

()

*

(// : // :)

webcam

(FIS)

AND

RGB

Matlab

on-line off-line

off-line on-line

% / % /

:

()

()

1. Photo-sensing

()

()

$$D = \{(x, \mu_D(x)) | x \in X, \mu_D(x) \in [0,1]\} \quad () \quad (.)$$

$$D \quad X \quad x$$

$$\mu_D(x) \quad () \quad X$$

X x

[0,1] $\mu_D(x)$ D x if-then

$\mu_D(x)$

(.)

(.)

(MF)

()

()

() ()

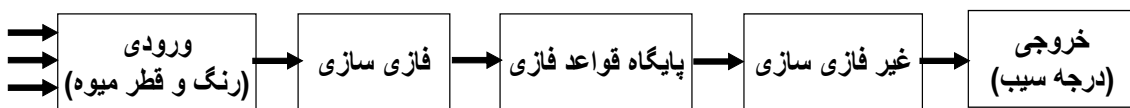
()

()

()

- 3. Universe of discourse
- 4. Membership Function (MF)
- 5. triangular
- 6. trapezoidal
- 7. Gaussian

- 1. Decision Support Systems
- 2. Crisp

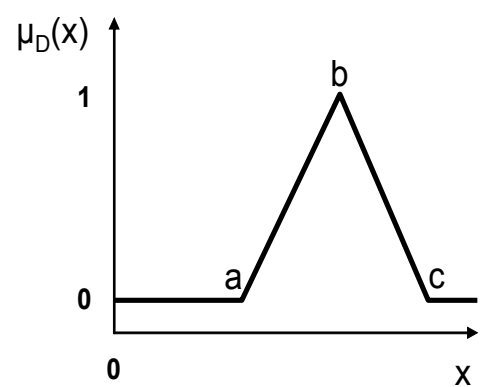


... :
 $B_i \ A_i$
 $y_i \ x_i$
 n
 $C_i \ ()$ then .
 $()$ z_i .
 i R_i
 (Color) .
 (RGB) .
 () AND
 $\mu_{A \cap B} = \min(\mu_A, \mu_B)$ ()
 () () ()
 () () ()
 () () ()
 () () ()
 if-then
 () () () AND
 () () ()
 () () ()
 () ()
 .
 ε γ

$$f(x; a, b, c) = \begin{cases} 0, & x < a \\ \frac{x-a}{b-a}, & a \leq x < b \\ \frac{c-x}{c-b}, & b \leq x < c \\ 0, & c \leq x \end{cases} \quad ()$$

$$f(x; a, b, c) = \max(\min(\frac{x-a}{b-a}, \frac{c-x}{c-b}), 0) \quad ()$$

$c \ b, a$
 x
 .()



if-then .
 : ()
 IF x is A THEN y is B. ()
 $B \ A$
 $y \ x$
 if . $Y \ X$
 "y is then " "x is A"
 .() B
 : AND
 R_i : IF x_i is A_i AND y_i is B_i THEN z_i is C_i . ()
 $i=1, 2, \dots, n$

-
- 3. Center of gravity (COG)
 - 4. Mean of maximum (MOM)

-
- 1. Antecedent or premise
 - 2. consequent

(.)

(.)

()

)

$a_n \dots a_2 a_1$

$C_n \dots C_2 C_1$ (

x

$$G = \frac{\sum_{i=1}^n a_i C_i}{\sum_{i=1}^n a_i}$$

(

(/ hp) / kW

rpm

)

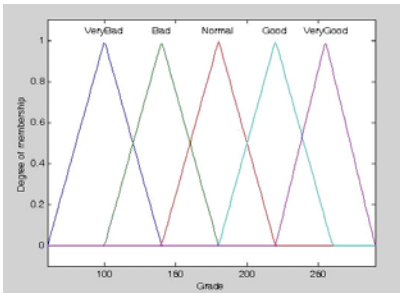
n

G (

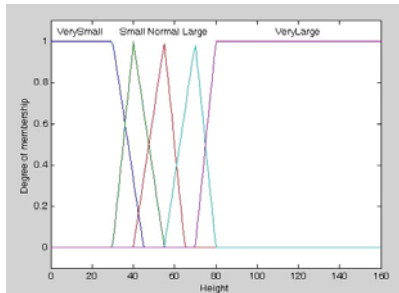
/ cm/s

1. First of maximum (FOM)

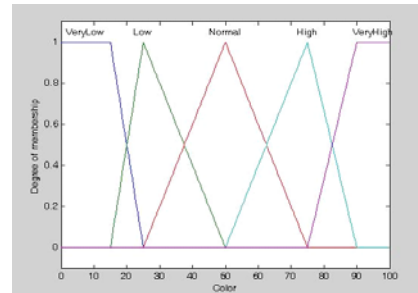
()



