

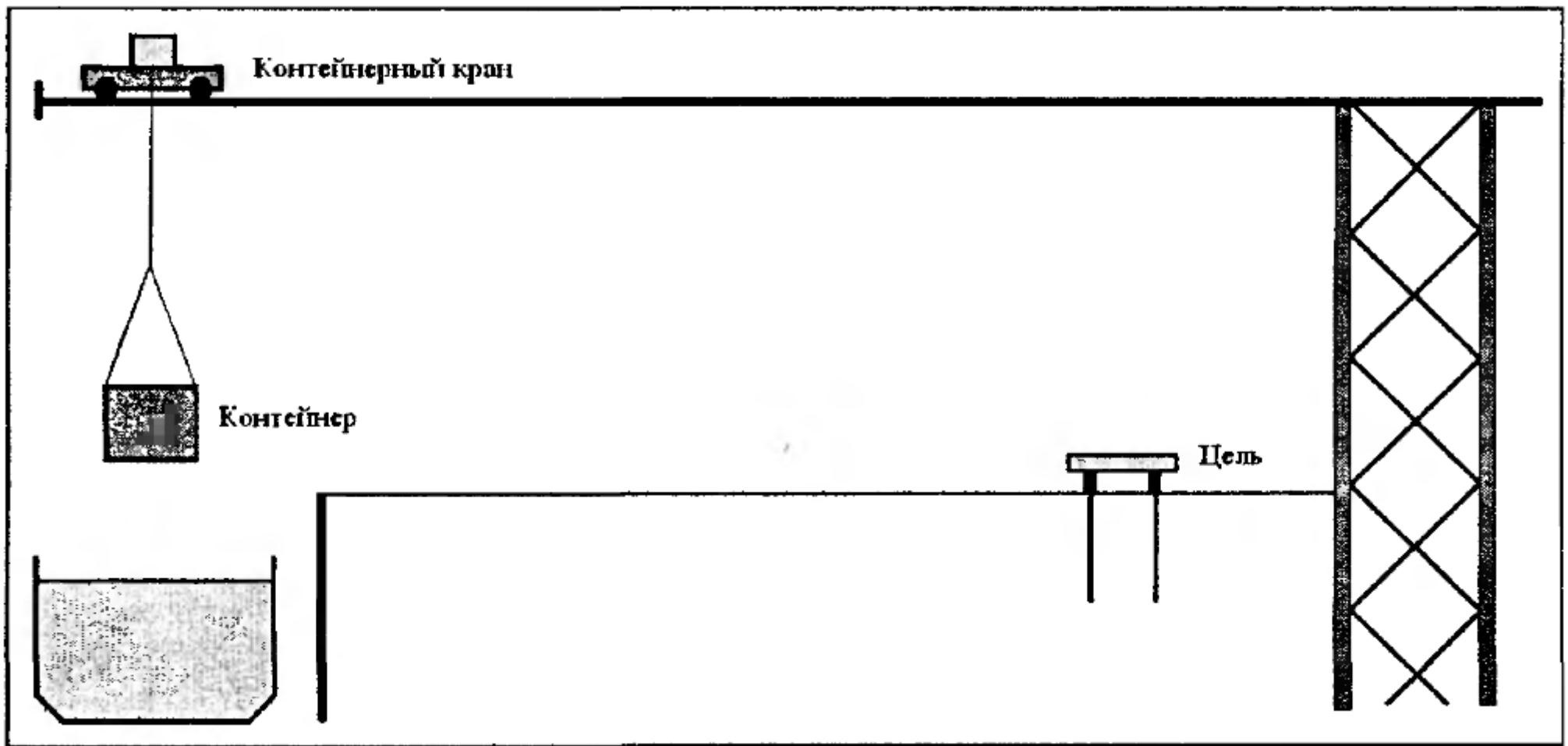
Нечеткая модель управления контейнерным краном

*Гуцанский Дмитрий, 342
группа*

Нечеткая логика

- 1965 — «Fuzzy Sets» Заде
- 1975 — Первый нечеткий регулятор (Мамдани и Ассилиан)
- 1982 — Первый промышленный нечеткий регулятор (Холмблад и Остергад)

Постановка задачи

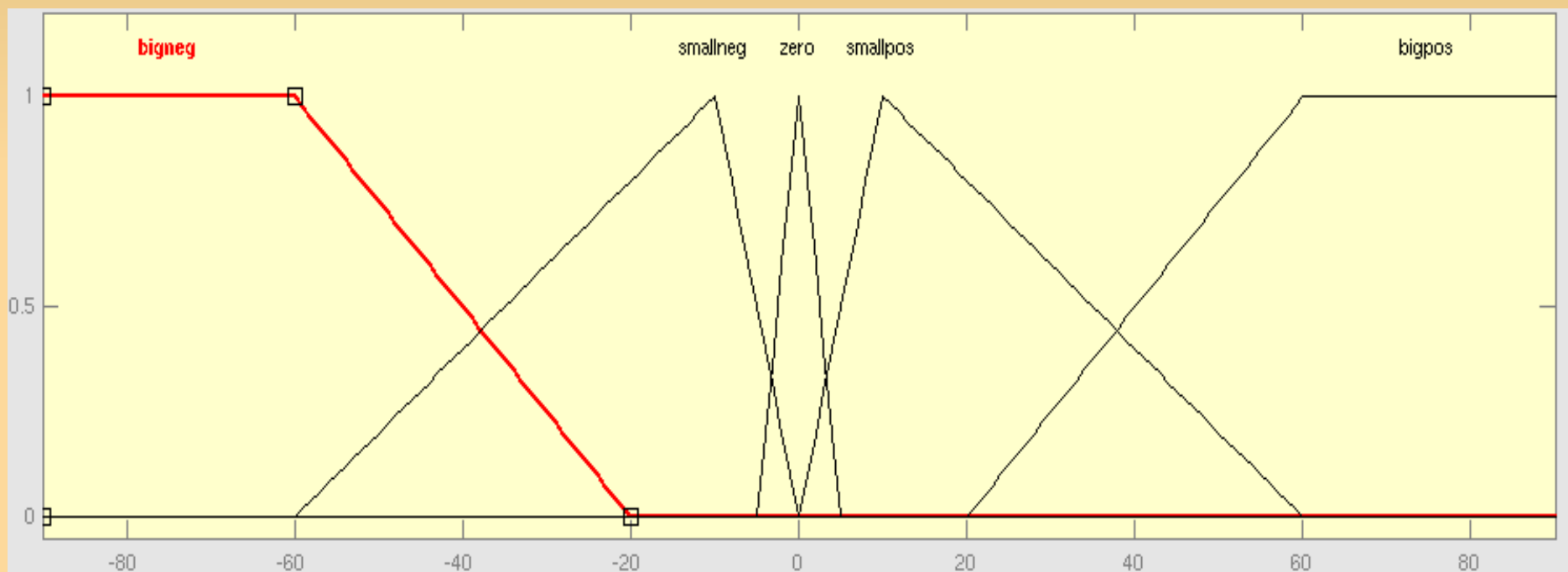


Обоснованность применения

- Построение математической модели классическими методами затруднительно
- Механизм поведения системы легко описывается в виде эвристических правил

