087
Fax: +609-424-6000

<http://fkee.ump.edu.my/index.php/en/staff-menu/articles-staff/1034-niha-main-profile>



Introduction to Artificial
Intelligent by N.M.A Ghani