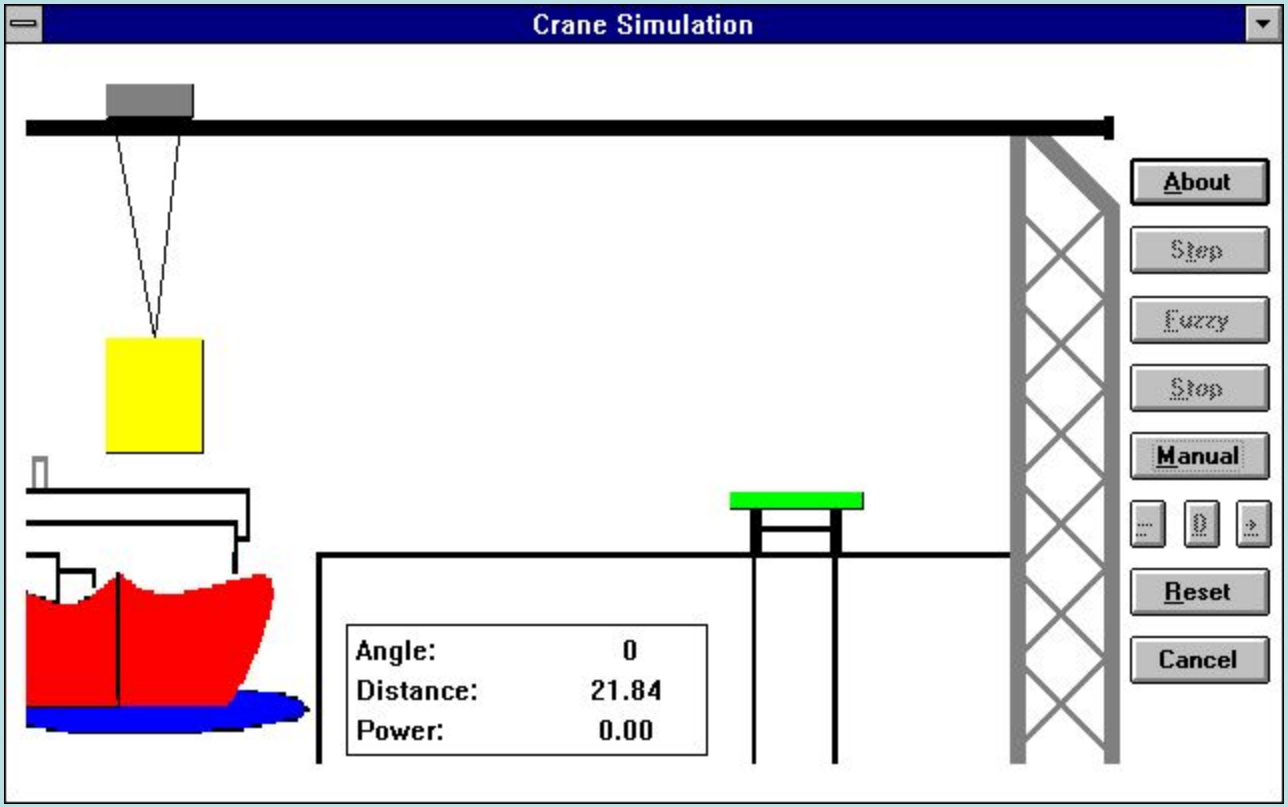
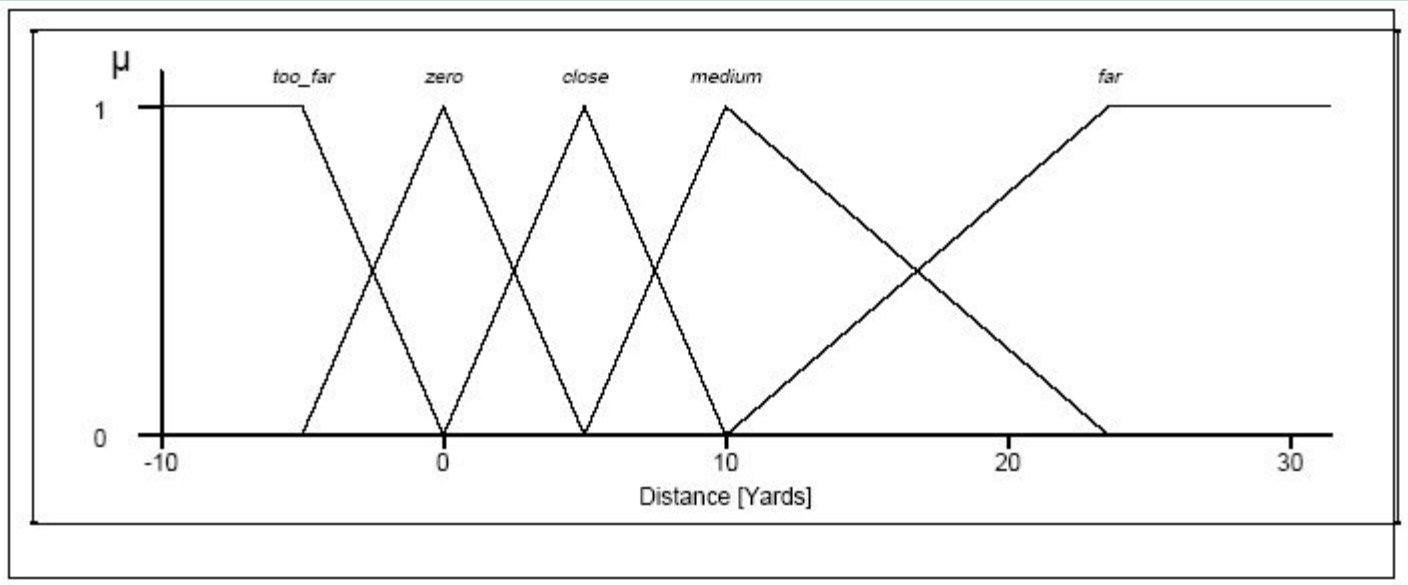
НЕЧЕТКОЕ УПРАВЛЕНИЕ КОНТЕЙНЕРНЫМ КРАНОМ