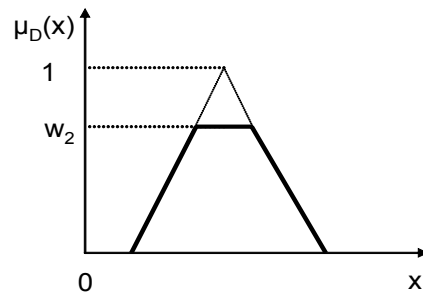
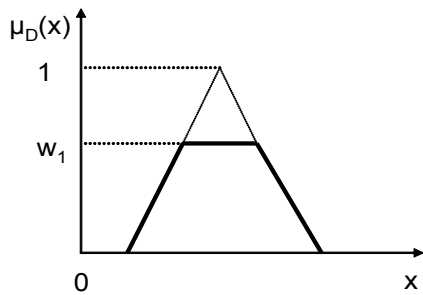
ج- متغیر خروجی (درجه سیب)

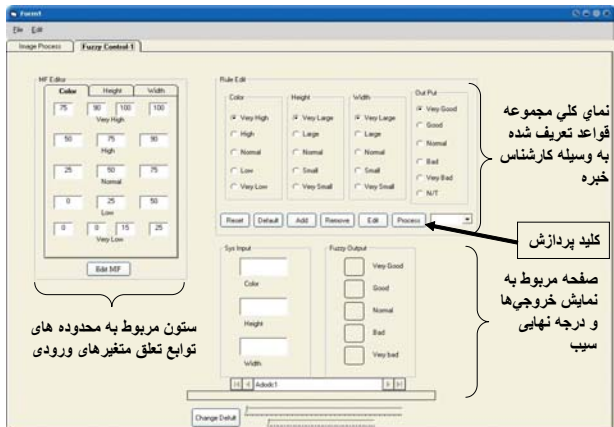
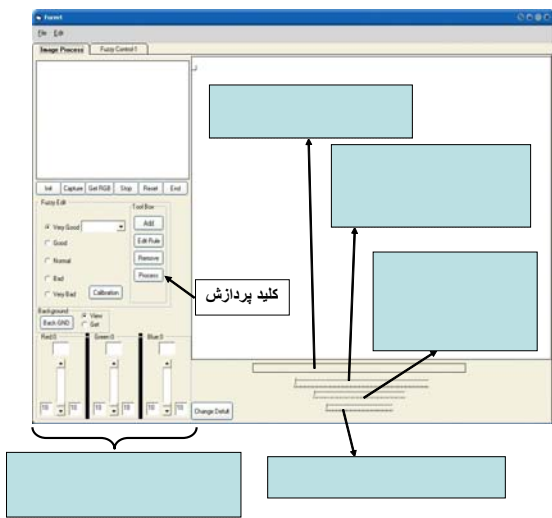
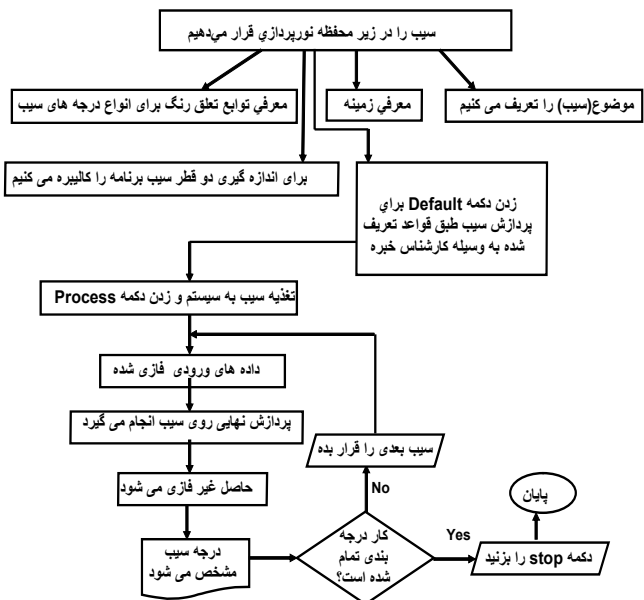


ب- متغیر ورودی (اندازه)



الف- متغیر ورودی (رنگ)





()

