



Type-n Fuzzy Control for Robotics

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Robotics has to handles the problem with inexact to slowly approach the Object without impact. This inexactness is fuzzy. The slow is defined by fuzziness. Fuzzy logic made inexact to exact. For this fuzzy type-n of approach. Robotics has to handle with inexact or fuzzy information and object should be placed exact position. The inexact information is fuzzy. Fuzzy algorithms are designed for Robotics to deal with inexact information. In this presentation, Type-n fuzzy Algorithms are designed for controlling Robotics. And reach Robotics exact position without impact

The fuzzy set A of X is characterized as its membership function $A = \mu_A(x)$ and ranging values in the unit interval $[0, 1]$
 $\mu_A(x) \rightarrow [0, 1], x \in X$, where X is Universe of discourse.

For instance, the fuzzy propositions “go slowly”

slow=0.9/100+0.4/50+0.3/30 +0.2/20+0.1/10

Definition: The fuzzy set type-n $\tilde{A}$ is characterized by membership function $\mu_{\tilde{A}}:X \rightarrow [0,1]$ $[0,1],[0,1],[0,1] \dots$ $x \in X$

Type-n Fuzzy Control for Robotics

$\mu_A(x)$	x1	x2	x3	x4	x5
low	0.9	0.7	0.6	0.3	0.1
Very slow	0.81	0.49	0.36	0.09	0.01
Very very slow	0.65	0.24	0.12	0.00	0.00

1. Anood Ibrahim1, Reba Rachel Alexander1 , Control Systems in Robotics: A Review,International Journal of Engineering Inventions,Volume 5, Issue 5 [May 2016] PP: 29-38

2. T. Takagi and M.Sugeno, “Fuzzy Identification of Systems and Its application to Modeling and control”, IEEE Transactions on Systems Man and Cybernetics. vol.15,no.1, pp.116-132.-13, 1985.

3. Poli Venkata Subba Reddy , FUZZYALGOL: Fuzzy Algorithmic Language for designing Fuzzy Algorithms, Journal of Computer Science and Engineering, Vol.2, Issue 2, pp.21-24, August 2010..

Fuzzy mean-ends analysis process is detection of differences between current state and goal state. For instance driving a car with Robotics has starting point to goal point. The process is mean-ends analysis. The mean –ends analysis need algorithms. The fuzzy algorithms are need for inexact information.

The Robot has to pick up the object and carry the object until place on another object properly.

PICK-UP(obj)

