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UNCERTAIN INPUT SELECTION MODEL FOR NEURON

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ABSTRACT

The application of Artificial Neural Network model does not provide optimal results in learning with the large quantity of inputs and real time. The input stated in matrix with plenty of quantity makes the process in pattern recognition getting slow. A model is required to minimize input for training and to recognize patterns faster. Input recognition is required to know the special characteristics of inputs which may represent all inputs using a model. In addition, input recognition is necessary to know the inputs with the binary value not only 1 and 0, but it may be with the value in between. To know uncertain inputs, it is conducted by determining the degree of membership of each variable. And, for each selection of input, it can be done by declaring it as a row vector and by calculating the euclidean distance between each row vector. Furthermore, the selected input may represent input for training. Training is carried out with input variables consisting of dissolved oxygen, water pH, salinity and water temperature to determine the quality of water. With the model algorithm which is called as Uncertain Input Selection Model for neurons, it helps to accelerate training in the system to determine the water wheel can rotate.

Keywords: *Selection, Input, Uncertain, Euclidean*

1. INTRODUCTION

At the time of the 21st century, it is faced with the 4.0 industrial revolution which is as the digital era along with the Internet of Things (IoT) where all devices connected in the world of internet network, neuro technology, nano technology and artificial intelligence collaborate to be smart devices. Developing the knowledge of artificial intelligence is necessary, especially the latest hardware development. With more efficient computation algoritm and complex as well as with the support of the availability of massive supporting data (wide scale) and large, it motivates the latest services such as artificial intelligence. One of the parts from the artificial intelligence is artificial neural network. Artificial Neural Network is a mathematical model in a collection unit connected in parallel with the form resembling neural network in human brain. According to the expert of artificial neural network, Haykin.S, the artificial neural network is such a processor which may save the knowledge and experience in order the processor may work like human brain to adaptate with any problem. Besides giving the training in the ability to analyze and calculate with some browsing methods, probability and certainty level, artificial neural network can think and adaptate with one problem both to controlled and uncontrolled learning. The system can also know from the previous decision taken by giving the reward in every time the system execute something correct. However, the model of artificial neural network in learning system is not effective for this time, slow learning process with the large number of inputs and for the hardware based system. For the network operation, the training is necessary for the large number of data and the time required for training process is too long [1]. The biggest weakness of the widely spread use of Multi Layer Perceptron using algoritm of Back Propagation in the application of real time is the slow speed in learning and it requires one training to upgrade network weight [2].

Some models of Neural Network such as McCulloch-Pitts use weight (w) and threshold value (θ) analitically. Other models perform more repetition in learning using the change of weight to get maximum weight, such as Delta Rule,

Perceptron, Kohonen Network, Hetereo Assosiatif Memory, Learning Vector Quantization, Heb Rule, Back Propagation. Also, the generalization ability is limited with binary [3]. And, the weakness of neural network is inefficient to perform aritmethic operations, logical operations and symbolics. The network requires the training to operate and it takes long time to operate for the large number of data. The strength of neural network is able to know the data entered even for incomplete data or for disrupted data. To represent the input and output data in artificial neural network, all must be changed into the value 0 dan 1. Of course, it requires pre-processing of input data manipulation and it takes longer time, CPU power and hard-disk space consumption. Usually, tools of neural network provide histogram to observe the categorical values and it can be automatically change the numerical values into the range 0 up to 1 [1]. In the learning process to determine the convergent or non-convergent, the form of activation and the number of neruons are determined in hidden layer [4]. The connection among neurons in the architecture of network is necessary to make good Neural Network [1]. One neuron model is required to determine the way of how to optimize the system learning to know one pattern during the process is lasting. In the autoassociative memory, it is by taking the information partially in order to construct the pattern previously saved, and in order every pattern is associated with own pattern. In any time, if incomplete input is entered into the network, the precise pattern can be still called [5]. The use of selection model is as a solution to determine initial weight [6] and as the choice to determine the optimum weight for artificial neural network [7] and the selection of algoritm can be become the solution [3]. The algoritm selection can solve the problem which requires the solution and can be quickly taken and easily implemented for the problem with quick change [1]. Next, other problem is varied inputs and the problem of linguistic should be managed in the neurall network by classifing them in real time [8]. A model is required in order to know the special input to represent the inputs and the system can recognize the pattern as the representation of the inputs [9]. At the time of designing neural network, the needs of node and layer should be considered. For big network, it is not possible by merely using learning method with capacity for small network [10]. In addition, for the online based system requiring real time, neurall network is difficult to apply [11]. Neural network has effective capability to perform non-linier system modelling with the mapping between input and output [12]. And, with the algoritm approach, the selection can be used to optimize the weight and parameter of neural network for substituting reverse propagation and try to find the initial weight and optimum weight for artificial neural network [7]. Further, the output of association unit in one simple perceptron is binary vector. The vector is required as input signal into output unit in each part following it [3]. And, Artificial Neural Network still requires the intervention of experts in asserting the knowledge and in examining the data. The proposed model is named as Uncertain Input Selection Model for Neuron to be tested in one quality of water with the variables of dissolved oxygen, temperature, and water pH.