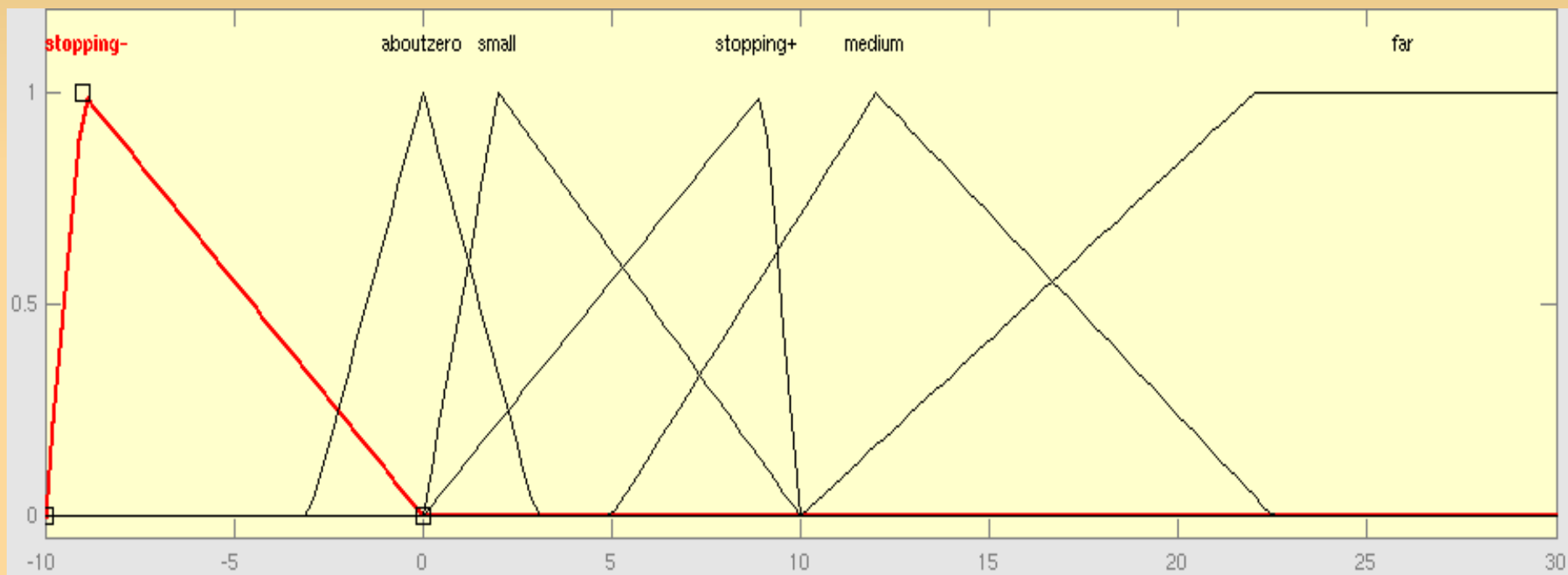
Переменные системы

Angle



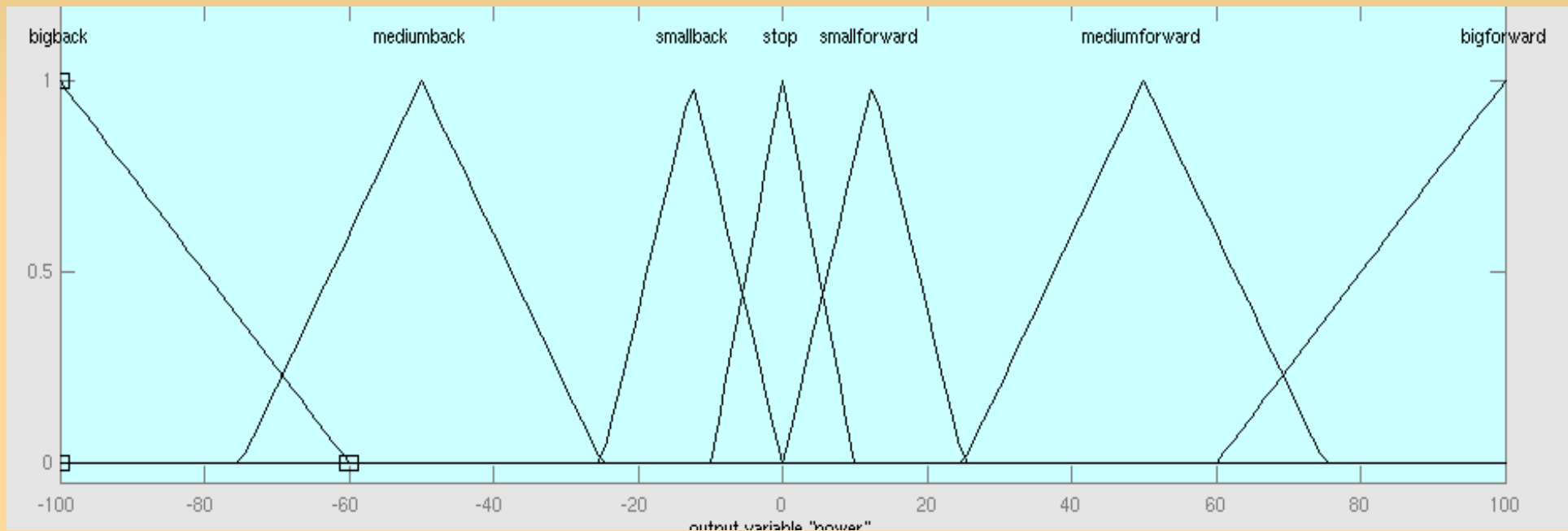
Переменные системы

Distance



Переменные системы

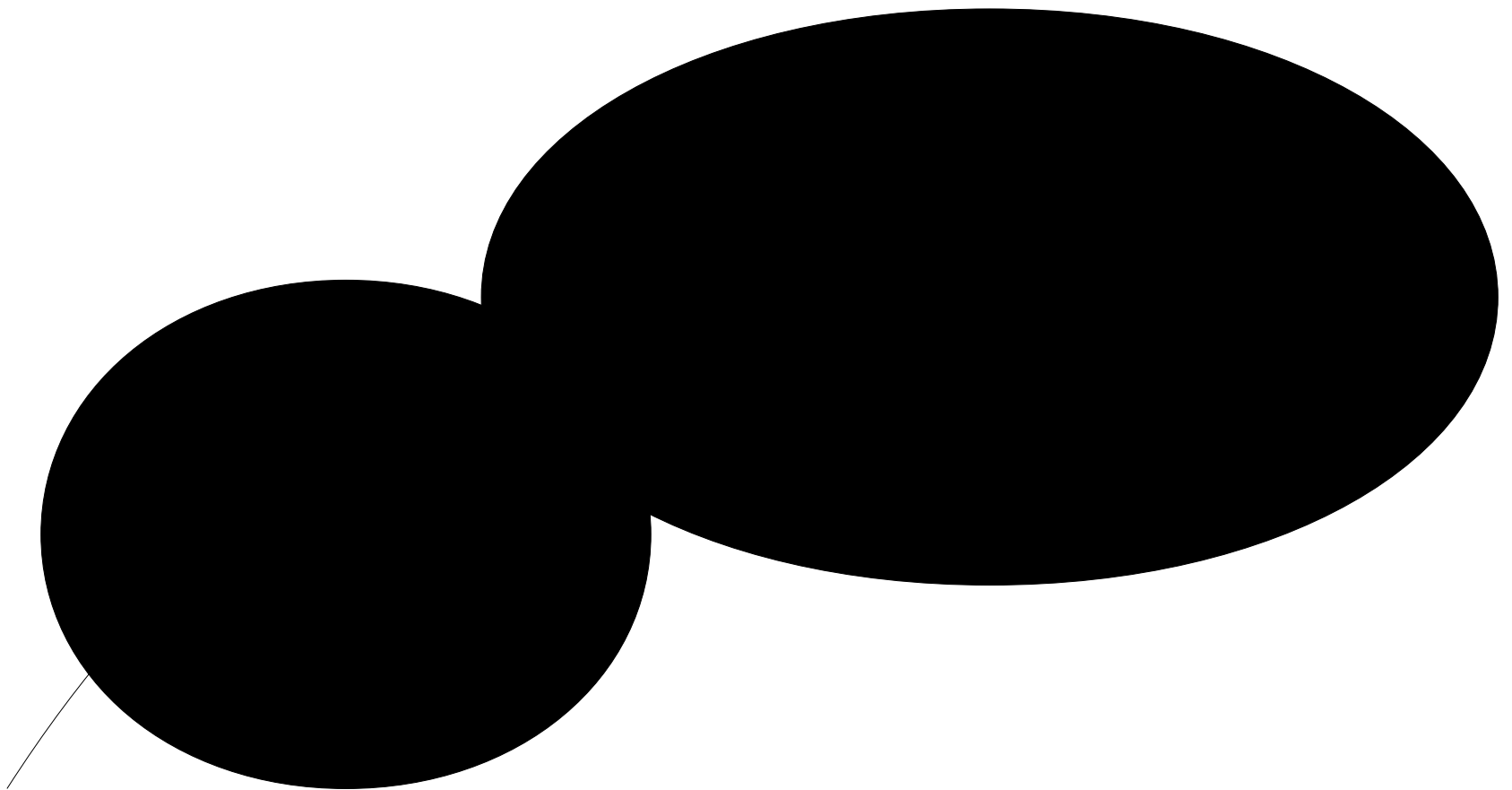
Power



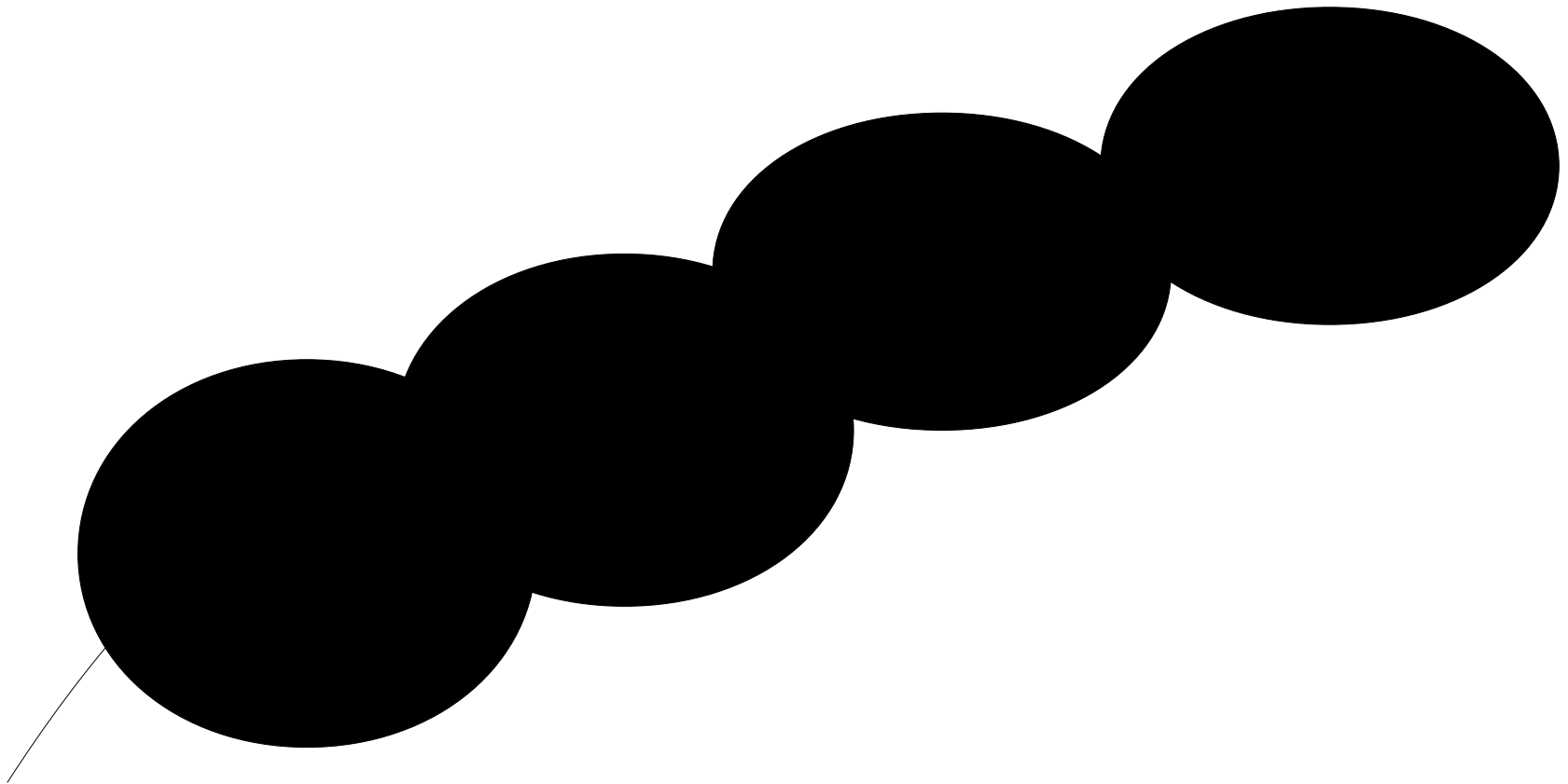
Правила

- If angle = zero and distance = far then power = mediumforward.
- If angle = smallneg and distance = far then power = bigforward.
- If angle = smallneg and distance = medium then power = bigforward.
- If angle = bigneg and distance = medium then power = mediumforward.
- If angle = smallpos and distance = small then power = mediumback.
- If angle = zero and distance = small then power = stop.
- If angle = smallneg and distance = small then power = mediumforward.
- If angle = zero and distance = aboutzero then power = stop.
- If angle = smallpos and distance = aboutzero then power = mediumforward.
- If distance = stopping- then power = smallback.
- If distance = stopping+ then power = smallforward.