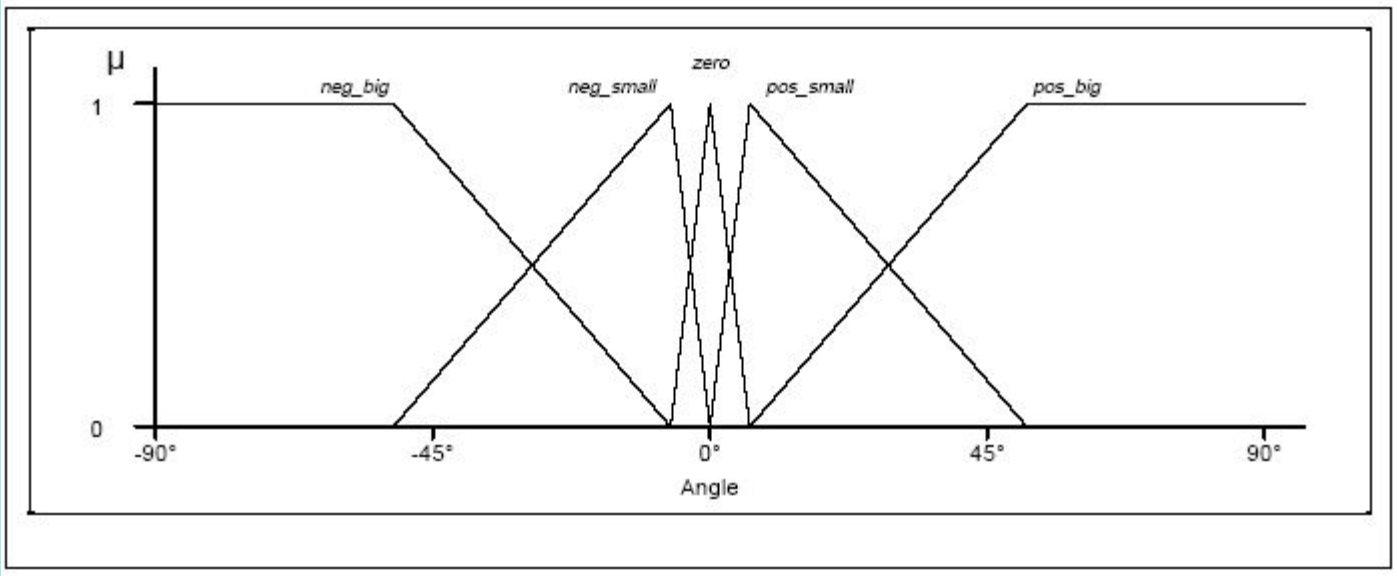

Crane Simulation
About
Step
Fuzzy
Step
Manual
Reset
Cancel
Angle: 0
Distance: 21.84
Power: 0.00