2. THE PROPOSED METHOD

The proposed method from the artificial neural network is the model which is able to select the input by minimizing the entered inputs with the selection from all inputs which may represent all the inputs making faster learning process. For the selection of input, the approach of vector form by calculating the euclidean distance from the input vector entered from the whole inputs. To perform the process in uncertain input can be carried out with the function of membership in order that it can be known by the system. And, the selection input can be simplified with logical function of OR (max function) for simpler of the input. Next, the input is trained to get best weight up to the appropriate target determined. After that, with the weight, it can be used for conducting the testing. The steps in making the model is as follows;

a. Forming matris input
   The accepted input from some variables determined is arranged in the form of vector. Further, the accepted input from the vector form will be changed into the matrix form.

$$\begin{bmatrix} v11 & v12 & v1n \\ v21 & & \\ v3n & & \end{bmatrix}$$

b. Forming the membership degree from the input
   In order that it can be selected, the ambiguity of uncertain inputs which can not be processed by neurons, then, it should be changed

into 0, 1 and in-between with the model uncertainty.

c. Forming the preference weight of each criteria from the determined variables.
To choose in-between of the inputs, the variables must be selected from some criteria from the variable into input 1 by determining the number of preference weight of each criteria for every variable. With the preference weight, it can be used to select the input based on its weight in getting input 1 from some criteria in variable 1.

d. The preference weight is determined to calculate each value of the criteria in every variable. The value of preference weight is calculated from each input based on the criteria of the variable in order it can be selected.

e. Selecting with OR function (max function)
Conducting the selection of every criteria based on the preference weight with OR function (max function) by seeking of the highest value.

f. Selecting the input by calculating the euclidean distance between each line vector to represent the input.

g. Conducting the training and testing.

3. METHOD

3.1. The function of membership

The function of membership is as a graphic to represent the number of each membership degree of input variables in the interval between 0 and 1. The used of input variables are free variables, namely dissolved oxygen, pH, temperature and water salinity.The produced output are as independent variables, namely water quality and rotation control of windmill. The water wheelrotates if the quality is not good and the water wheeldoes not rotate if the quality of water is not good [1].

3.2 Neurons

Neurons are the information processing unit as the base in the operation of neural network. In human brain, one neuron or certain neural cell collects the signal of stimulation from other neuron through dendrite. The incoming signal accepted by the dendrite will be added up and sent through axon into last dendrite touched with the denrite from other neurons. The signal will be accepted by other neurons if it fullfills certain threshold value and the neurons can be activated. Learning occurs at the time of any connection between one neuron with other neurons in adaptive and dynamical lasting. Neurons form the collection units connected with connection path. The path has varied weigth or strength. The positive weight will strengthen the signal and negative will weaken the signal carried in. Further, the summing unit will add up the signal inputs multiplied with the weight. And, the function of activation will determine whether the signal of the input will be continued into other neurons or will be not be continued [14].