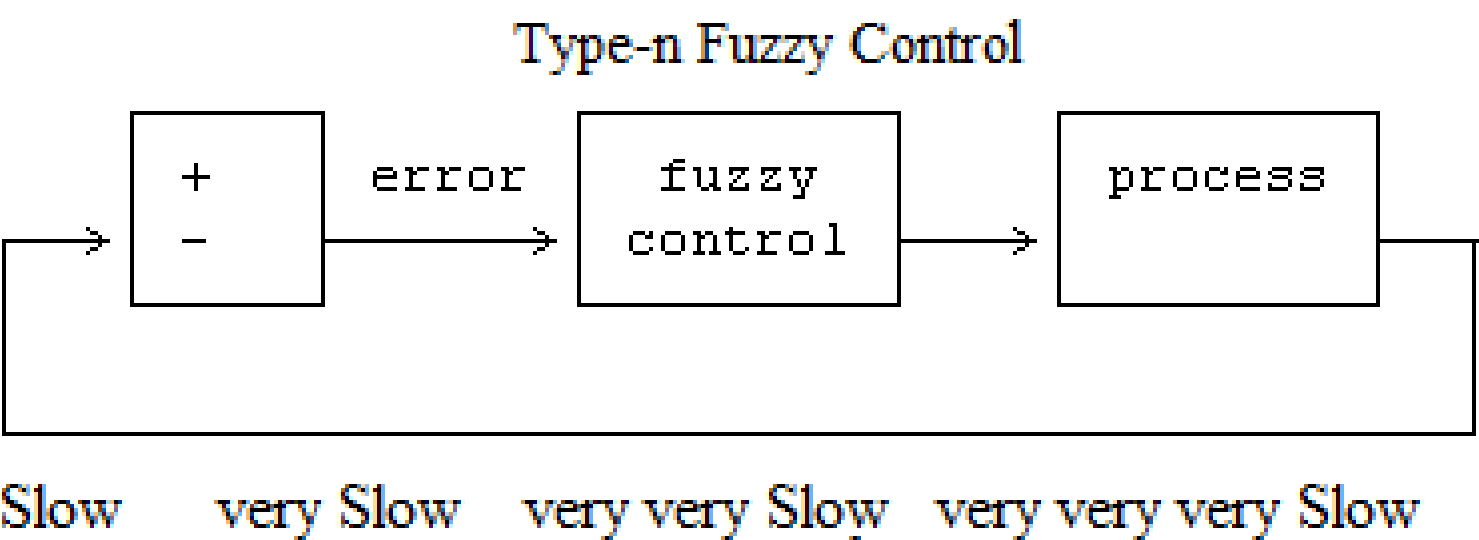
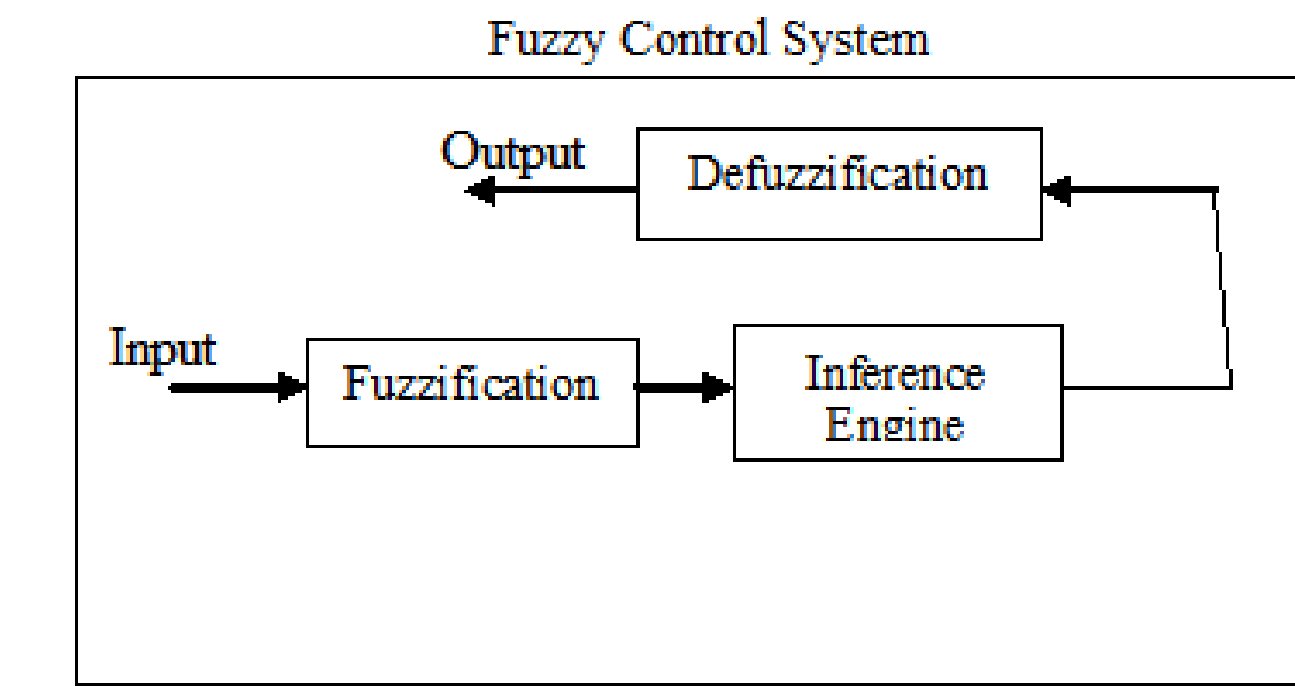
CARRY(OBJ,1)

PUSH-DOWN(OBJ)

PLACE(OBJ, 1)

GO SLOWLY(DISTANCE)

	carry	Pick up	Push down	place
Move object	V			
Move robot		V		
Clear object			V	
Get arm empty			V	
Get object on object		V	V	V
Hold object		V		



Fuzzy Control System to reach exact position with Type-n Fuzzy Control System and Fuzzy Agent Shell is given by