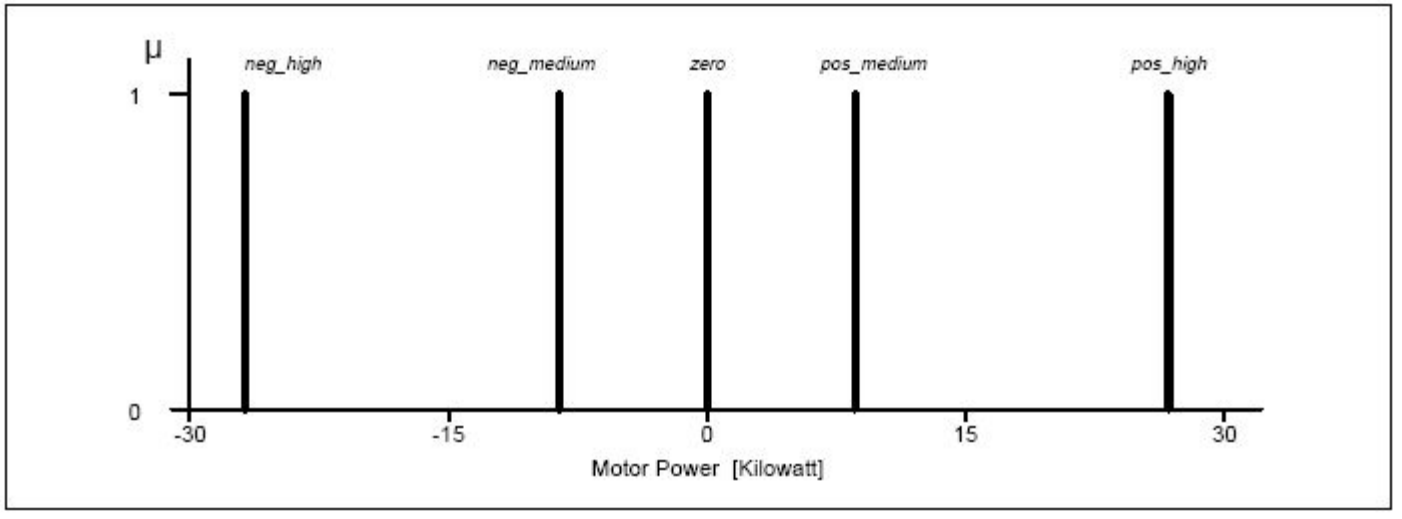
Интуитивные правила действий оператора крана

Анализ действий оператора показывает, что он использует ряд эмпирических правил при управлении краном:

1. Начинать движение со средней мощностью.
2. Если кран тронулся, регулировать мощность так, чтобы контейнер немного отставал от тележки крана.
3. При приближении к цели уменьшить скорость, так чтобы контейнер немного опережал тележку крана.
4. Если контейнер очень близко к цели, включить мотор.
5. Если контейнер над целью и колебаний нет, выключить мотор.


μ
1
0
too_far
zero
close
medium
far
-10
0
10
20
30
Distance [Yards]


μ
1
0
neg_big
neg_small
zero
pos_small
pos_big
-90°
-45°
0°
45°
90°
Angle


μ
neg_high
neg_medium
zero
pos_medium
pos_high
1
0
-30
-15
0
15
30
Motor Power [Kilowatt]

База правил контроллера

RULE 1: IF distance IS far	AND angle IS zero	THEN power IS pos_medium
RULE 2: IF distance IS far	AND angle IS neg_small	THEN power IS pos_big
RULE 3: IF distance IS far	AND angle IS neg_big	THEN power IS pos_medium
RULE 4: IF distance IS medium	AND angle IS neg_small	THEN power IS neg_medium
RULE 5: IF distance IS close	AND angle IS pos_small	THEN power IS pos_medium
RULE 6: IF distance IS zero	AND angle IS zero	THEN power IS zero

Этапы вывода

Execution of the rule base broken down into the following steps:

- Aggregation
  Determing the degree of accomplishement of the condition
  from the degree of membership of the subconditions

