FuzzySystem.fs

Sunday, October 29, 2023 - 8:29 PM

Input variables

Name	Range	Number of membership functions
PH	0 -> 14	3
TDS	0 -> 2000	3
Turbidity	0 -> 5	2
ORP	-1500 -> 1500	2

Output variables

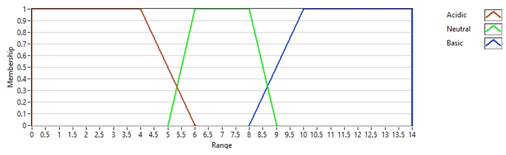
Name	Range	Number of membership functions
Drinkability	0 -> 100	3

Defuzzification method: Center of Area

Input membership functions

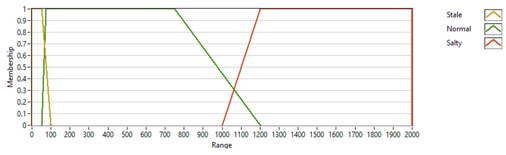
PH

Membership function	Shape	Points
Acidic	Trapezoid	0 ; 0 ; 4 ; 6
Neutral	Trapezoid	5 ; 6 ; 8 ; 9
Basic	Trapezoid	8 ; 10 ; 14 ; 14



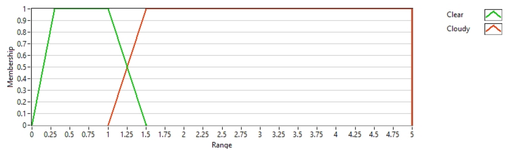
TDS

Membership function	Shape	Points
Stale	Trapezoid	0 ; 0 ; 50 ; 100
Normal	Trapezoid	50 ; 75 ; 750 ; 1200
Salty	Trapezoid	1000 ; 1200 ; 2000 ; 2000



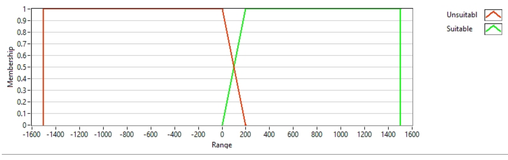
Turbidity

Membership function	Shape	Points
Clear	Trapezoid	0 ; 0.3 ; 1 ; 1.5
Cloudy	Trapezoid	1 ; 1.5 ; 5 ; 5



ORP

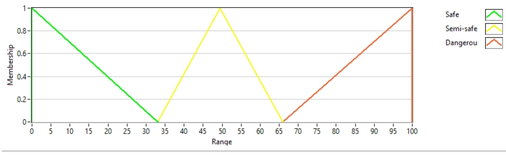
Membership function	Shape	Points
Unsuitable	Trapezoid	-1500 ; -1500 ; 0 ; 200
Suitable	Trapezoid	0 ; 200 ; 1500 ; 1500



Output membership functions

Drinkability

Membership function	Shape	Points
Safe	Triangle	0 ; 0 ; 33
Semi-safe	Triangle	33 ; 49.5 ; 66
Dangerous	Triangle	66 ; 100 ; 100



Rules

1. IF 'PH' IS 'Acidic' AND 'TDS' IS 'Stale' AND 'Turbidity' IS 'Clear' AND 'ORP' IS 'Unsuitable' THEN 'Drinkability' IS 'Dangerous'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

2. IF 'PH' IS 'Acidic' AND 'TDS' IS 'Stale' AND 'Turbidity' IS 'Clear' AND 'ORP' IS 'Suitable' THEN 'Drinkability' IS 'Dangerous'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

3. IF 'PH' IS 'Acidic' AND 'TDS' IS 'Stale' AND 'Turbidity' IS 'Cloudy' AND 'ORP' IS 'Unsuitable' THEN 'Drinkability' IS 'Dangerous'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