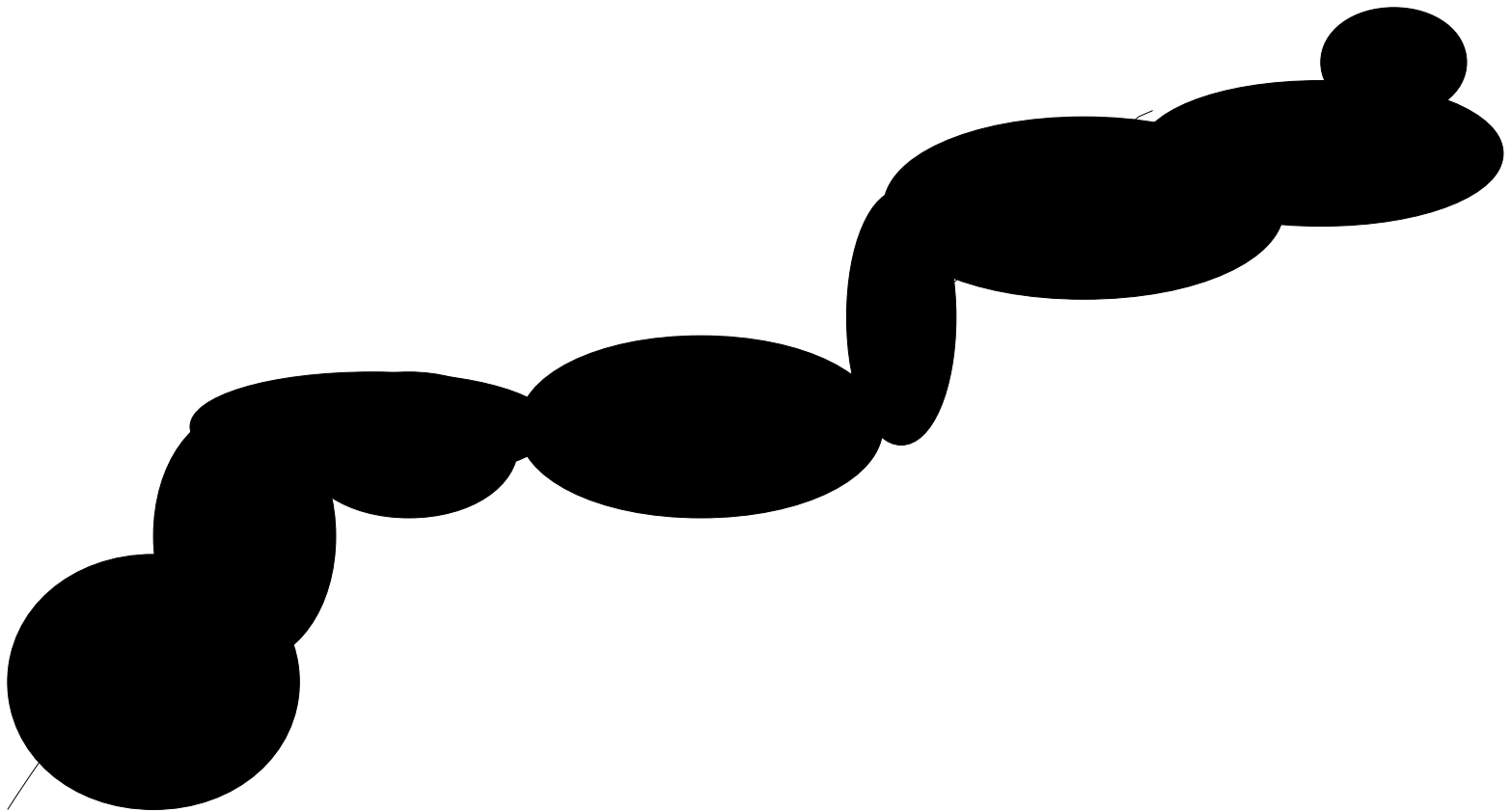
Математическое обоснование



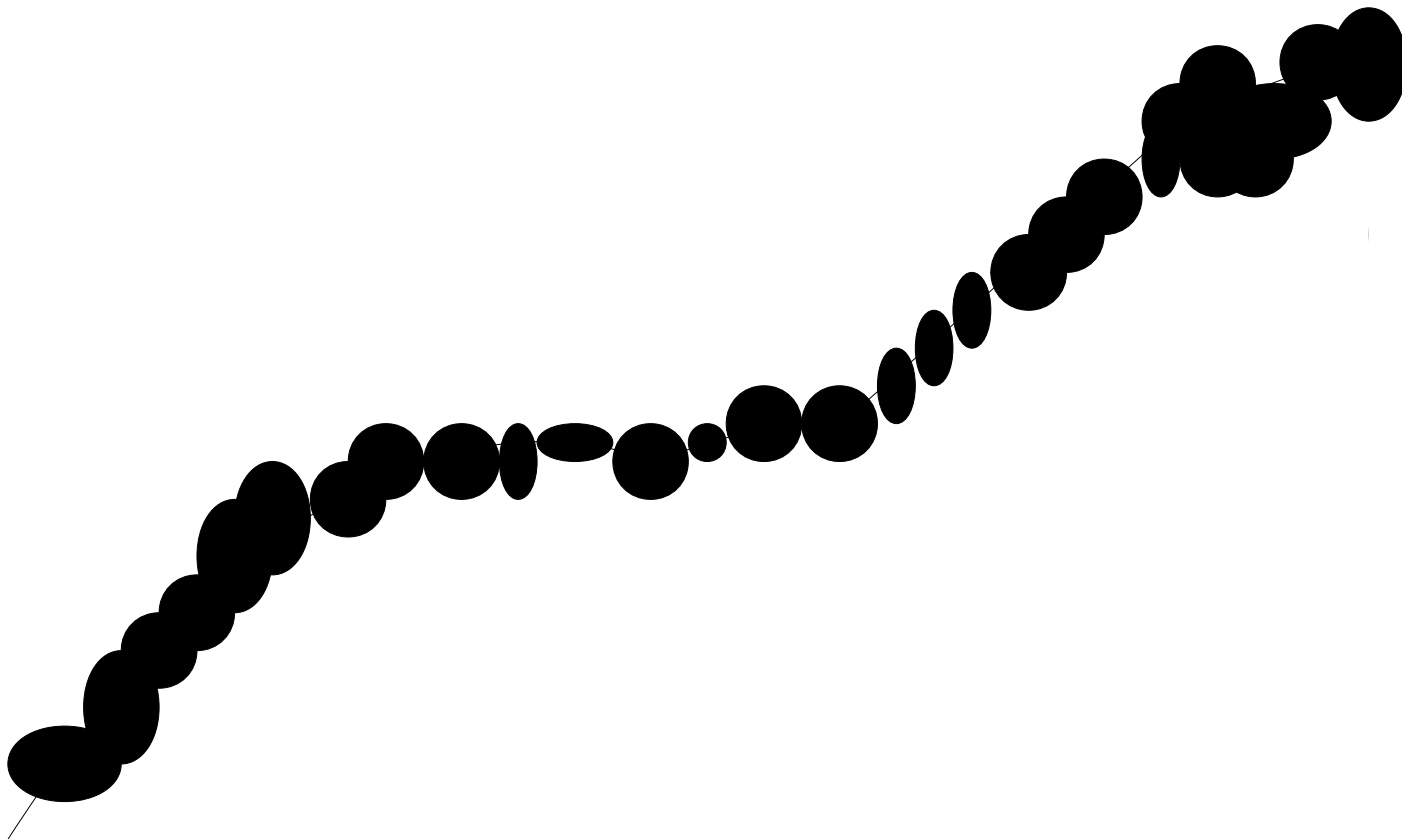
Математическое обоснование



Математическое обоснование

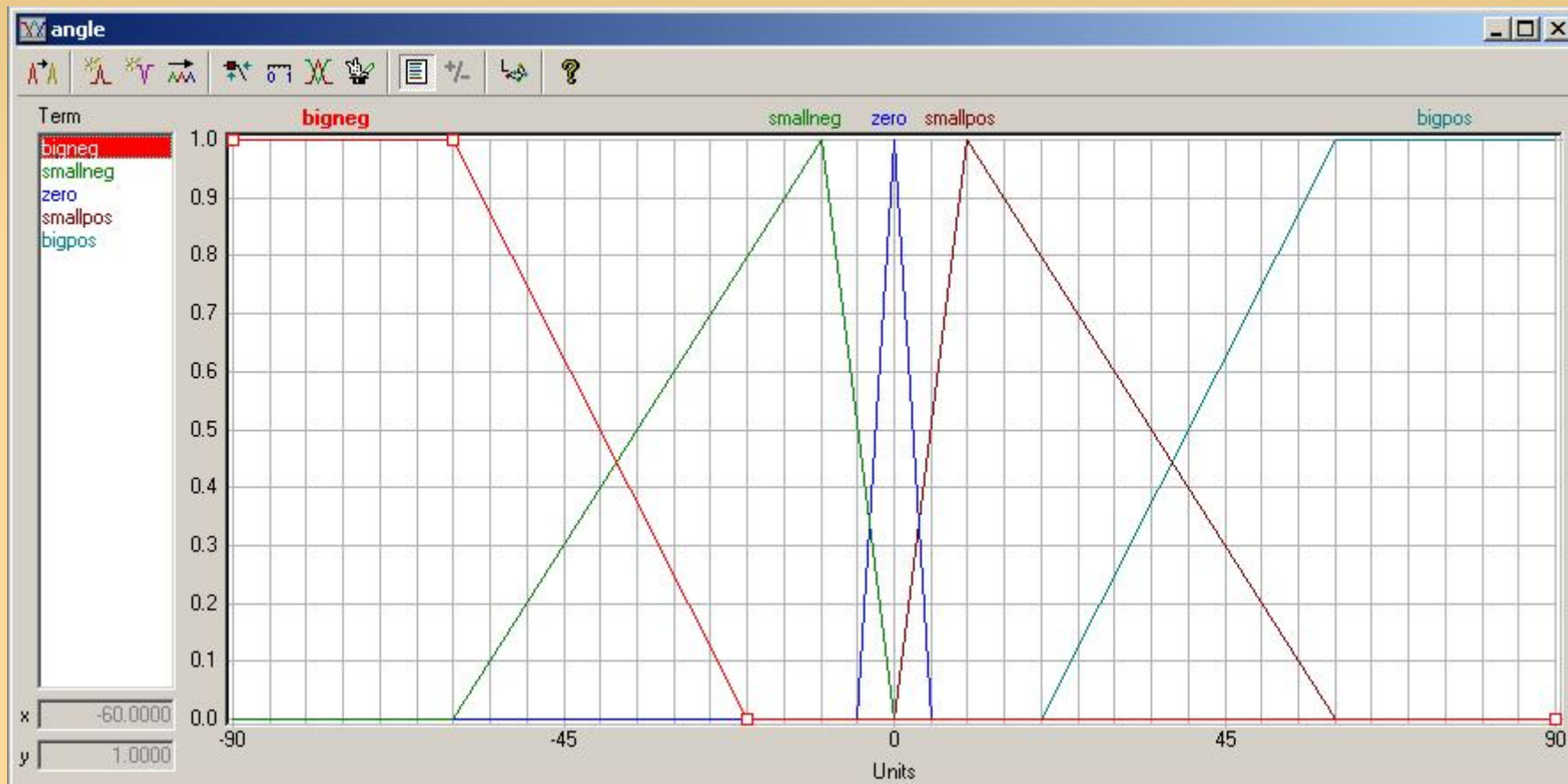