3.3. Samples

Samples are the population to search. The samples are considered as the representation of the population with the output to represent all observed phenomenons. The sizes and varieties of samples will be as a determiner for the quality of samples taken. There are two ways in taking samples, namely random or not random [15].

3.4. Vector

The vector quantity is as the quantity stating the number and its direction. Geometrically, the vector can be represented using the arrow or directed line segments with starting point and end point. The direction of the arrow denotes the direction of the vector, and the length of the arrow denotes the number and the value of its vector. Vector means the collection of the magnitude in which each of the magnitude is called as vector. The a vector of in Rn space is stated with a=[a1,a2,a3,...,an].

3.5 Jarak Euclidean

Euclidean distance is the calculation of distance from 2 point in *Euclidean space*. Euclidean space is introduced by Euclid,a mathematician from Greek in

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approximately 300 B.C.E to study the connection between angle and distance. This euclidean is related to Phytagoras theorem and it is usually applied in dimension 1,2 and 3. But, it is also simple if applied in higher dimension.The euclidean distance between 2 vectors a = [a1.a2.....a3] and b = [b1,b2, b3.....] is stated as the following:

$||a||=\sqrt{(a1-b1)^2+(a2-b2)^2+(a3-B3)^2+\cdots\ldots+an}$ [16].

4. RESULT AND DISCUSSION

4.1. Data for training

The data used for training are the data of shrimp farming with the matrix of 4 x 16 including the temperature variable, dissolved oxygen, pH and salinity to determine the quality of water in fishpond in accordance with the Table 4.1 as the following:

Table 4.1 The Data Used For Training

No	X1(i) (temperature/oC)	X2(j) (DO(mg/l))	X3 (k) (pH)	X4 (l) (salinity)
1	10	11,29	7,30	33,16
2	11	11,03	7,28	33,14
3	12	10,78	7,26	34,1
4	20	9,09	7,10	35,2
5	21	8,91	7,08	35,2
6	22	8,74	7,06	35,1
7	23	8,58	7,04	34,9
8	24	8,42	7,03	35,1
6	25	8,26	7,01	35,3
7	26	8,11	7,01	35,4
8	27	7,97	7,00	35,5
9	28	7,83	6,69	35,6
10	29	7,69	6,98	35,7
11	30	7,56	6,97	35,8
12	31	7,43	6,96	35,9
13	32	7,83	6,69	7,30
14	33	7,69	6,98	7,18
15	34	7,56	6,97	7,06
16	35	7,43	6,96	6,95

4.2. Analysis

4.2.1 Degree of membership

a. The value of degree of membership from pH.

The curve of degree of membership (μ) with the variable of pH containing 3 fuzzy sets are acid, base and neutral. The weight of preference for neutral pH = 0.7, acid = 0.2 and base = 0.1 is in accordance with the figure 4.1 below:

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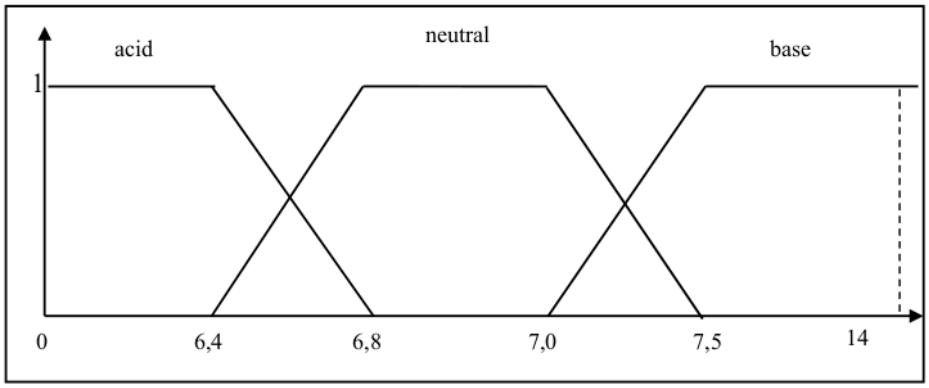