4. IF 'PH' IS 'Acidic' AND 'TDS' IS 'Stale' AND 'Turbidity' IS 'Cloudy' AND 'ORP' IS 'Suitable' THEN 'Drinkability' IS 'Dangerous'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

5. IF 'PH' IS 'Acidic' AND 'TDS' IS 'Normal' AND 'Turbidity' IS 'Clear' AND 'ORP' IS 'Unsuitable' THEN 'Drinkability' IS 'Dangerous'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

6. IF 'PH' IS 'Acidic' AND 'TDS' IS 'Normal' AND 'Turbidity' IS 'Clear' AND 'ORP' IS 'Suitable' THEN 'Drinkability' IS 'Dangerous'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

7. IF 'PH' IS 'Acidic' AND 'TDS' IS 'Normal' AND 'Turbidity' IS 'Cloudy' AND 'ORP' IS 'Unsuitable' THEN 'Drinkability' IS 'Dangerous'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

8. IF 'PH' IS 'Acidic' AND 'TDS' IS 'Normal' AND 'Turbidity' IS 'Cloudy' AND 'ORP' IS 'Suitable' THEN 'Drinkability' IS 'Dangerous'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

9. IF 'PH' IS 'Acidic' AND 'TDS' IS 'Salty' AND 'Turbidity' IS 'Clear' AND 'ORP' IS 'Unsuitable' THEN 'Drinkability' IS 'Dangerous'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

10. IF 'PH' IS 'Acidic' AND 'TDS' IS 'Salty' AND 'Turbidity' IS 'Clear' AND 'ORP' IS 'Suitable' THEN 'Drinkability' IS 'Dangerous'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

11. IF 'PH' IS 'Acidic' AND 'TDS' IS 'Salty' AND 'Turbidity' IS 'Cloudy' AND 'ORP' IS 'Unsuitable' THEN 'Drinkability' IS 'Dangerous'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

12. IF 'PH' IS 'Acidic' AND 'TDS' IS 'Salty' AND 'Turbidity' IS 'Cloudy' AND 'ORP' IS 'Suitable' THEN 'Drinkability' IS 'Dangerous'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

13. IF 'PH' IS 'Neutral' AND 'TDS' IS 'Stale' AND 'Turbidity' IS 'Clear' AND 'ORP' IS 'Unsuitable' THEN 'Drinkability' IS 'Semi-safe'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

14. IF 'PH' IS 'Neutral' AND 'TDS' IS 'Stale' AND 'Turbidity' IS 'Clear' AND 'ORP' IS 'Suitable' THEN 'Drinkability' IS 'Safe'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

15. IF 'PH' IS 'Neutral' AND 'TDS' IS 'Stale' AND 'Turbidity' IS 'Cloudy' AND 'ORP' IS 'Unsuitable' THEN 'Drinkability' IS 'Semi-safe'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

16. IF 'PH' IS 'Neutral' AND 'TDS' IS 'Stale' AND 'Turbidity' IS 'Cloudy' AND 'ORP' IS 'Suitable' THEN 'Drinkability' IS 'Semi-safe'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

17. IF 'PH' IS 'Neutral' AND 'TDS' IS 'Normal' AND 'Turbidity' IS 'Clear' AND 'ORP' IS 'Unsuitable' THEN 'Drinkability' IS 'Semi-safe'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

18. IF 'PH' IS 'Neutral' AND 'TDS' IS 'Normal' AND 'Turbidity' IS 'Clear' AND 'ORP' IS 'Suitable' THEN 'Drinkability' IS 'Safe'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

19. IF 'PH' IS 'Neutral' AND 'TDS' IS 'Normal' AND 'Turbidity' IS 'Cloudy' AND 'ORP' IS 'Unsuitable' THEN 'Drinkability' IS 'Semi-safe'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

20. IF 'PH' IS 'Neutral' AND 'TDS' IS 'Normal' AND 'Turbidity' IS 'Cloudy' AND 'ORP' IS 'Suitable' THEN 'Drinkability' IS 'Semi-safe'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