Математическое обоснование



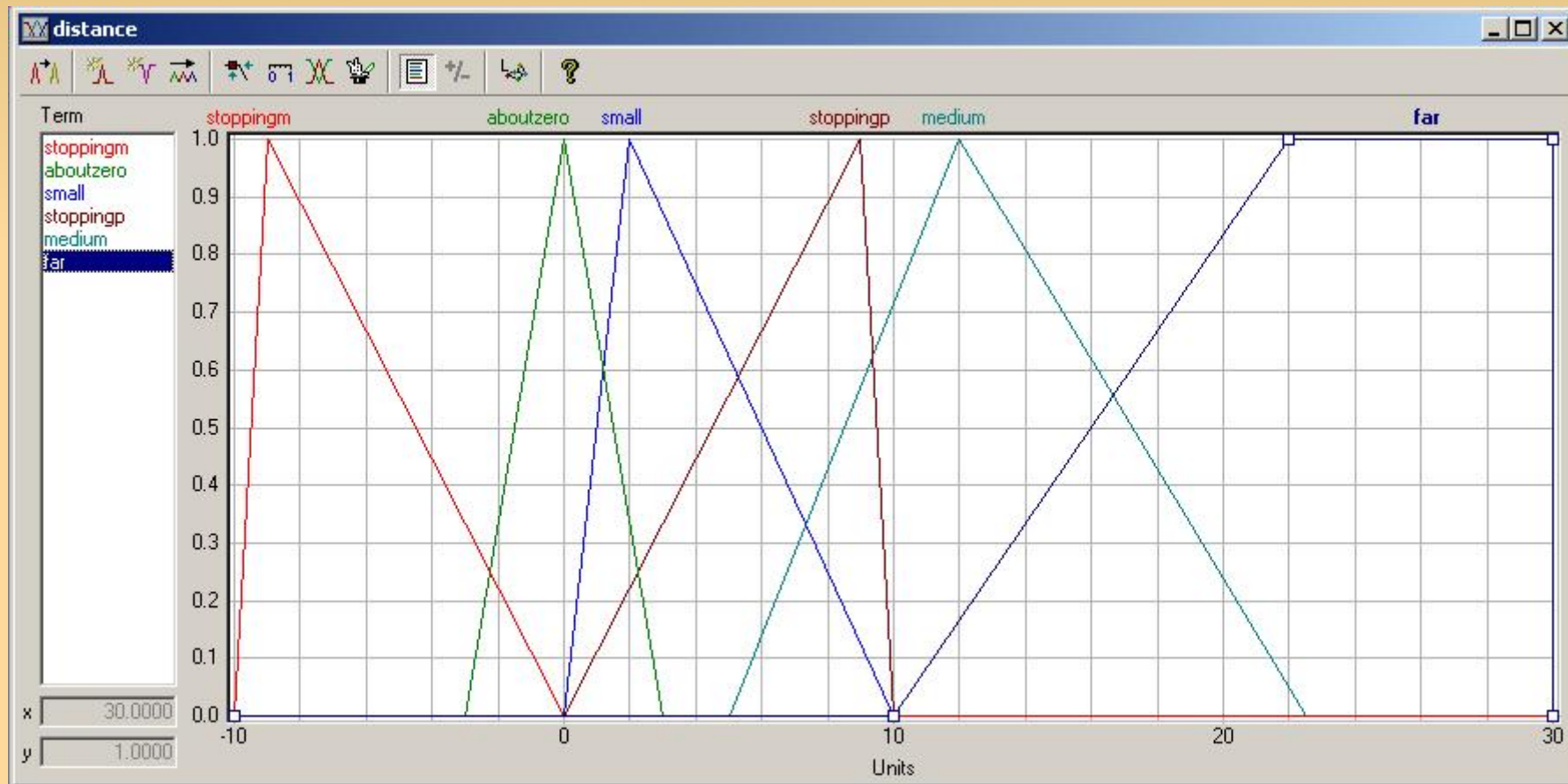
fuzzyTECH

- Представление переменных.



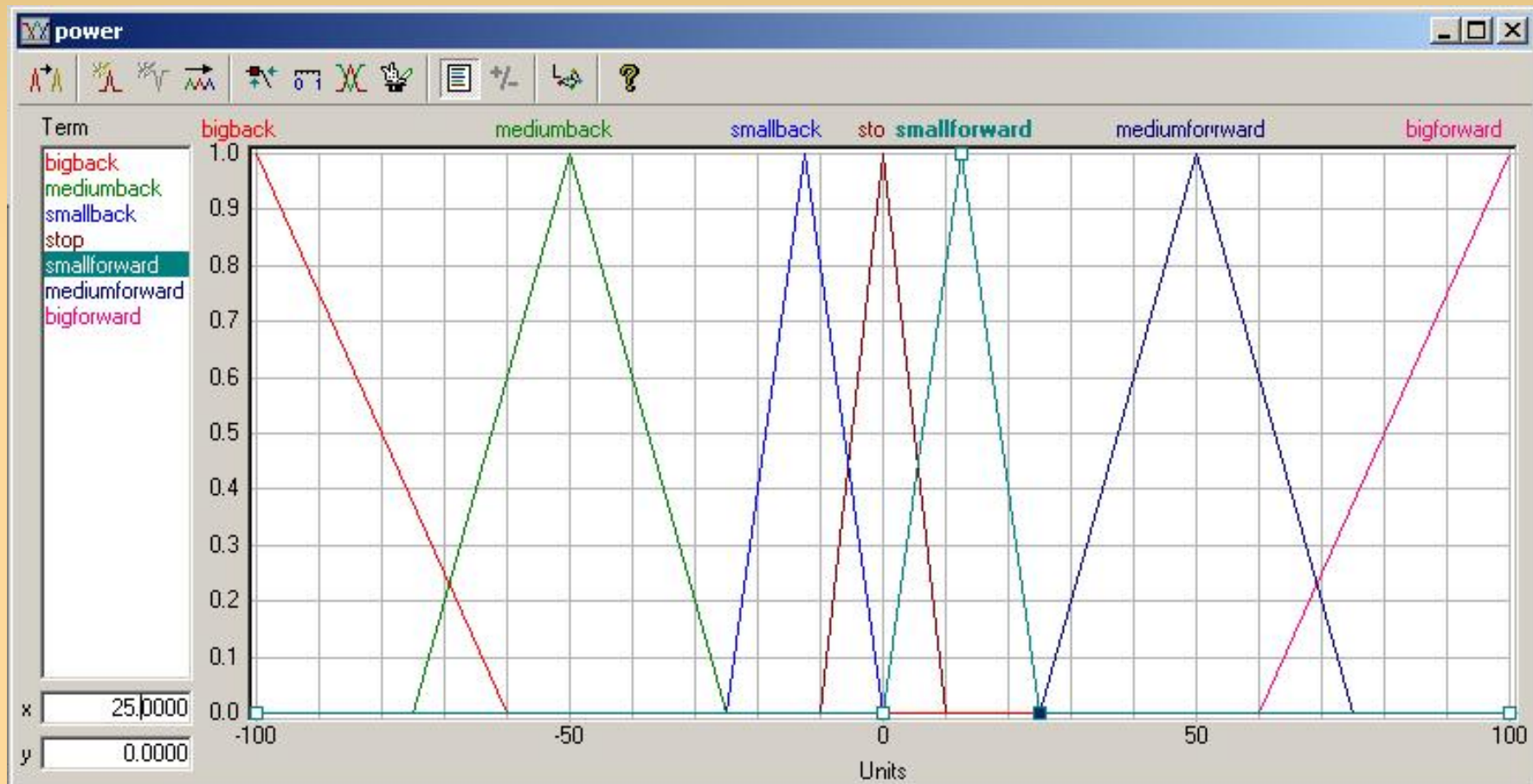
fuzzyTECH

- Представление переменных.