P_{k1} AND P_{k2} OR (NOT P_{k3}) = P_k

for all n conditions

- Activation
  Activation of the IF-THEN conclusion

If condition P_k THEN conclusion C_k

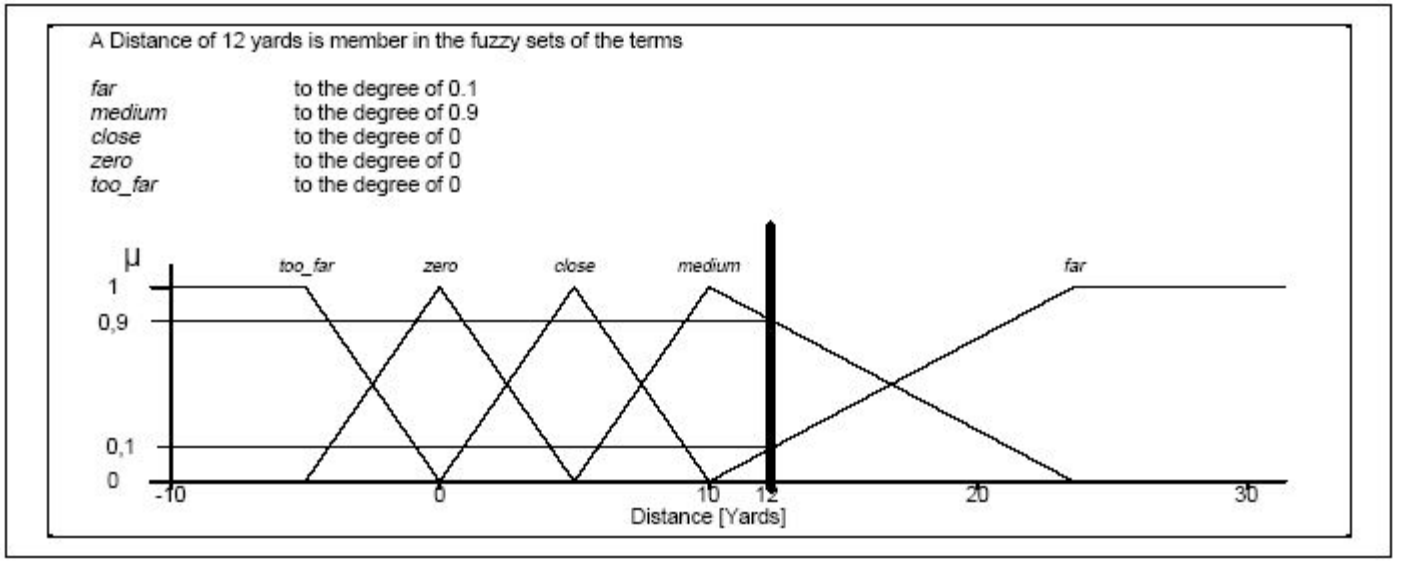
for all n rules

  - Consideration of the weighting factor of each rule

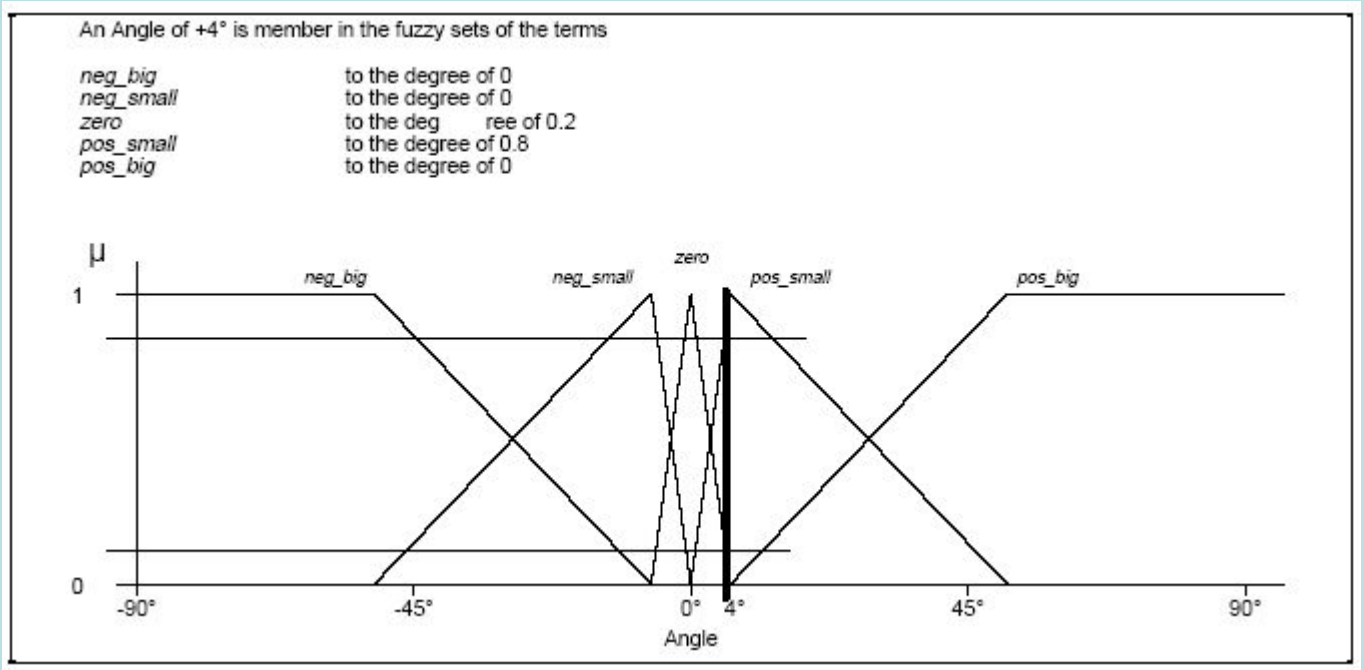
- Accumulation
  Combination of the weighted results
  of the rules into an overall result