Mercury webcam

USB

/ GHz)

([RAM]



Fuzzy Image Process

() Control

Edit File

off-line)

on-line off-line

(

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()

(

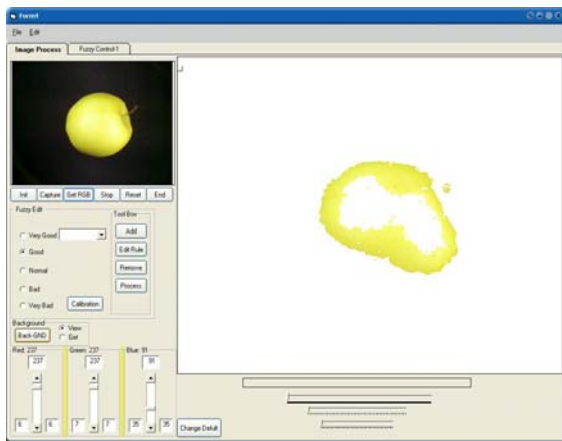
off-line

Get RGB

Calibration

USB

USB



add

(Good)

() add



) Get RGB

(

Get
Back-GND

off-line

View

Get RGB
Back-GND

()

Process

/

)

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Fuzzy-Control

1. If (Color is Very High) and (Height is Very Large) and (Width is Very Large) then (Grade is Very Good)
2. If (Color is Very High) and (Height is Very Large) and (Width is Large) then (Grade is Very Good)
3. If (Color is Very High) and (Height is Very Large) and (Width is Normal) then (Grade is Very Good)
4. If (Color is Very High) and (Height is Large) and (Width is Very Large) then (Grade is Very Good)
5. If (Color is Very High) and (Height is Large) and (Width is Large) then (Grade is Very Good)
6. If (Color is Very High) and (Height is Normal) and (Width is Very Large) then (Grade is Very Good)
7. If (Color is High) and (Height is Very Large) and (Width is Very Large) then (Grade is Very Good)
8. If (Color is High) and (Height is Very Large) and (Width is Large) then (Grade is Very Good)
9. If (Color is High) and (Height is Very Large) and (Width is Normal) then (Grade is Very Good)
10. If (Color is High) and (Height is Large) and (Width is Very Large) then (Grade is Very Good)
11. If (Color is High) and (Height is Normal) and (Width is Very Large) then (Grade is Very Good)

Access

on-line

...

on-line

on-line

File

off-line

Height

Color

High, Very Good, .

Width

) Very High, Large, Very Large,

(

()

()

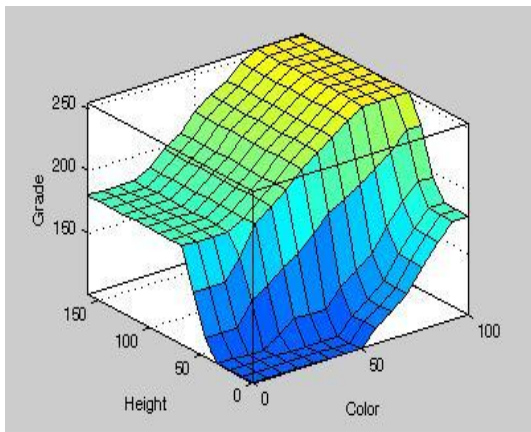
Grade .

/ % / %

Type='mamdani'
Decision method for fuzzy logic operators AND: '
MIN
Decision method for fuzzy logic operators OR: '
MAX'
Implication method: 'MIN'
Aggregation method: 'MAX'
Defuzzification:' CENTROID' (centre of gravity)

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() ()
) ()
(

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Matlab

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()

()

/

.() (Height)

/ /

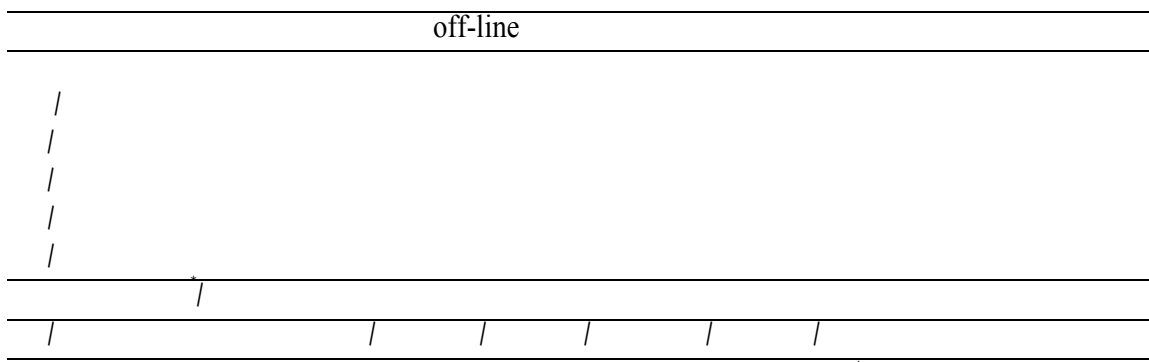
()