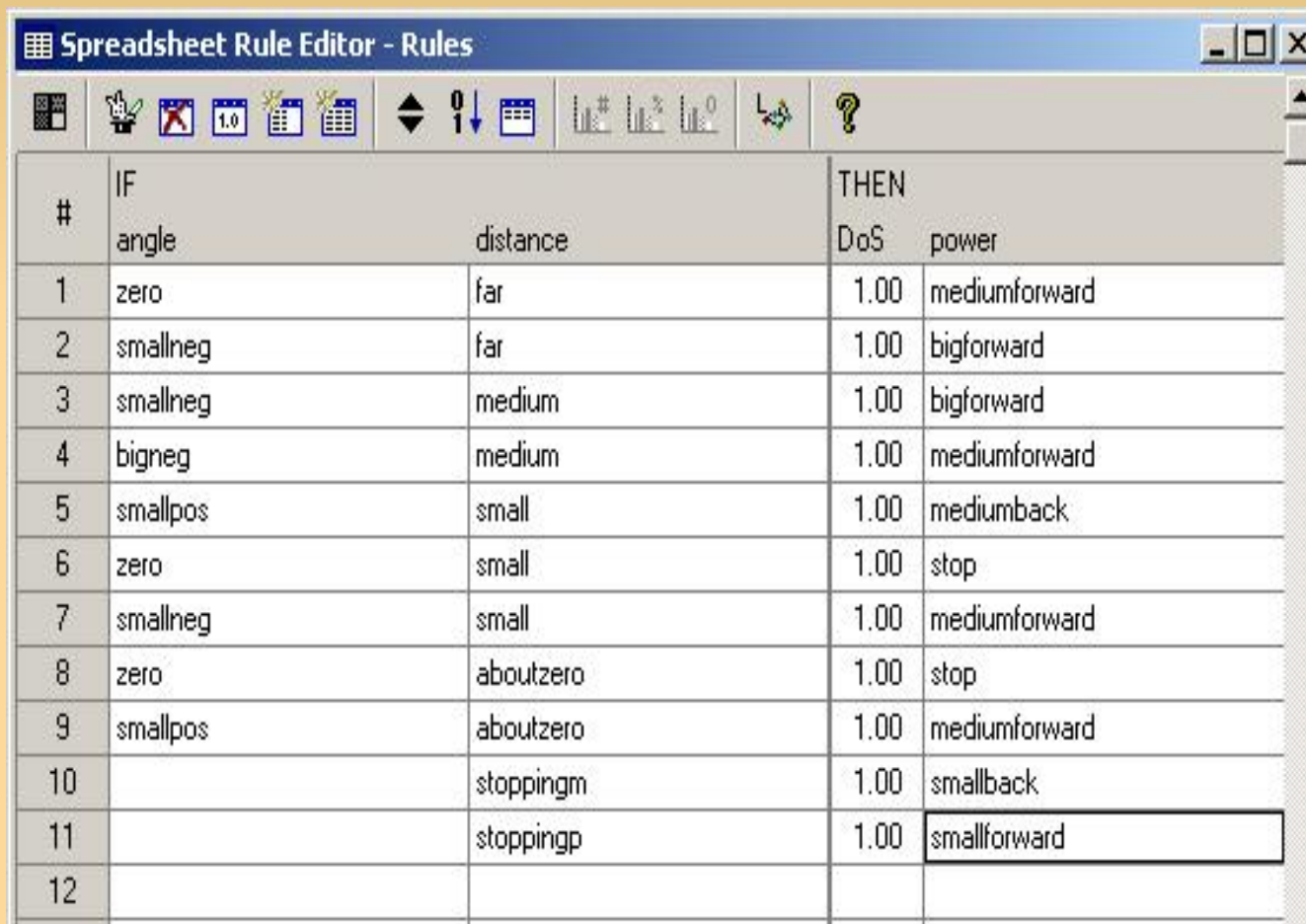
fuzzyTECH

- Представление переменных.



fuzzyTECH

- Представление правил

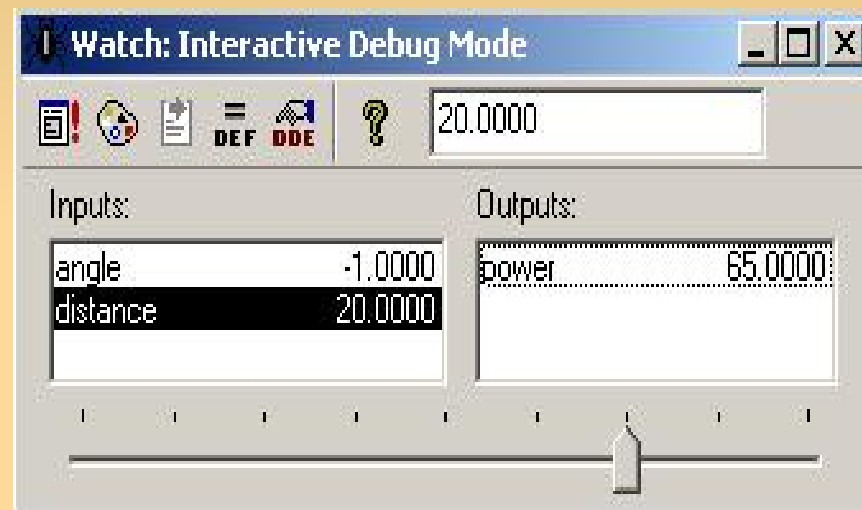


The screenshot shows a window titled "Spreadsheet Rule Editor - Rules" with a toolbar and a table of rules. The table has columns for rule number, IF conditions (angle and distance), and THEN actions (DoS and power).

#	IF	THEN		
	angle	distance	DoS	power
1	zero	far	1.00	mediumforward
2	smallneg	far	1.00	bigforward
3	smallneg	medium	1.00	bigforward
4	bigneg	medium	1.00	mediumforward
5	smallpos	small	1.00	mediumback
6	zero	small	1.00	stop
7	smallneg	small	1.00	mediumforward
8	zero	aboutzero	1.00	stop
9	smallpos	aboutzero	1.00	mediumforward
10		stoppingm	1.00	smallback
11		stoppingp	1.00	smallforward
12				