Inference step	*Operators*
Aggregation	
AND	*Minimum*
Activation	
conversion of the IF-THEN-conclusion	
	Minimum
Accumulation	*Maximum*

Фазификация (1)

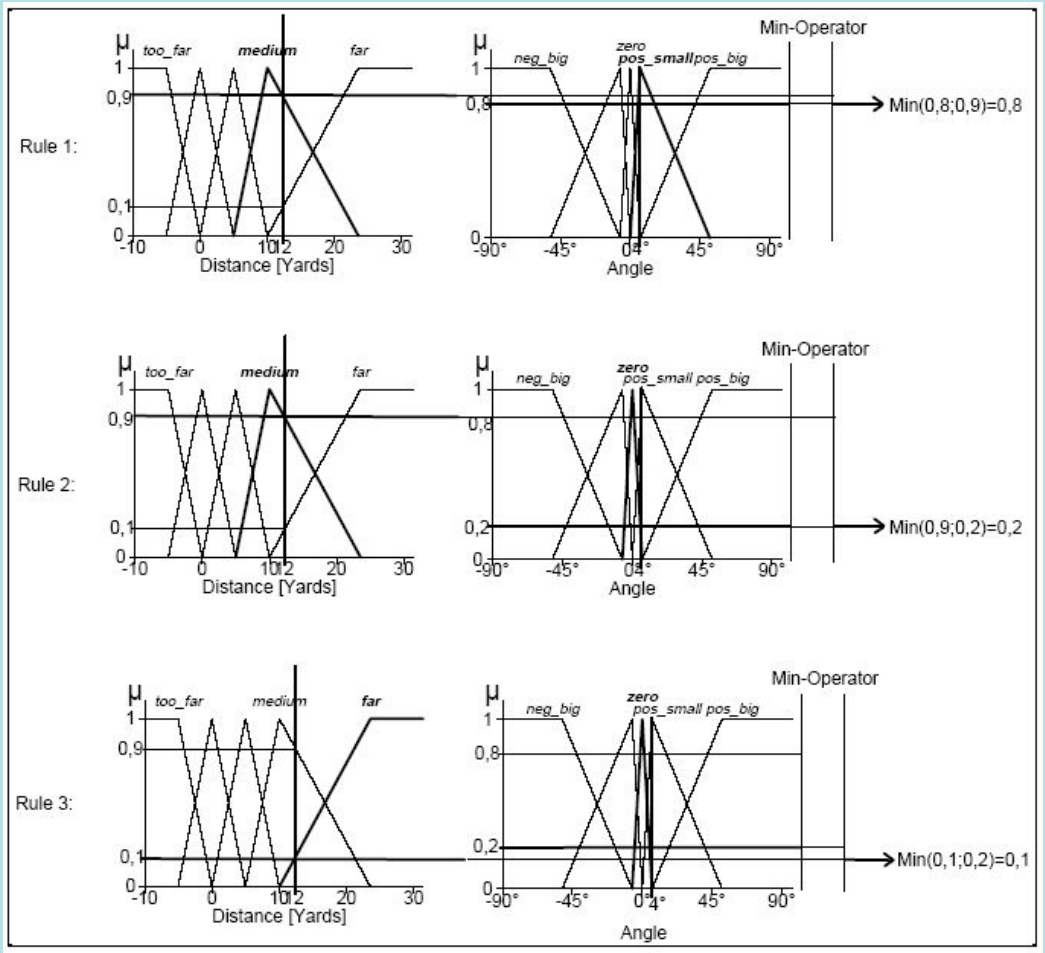


Фазификация (2)