-
1. Fisher
 2. Boltzman
 3. visual properties

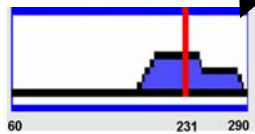
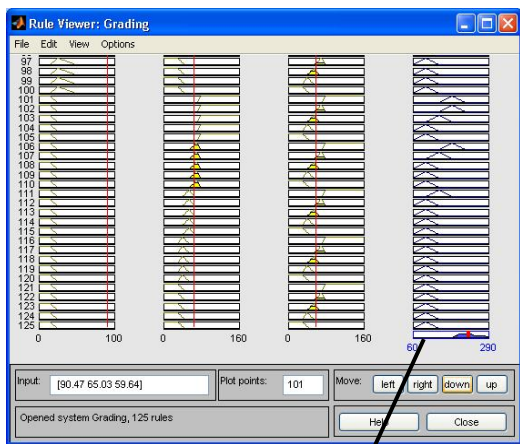
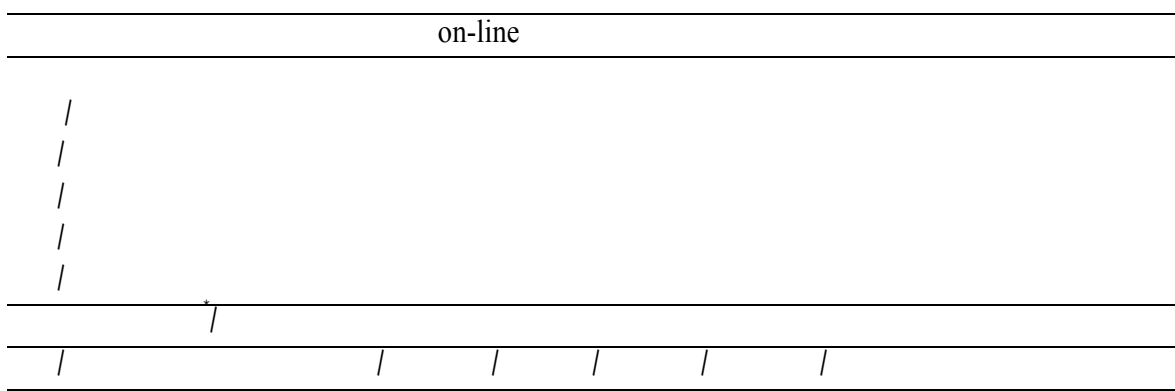
...

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off-line

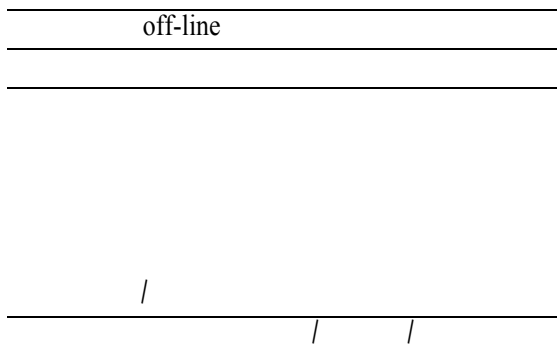


on-line

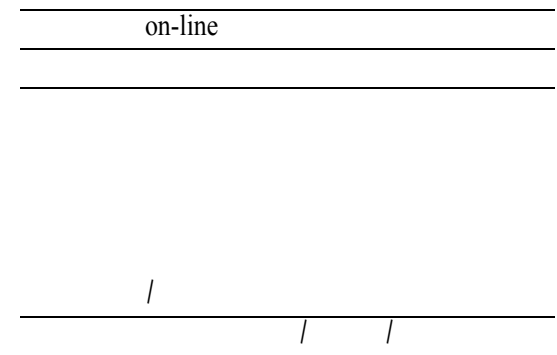


Matlab

off-line



on-line



() ()

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δ

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/

off-line

/

on-line

//

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() (/)

() (/)

off-line

REFERENCES

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