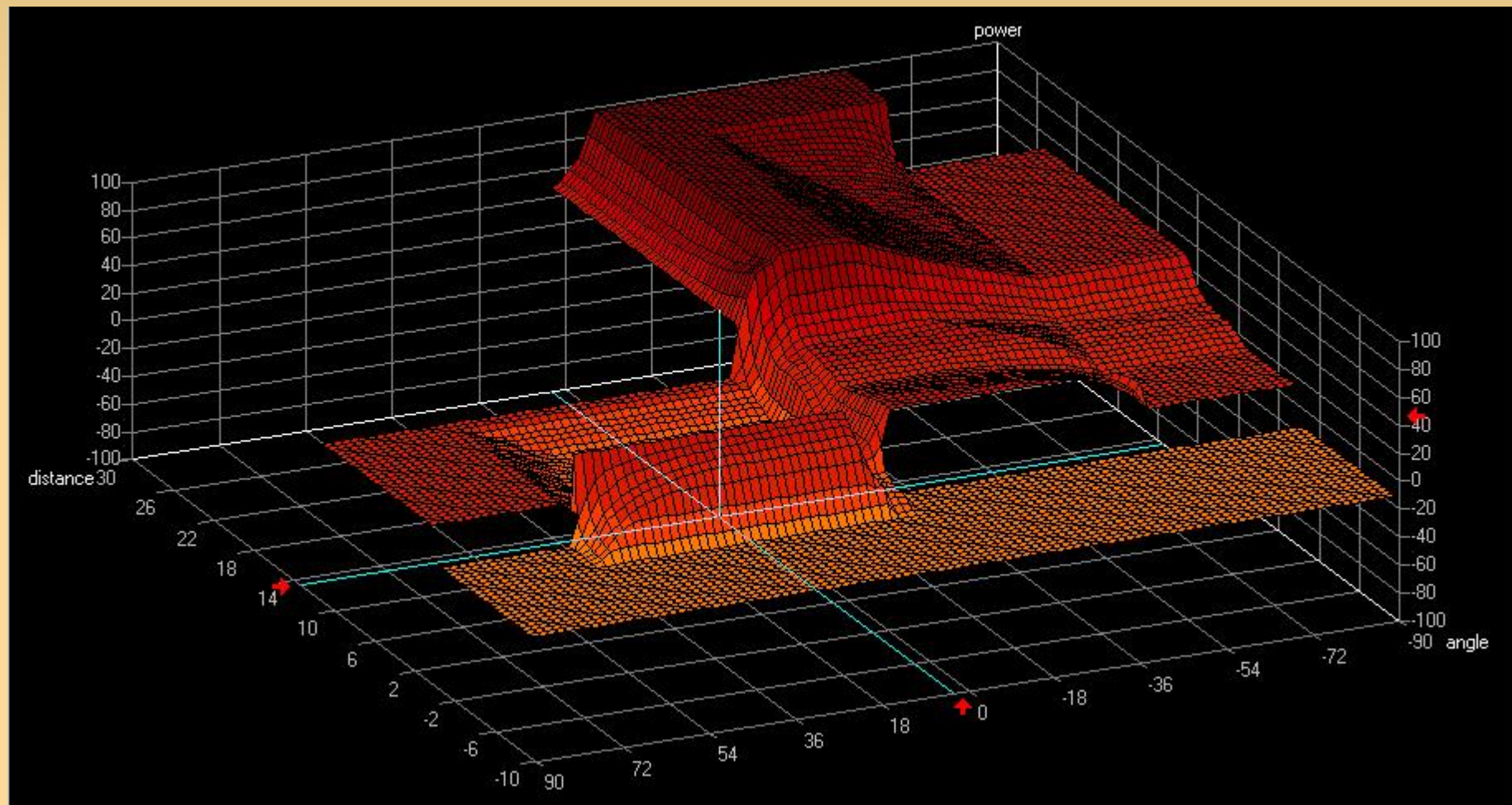
fuzzyTECH

- Проверка результатов



fuzzyTECH

- Проверка результатов

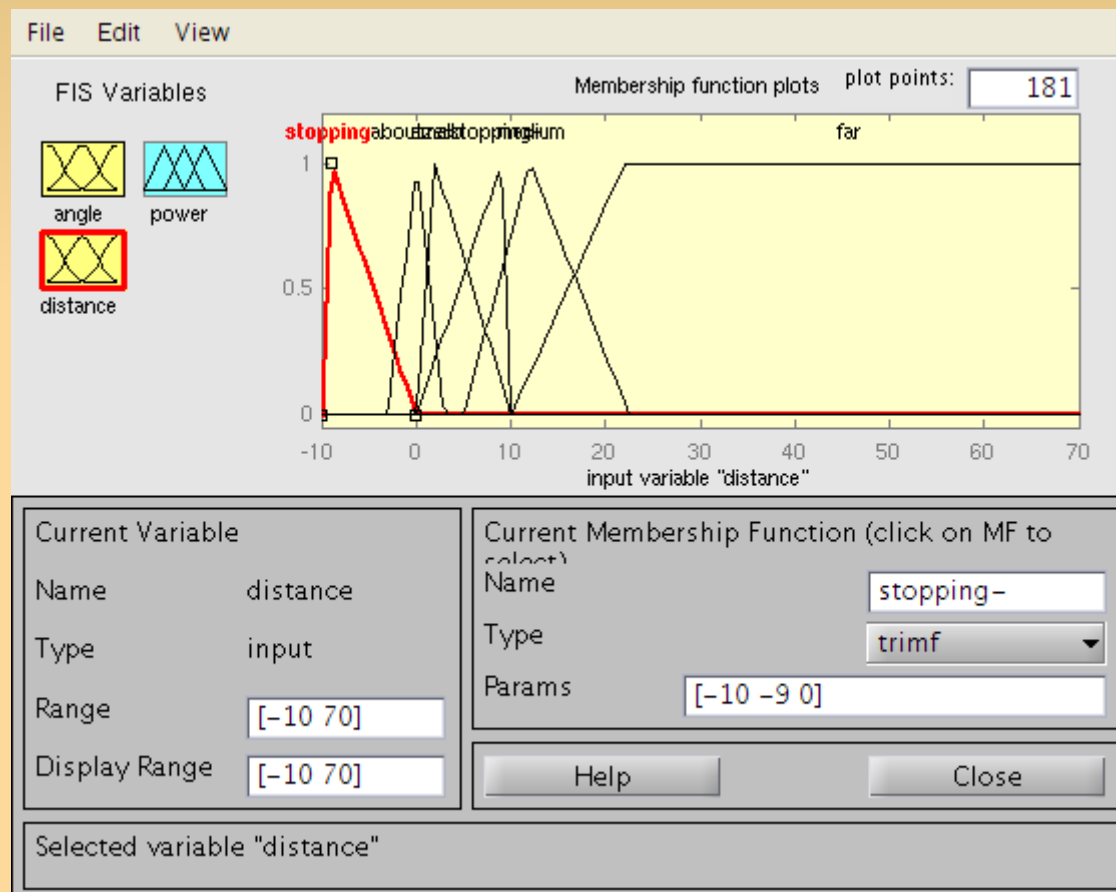


Matlab

Код функции

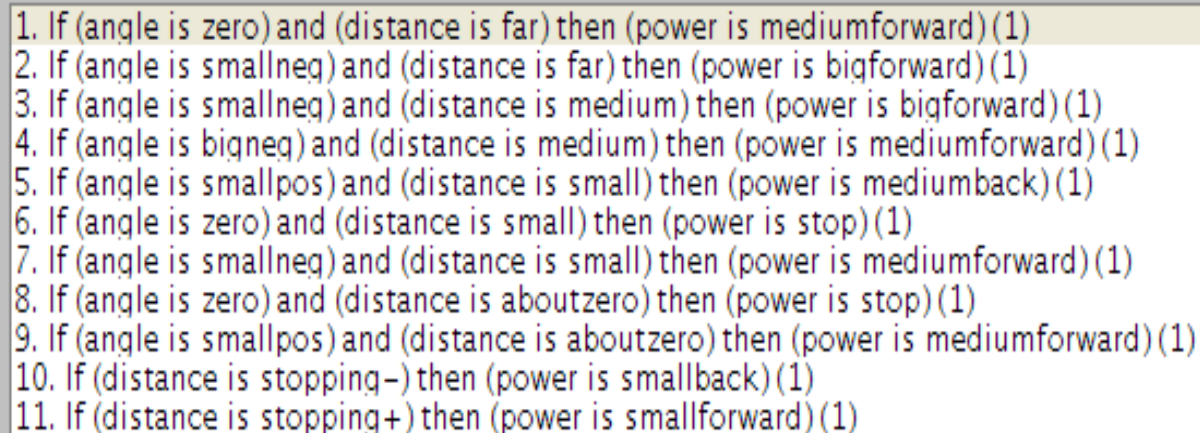
Matlab

```
>>fuzzy(megafunction(70))
```



Matlab

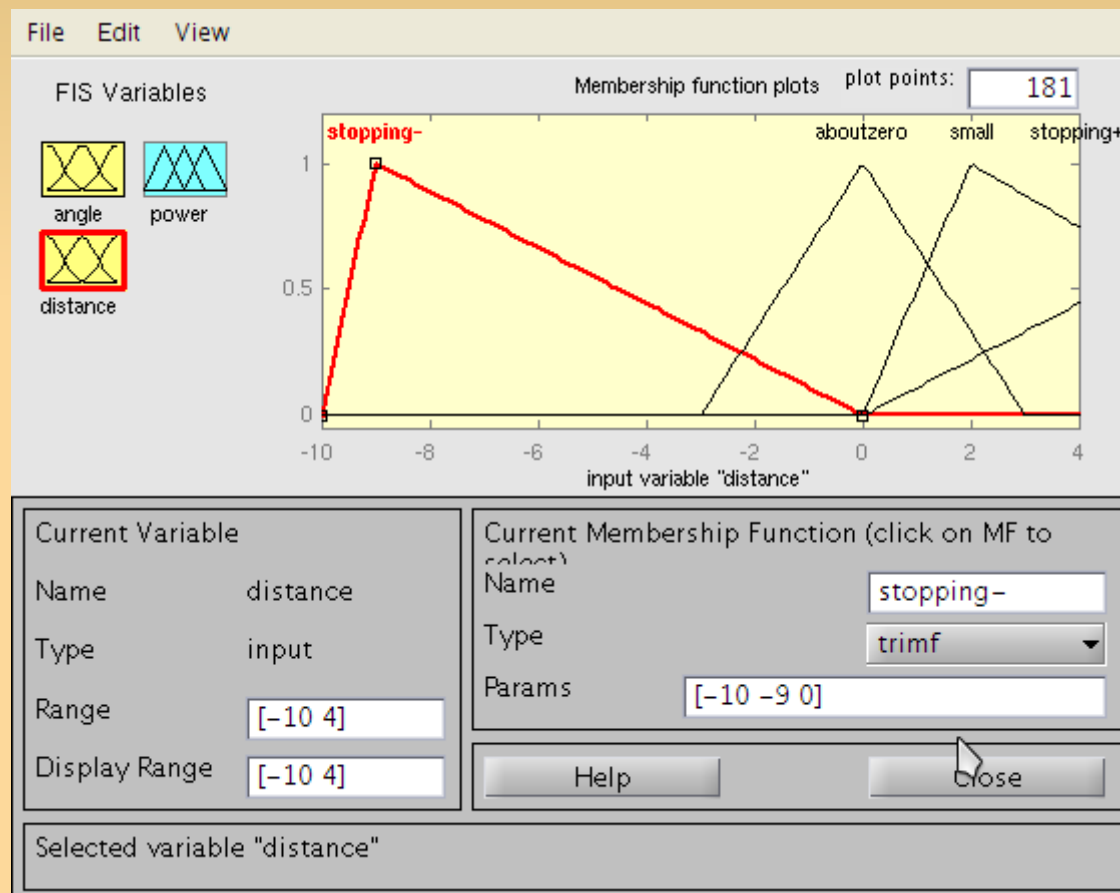
```
>>fuzzy(megafunction(70))
```



```
1. If (angle is zero) and (distance is far) then (power is mediumforward) (1)
2. If (angle is smallneg) and (distance is far) then (power is bigforward) (1)
3. If (angle is smallneg) and (distance is medium) then (power is bigforward) (1)
4. If (angle is bigneg) and (distance is medium) then (power is mediumforward) (1)
5. If (angle is smallpos) and (distance is small) then (power is mediumback) (1)
6. If (angle is zero) and (distance is small) then (power is stop) (1)
7. If (angle is smallneg) and (distance is small) then (power is mediumforward) (1)
8. If (angle is zero) and (distance is aboutzero) then (power is stop) (1)
9. If (angle is smallpos) and (distance is aboutzero) then (power is mediumforward) (1)
10. If (distance is stopping-) then (power is smallback) (1)
11. If (distance is stopping+) then (power is smallforward) (1)
```