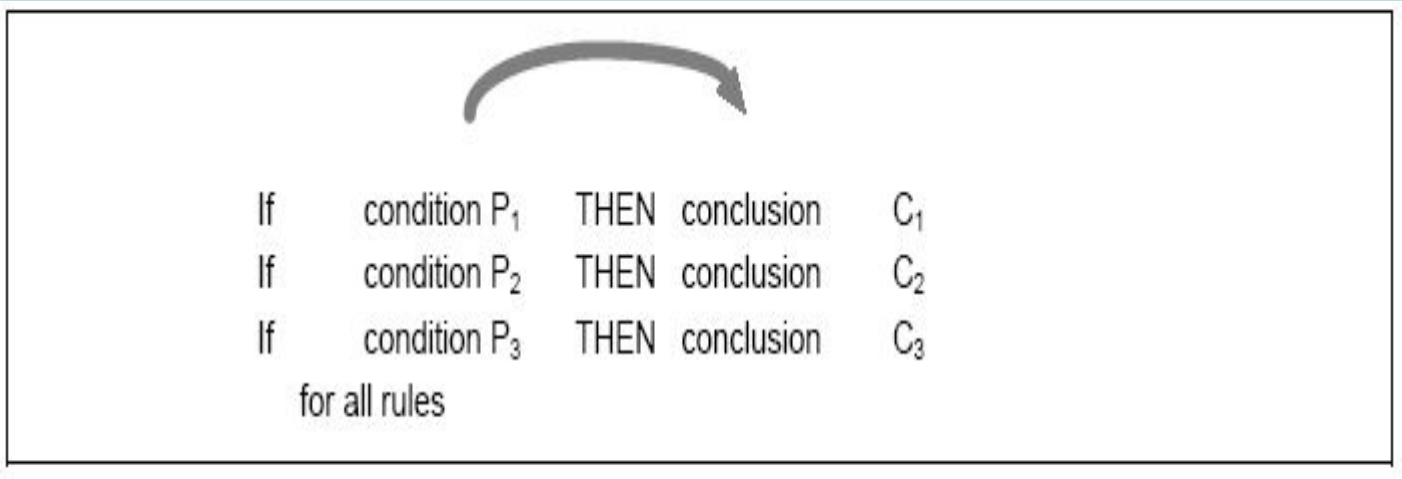


Rule 1: IF distance IS medium	AND angle IS pos_small	THEN power IS pos_medium
Rule 2: IF distance IS medium	AND angle IS zero	THEN power IS zero
Rule 3: IF distance IS far	AND angle IS zero	THEN power IS pos_medium

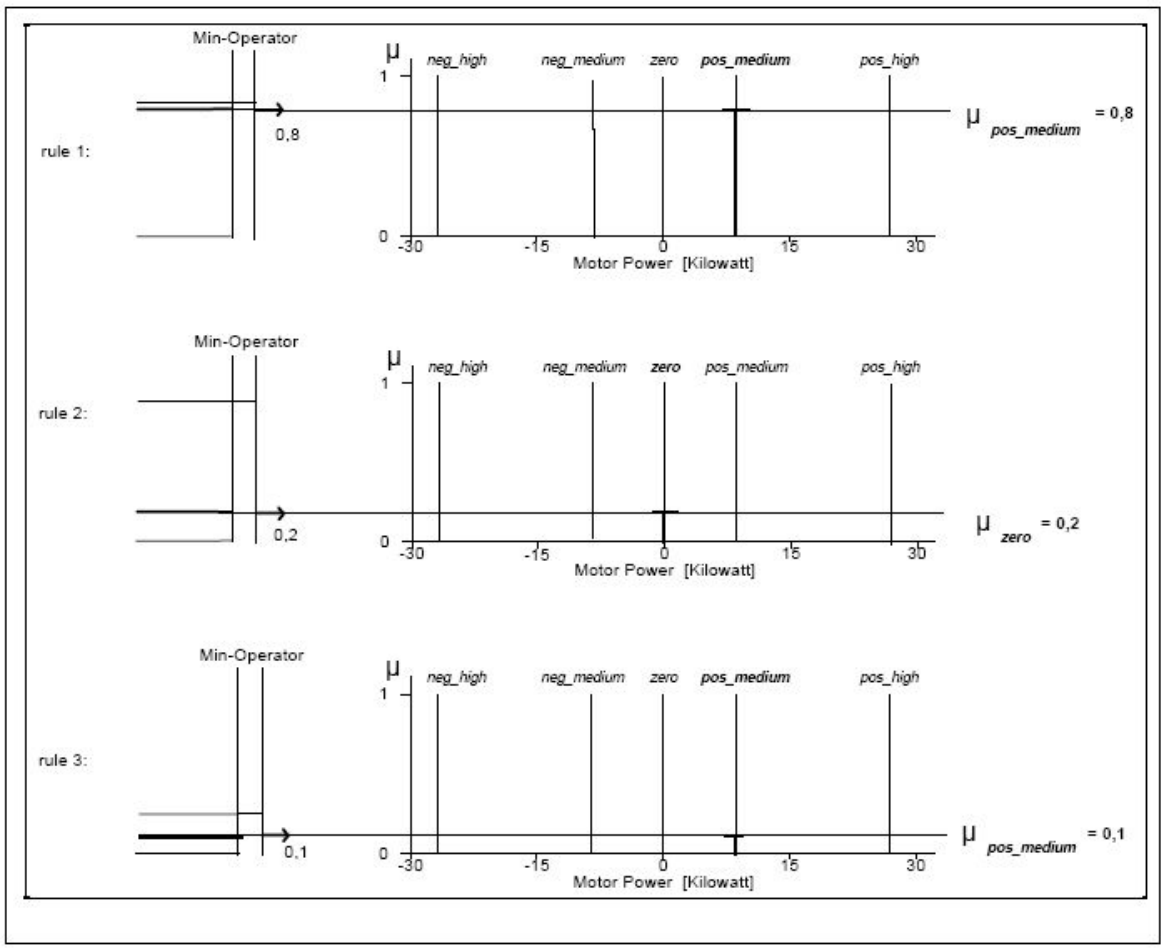
Фазификация (3)