Figure 4.1: Degree Of Membership From Ph

The value Degree of membership from pH shown in scale 0-14
- pH (0-6,4) adalah acid, pH (6.5-7.5) adalah neutral, pH (7,6-14) adalah base.
The value degree of membership from pH,as the following:

$$\mu \text{Acid}[x] = \begin{cases} 1; x \le 6{,}4 \\ (6{,}8 - x) / (6{,}8 - 6{,}4); 6{,}4 \le x \le 6{,}8 \\ 0; x \ge 6{,}8 \end{cases} \quad \mu \text{Base}[x] = \begin{cases} 0; x \le 7{,}0 \\ (x - 7) / (7{,}5 - 7{,}0); 7{,}0 \le x \le 7{,}5 \\ 1; x \ge 7{,}5 \end{cases}$$

$$\mu \text{Neutral}[x] = \begin{cases} (x - 6{,}4) / (6{,}8 - 6{,}4); 6{,}4 \le x \le 6{,}8 \\ 1; 6{,}8 \le x \le 7{,}0 \\ (7{,}5 - x) / (7{,}5 - 7{,}0); 7{,}0 \le x \le 7{,}5 \\ 0; x \le 6{,}4 \text{ or } x \ge 7{,}5 \end{cases}$$

b. The value of degree of membership from the temperature
The degree of membership with temperature variable consists of cold, medium and hot. It is in accordance with the figure 4.2 below.

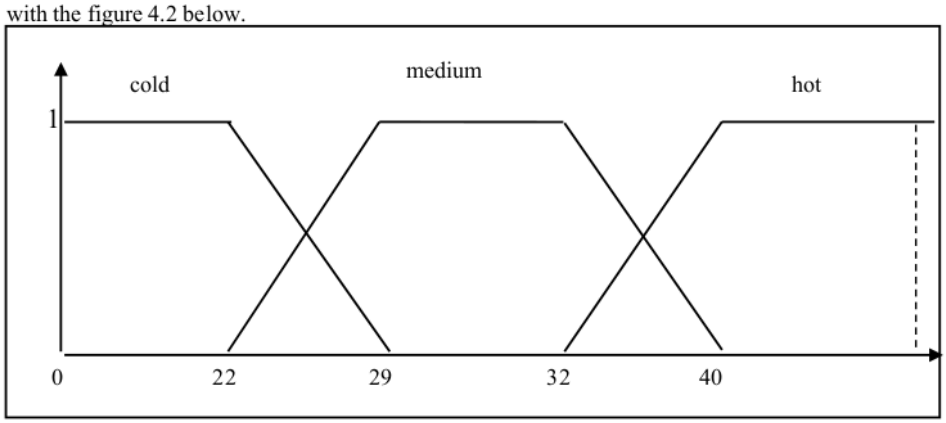

Figure 4.2: Degree Of Membership From The Temperature

Degree of membeship from the temperature :

$$\mu cold[x] = \begin{cases} 1; x \le 22 \\ (29 - x) / (29 - 22); 22 \le x \le 29 \\ 0; x \ge 29 \end{cases} \quad \mu hot[x] = \begin{cases} 0; x \le 32 \\ (x - 32) / (40 - 32); 32 \le x \le 40 \\ 1; x \ge 40 \end{cases}$$

$$\mu medium[x] = \begin{cases} (x - 22) / (29 - 22); 22 \le x \le 29 \\ 1; 29 \le x \le 32 \\ (40 - x) / (40 - 32); 32 \le x \le 40; \\ 0; x \le 22 \text{ or } x \ge 40 \end{cases}$$

c.The value of degree of membership from salinity
The range of optimum salinity for shrimp is 12-30 ppt. The curve of degree of membership (μ) with salinity variable with fuzzy sets is low, medium and high. It is in accordance with the figure 4.3 below:

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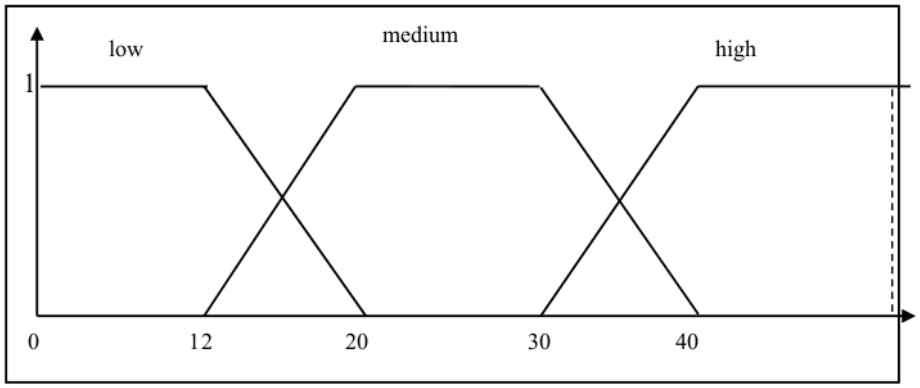

Figure 4.3: Degree Of Membership From The Salinity

The value of degree of membership from salinity:

$0 ; x \geq 20$ $0, ; \leq 30$

μ *low*[*x*]=(20- x) / (20 – 12), $12 \leq x \leq 20$, **μ high;[*x*]**=(x- 30) / (40 – 30); $30 \leq x \leq 40$

$1; x \leq 12$

$1; x \geq 40$

$0; x \leq 12$ or $x \geq 40$

μ medium [*x*] = (x- 12) / (20 – 12); $12 \leq x \leq 20$

$1; 20 \leq x \leq 30$

(40- x) / (40 – 30); $30 \leq x \leq 40$;

c.The value of degree of membership from dissolved oxygen

The curve of degree of membership (μ) from the variable containing 3 fuzzy is little, medium and big. It is in accordance with the figure 4.4 below:

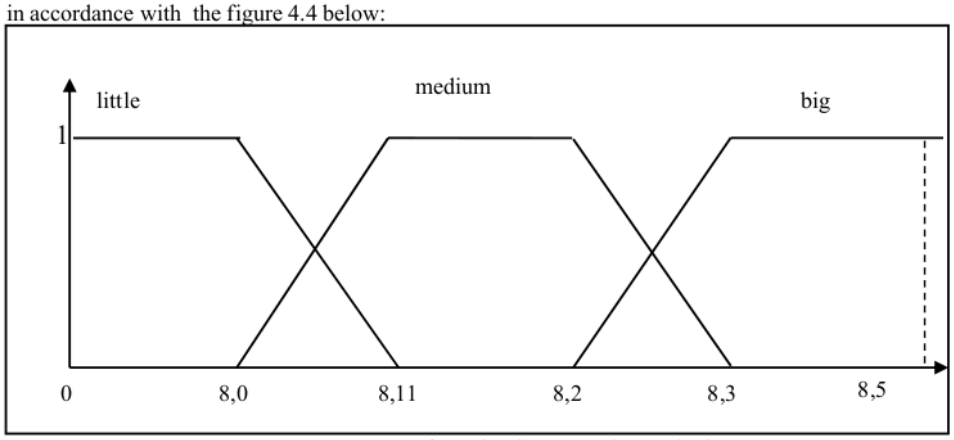

Figure 4.4: Degree Of Membership From The Disolved Oxygen

The value of degree of membership from dissolved Oxygen:

$0 ; x > 8,11$ $0 ; \leq 8,3$

μ little [x]= (8 ,11 - x) / (8,11 – 8,0), $8,0 \leq x \leq 8,11$ μbig[x] = (x- 8,2) / (8,3 – 8,2); $8,2 \leq x \leq 8,3$

$1; x \leq 8,0$ $1; x \geq 8,3$

$0; x \leq 8,0$ or $x \geq 8,3$

μMedium [x] = (x- 0,2) / (0,5– 0,2); $0,2 \leq x \leq 0,5$

$1; 8,11 \leq x \leq 8,2$

(8,3 - x) / (8,3-8,2); $8,3 \leq x \leq 8,2$ [18].