21. IF 'PH' IS 'Neutral' AND 'TDS' IS 'Salty' AND 'Turbidity' IS 'Clear' AND 'ORP' IS 'Unsuitable' THEN 'Drinkability' IS 'Semi-safe'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

22. IF 'PH' IS 'Neutral' AND 'TDS' IS 'Salty' AND 'Turbidity' IS 'Clear' AND 'ORP' IS 'Suitable' THEN 'Drinkability' IS 'Semi-safe'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

23. IF 'PH' IS 'Neutral' AND 'TDS' IS 'Salty' AND 'Turbidity' IS 'Cloudy' AND 'ORP' IS 'Unsuitable' THEN 'Drinkability' IS 'Semi-safe'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

24. IF 'PH' IS 'Neutral' AND 'TDS' IS 'Salty' AND 'Turbidity' IS 'Cloudy' AND 'ORP' IS 'Suitable' THEN 'Drinkability' IS 'Semi-safe'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

25. IF 'PH' IS 'Basic' AND 'TDS' IS 'Stale' AND 'Turbidity' IS 'Clear' AND 'ORP' IS 'Unsuitable' THEN 'Drinkability' IS 'Dangerous'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

26. IF 'PH' IS 'Basic' AND 'TDS' IS 'Stale' AND 'Turbidity' IS 'Clear' AND 'ORP' IS 'Suitable' THEN 'Drinkability' IS 'Dangerous'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

27. IF 'PH' IS 'Basic' AND 'TDS' IS 'Stale' AND 'Turbidity' IS 'Cloudy' AND 'ORP' IS 'Unsuitable' THEN 'Drinkability' IS 'Dangerous'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

28. IF 'PH' IS 'Basic' AND 'TDS' IS 'Stale' AND 'Turbidity' IS 'Cloudy' AND 'ORP' IS 'Suitable' THEN 'Drinkability' IS 'Dangerous'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

29. IF 'PH' IS 'Basic' AND 'TDS' IS 'Normal' AND 'Turbidity' IS 'Clear' AND 'ORP' IS 'Unsuitable' THEN 'Drinkability' IS 'Dangerous'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

30. IF 'PH' IS 'Basic' AND 'TDS' IS 'Normal' AND 'Turbidity' IS 'Clear' AND 'ORP' IS 'Suitable' THEN 'Drinkability' IS 'Dangerous'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

31. IF 'PH' IS 'Basic' AND 'TDS' IS 'Normal' AND 'Turbidity' IS 'Cloudy' AND 'ORP' IS 'Unsuitable' THEN 'Drinkability' IS 'Dangerous'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

32. IF 'PH' IS 'Basic' AND 'TDS' IS 'Normal' AND 'Turbidity' IS 'Cloudy' AND 'ORP' IS 'Suitable' THEN 'Drinkability' IS 'Dangerous'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

33. IF 'PH' IS 'Basic' AND 'TDS' IS 'Salty' AND 'Turbidity' IS 'Clear' AND 'ORP' IS 'Unsuitable' THEN 'Drinkability' IS 'Dangerous'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

34. IF 'PH' IS 'Basic' AND 'TDS' IS 'Salty' AND 'Turbidity' IS 'Clear' AND 'ORP' IS 'Suitable' THEN 'Drinkability' IS 'Dangerous'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

35. IF 'PH' IS 'Basic' AND 'TDS' IS 'Salty' AND 'Turbidity' IS 'Cloudy' AND 'ORP' IS 'Unsuitable' THEN 'Drinkability' IS 'Dangerous'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00

36. IF 'PH' IS 'Basic' AND 'TDS' IS 'Salty' AND 'Turbidity' IS 'Cloudy' AND 'ORP' IS 'Suitable' THEN 'Drinkability' IS 'Dangerous'
connective: AND (Minimum) ; implication: Minimum ; degree of support: 1.00