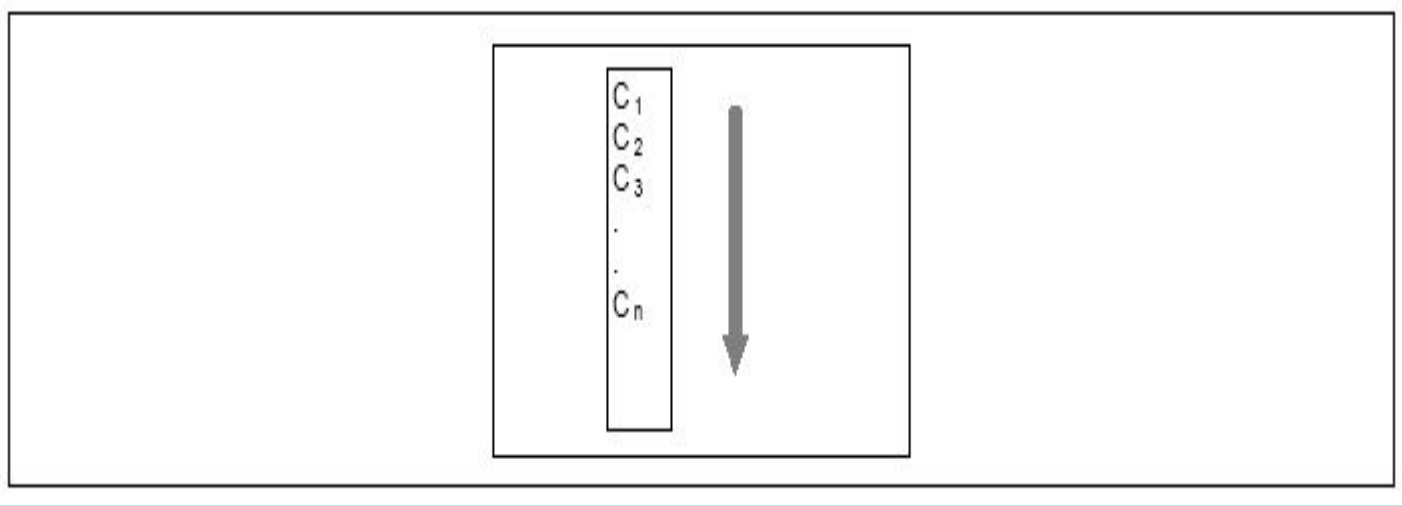
Активирование



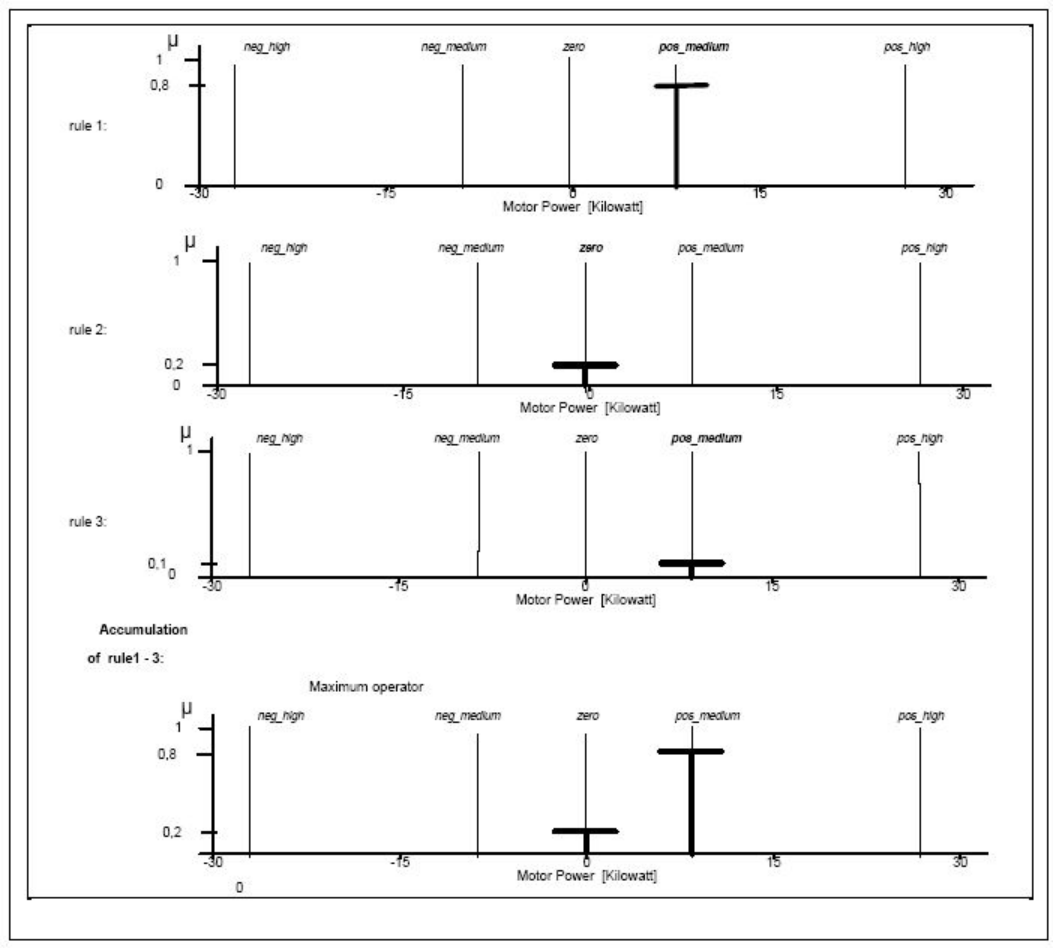
Нечеткий вывод



Аккумулирование



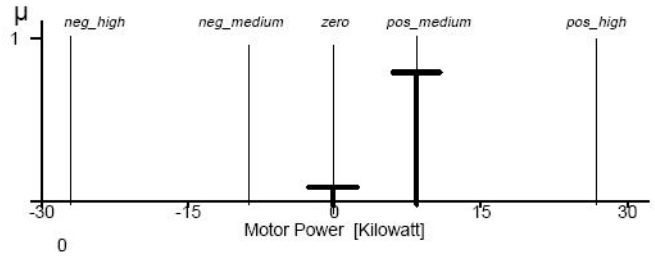
Аккумулирование

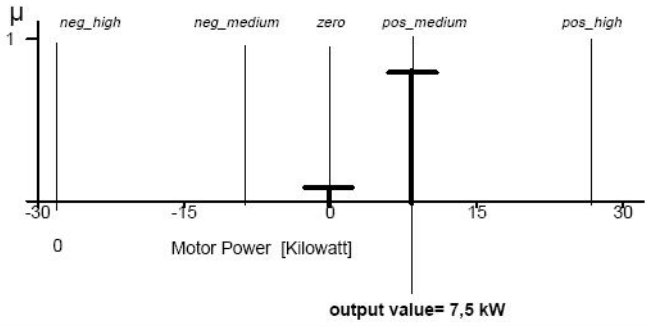


Дефазификация

Accumulation

of rule1 - 3:



Defuzzification Max Height Method

In the Max Height Method, the value of the output variables is determined by the membership function of the output set with maximum degree of membership.