The fuzzy set A is characterized by membership function

$\mu_A:X \rightarrow [0,1]$ $x \in X$

The fuzzy set type-n $\tilde{A}$ is characterized by membership function

$\mu_{\tilde{A}}:X \rightarrow [0,1]$ $[0,1],[0,1] \dots [0,1], x \in X$

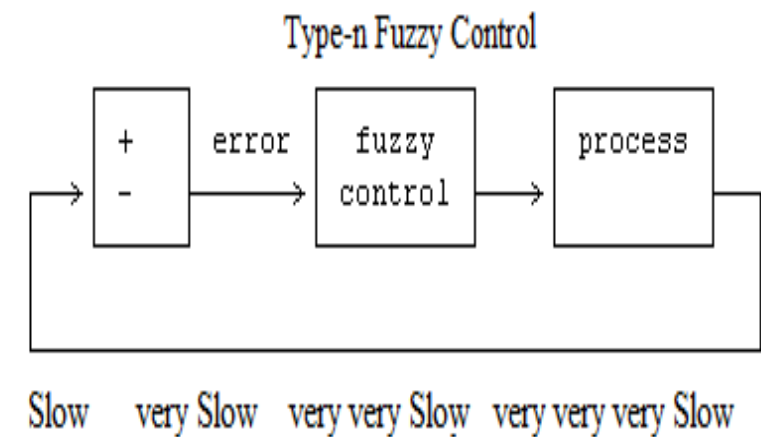
```
print("ChatXpertGPT Fuzzy Agent Shell")
print("Hi! I'm ChatXpertGPT Fuzzy Agent Give slows and I will giveDecision.")
print("Hi! I'm ChatXpertGPT. Type 'chat' to exit.")
while True:
    user_input = input("ChatXpertGPT: ")
    if user_input.lower() == 'chat':
        print("ChatXpertGPT: Chat is over.")
        break
    elif 'slow1' in user_input.lower():
        print("ChatXpertGPT: slow1")
        f1=float(input("fuzziness f1:"))
        print("ChatXpertGPT:", f1)
    elif 'slow2' in user_input.lower():
        print("ChatXpertGPT: slow2")
        f2=float(input("fuzziness f2:"))
        print("ChatXpertGPT:", f2)
    elif 'slow3' in user_input.lower():
        print("ChatXpertGPT: slow3")
        f3=float(input("fuzziness f3:"))
        print("ChatXpertGPT:", f3)
        f4=min(f1,f2,f3)
        print("if slow1 and slow2 and slow3 then ','Decision',f4)
        print("Action Off at',f4)
        ChatXpertGPT()
```

```
Hi! I'm ChatXpertGPT Fuzzy Agent
Give slows and I will giveDecision.
Hi! I'm ChatXpertGPT. Type 'chat' to exit.
ChatXpertGPT: 'slow1'
ChatXpertGPT: slow1
fuzziness f1:0.1
('ChatXpertGPT:', 0.1)
ChatXpertGPT: 'slow2'
ChatXpertGPT: slow2
fuzziness f2:0.01
('ChatXpertGPT:', 0.01)
ChatXpertGPT: 'slow3'
ChatXpertGPT: slow3
fuzziness f3:0.001
('ChatXpertGPT:', 0.001)
('if slow1 and slow2 and slow3 then ','Decision', 0.001)
('Action Off at', 0.001)
ChatXpertGPT: 'chat'
ChatXpertGPT: Chat is over.
```

Robotics handles the problem with exact information. Sometimes Robotics has to handle with inexact information and object should be placed exact position. The inexact information is fuzzy. Fuzzy algorithms used for Robotics to design inexact information. In this paper, fuzzy Algorithmic Language is discussed. Fuzzy algorithms are discussed for Fuzzy Robotics Systems to handle inexact information. Type-n fuzzy control systems are discussed to reach Robotics exact position.

The fuzzy algorithmic language is studied to design the fuzzy algorithms for fuzzy problems. The fuzzy algorithm language(FUZZYALGOL) consists of fuzzy variables, fuzzy expressions, fuzzy conditions, and fuzzy loops, etc. These constructs are used for designing fuzzy algorithms forgiven fuzzy problems.

The fuzzy set $\tilde{A}$ may be new



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