Matlab

```
>>fuzzy(megafunction(4))
```



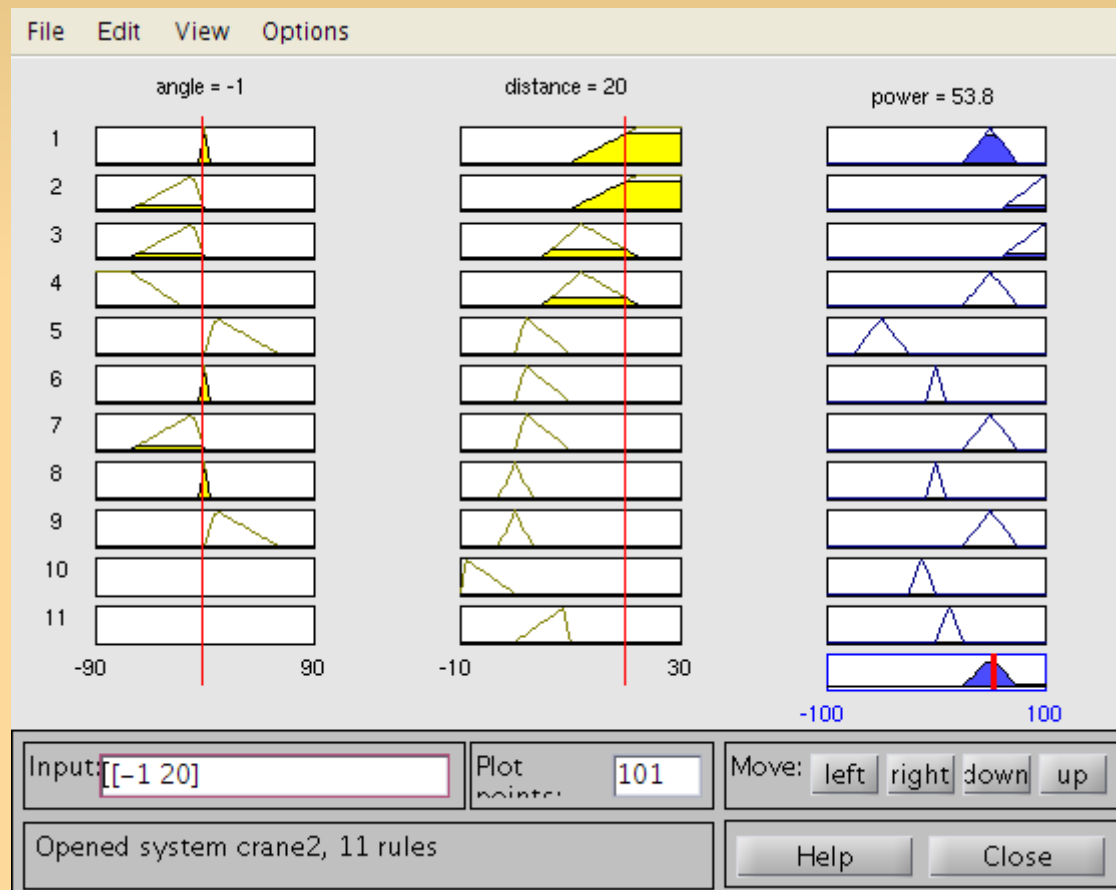
Matlab

```
>>fuzzy(megafunction(4))
```

```
1. If (angle is smallpos) and (distance is small) then (power is mediumback)(1)
2. If (angle is zero) and (distance is small) then (power is stop)(1)
3. If (angle is smallneg) and (distance is small) then (power is mediumforward)(1)
4. If (angle is zero) and (distance is aboutzero) then (power is stop)(1)
5. If (angle is smallpos) and (distance is aboutzero) then (power is mediumforward)
6. If (distance is stopping-) then (power is smallback)(1)
7. If (distance is stopping+) then (power is smallforward)(1)
```

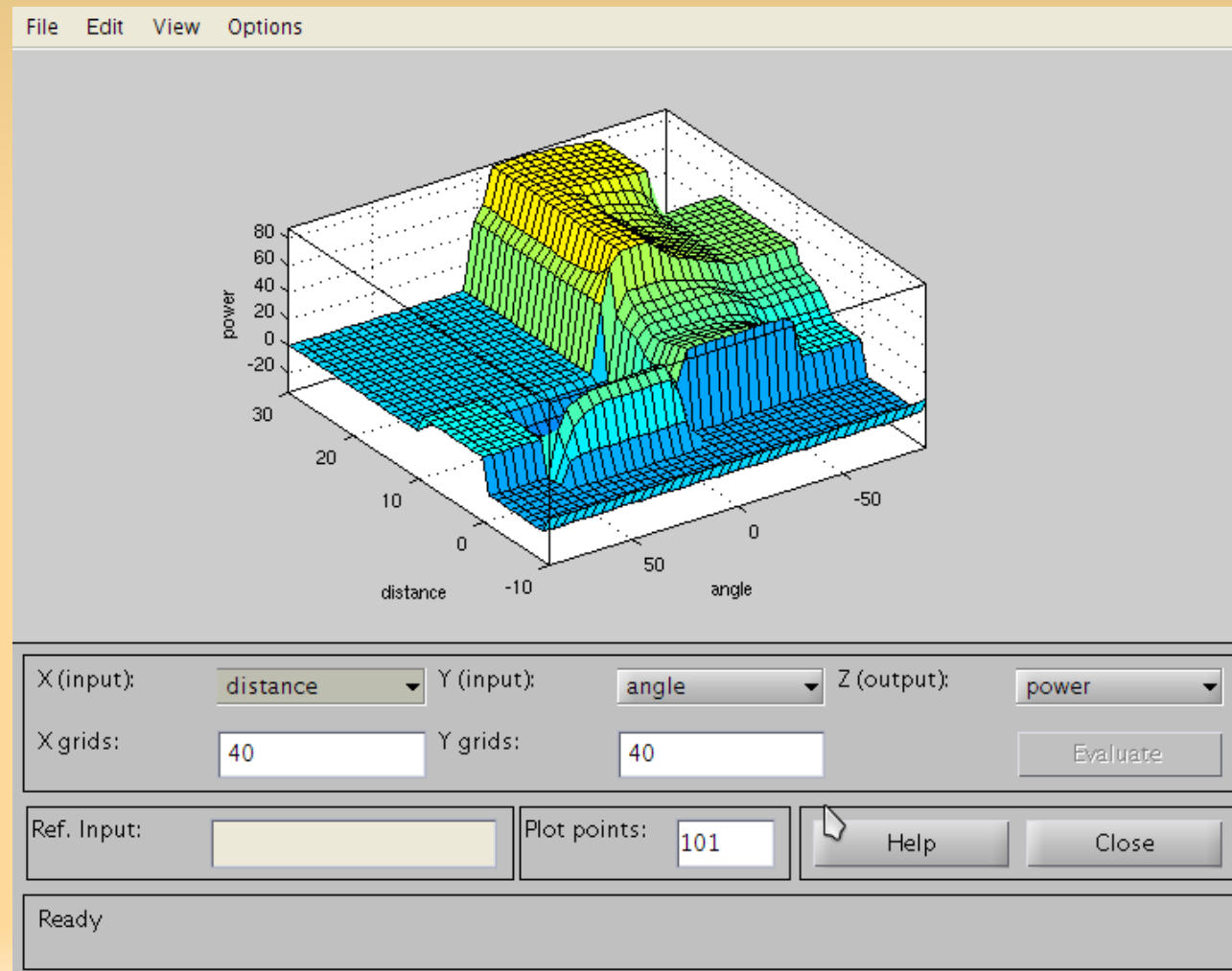
Matlab

- Проверка результатов



Matlab

- Проверка результатов



Итог

- Значения мощности отличаются между собой на 11.2.
- Построенные поверхности имеют схожий вид.

Итог

В силу отсутствия контейнерного крана, определить, которая из систем лучше справляется с поставленной задачей, не представляется возможным.