Then the data is converted in the degree of membership seen in Table.4.2.

Table 4.2 Data Is Converted In The Form Of Membership Degrees

NO	Temperature(^{0}C)			(DO(mg/l))			pH			salinity		
	cold	mediu m	Hot	littl e	mediu m	big	acid	neutr al	base	low	mediu m	hig h
1	1	0	0	0	0	1	0	0,8	0.2	0	0	1
2	1	0	0	0	0	1	0	0.84	0.16	0	0	1
3	1	0	0	0	0	1	0	0.88	0.12	0	0	1
4	1	1	0	0	0	1	0	0.4	0.6	0	0	1
5	0	1	0	0	0	1	0	0.94	0.06	0	0	1
6	0	1	0	0	0	1	0	0.98	0.02	0	0	1
7	0	1	0	0	1	0	0	0.98	0.02	0	0	1
8	0	0.75	0.50	1	0	0	0	0	1	0	0	1
9	0	0,50	0,5	1	0	0	1	0	0	0	0	1
10	0	0.25	0.75	1	0	0	0	1	0	0	0	1
11	0	0	1	1	0	0	0	1	0	0	0	1
12	0	0	1	1	0	0	0	1	0	0	0	1
13	0	0,50	0.50	1	0	0	1	0	0	1	0	0
14	0	0.25	0.75	1	0	0	0	1	0	1	0	0
15	0	0	1	1	0	0	0	1	0	1	0	0
16	0	0	1	1	0	0	0	1	0	1	0	0

Description of the importance of each criterion [17], as follows:

- Preference weight from pH is neutral= 0,7, acid=0,2 and base= 0,1.
- Preference weight from temperature is cold= 0,2, medium=0,7 and hot= 0,1.
- Preference weight from salinity is low = 0,2, medium=0,7 and high= 0,1.
- Preference weight from disolved oxygen = 0,05, medium=0,25 and high= 0,7

The ideal water quality based on the weight of preference are neutral pH = 0.7, medium temperature = 0.7, modium salinity = 0.7 and high dissolved Oxygen = 0.7 [0.7; 0.7; 0.7; 0.7] [17].

Table 4.3 Data from each variable with the target

NO	Temp .(^{0}C)	(DO(mg/l))	pH	salinity	target
1	0,2	0,7	0.17	0,2	1
2	1	1	0.84	1	1
3	1	1	0.88	1	1
4	1	1	0.60	1	1
5	1	1	0.94	1	1
6	1	1	098	1	1
7	1	1	0	1	1
8	0.75	1	1	1	1
9	0.50	1	1	1	1
10	075.	1	1	1	1
11	1	1	1	1	1
12	1	1	1	1	1
13	0.50	1	1	1	0
14	0.75	1	1	1	0
15	1	1	1	1	0
16	1	1	1	1	0

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From the testing results, it can be taken the connection, namely if the temperature is medium and pH is base and salinity is high, then the colour of water is low meaning the quality of water is not good. And, the rotation of water wheelis not running. And, if the temperature is medium, pH is neutral and salinity is medium, then the colour of water is clean meaning the quality of water is good, the rotation of water wheelis moving. Some rules to follow are:

1. IF pH is acid AND temperature is cold AND salinity is low AND Dissolved Oxygen is small, THEN the quality of water is not good AND the rotation of water wheelis not moving.
2. IF pH is neutral AND temperature is medium AND salinity is medium AND Dissolved Oxygen is medium, THEN the quality of water is medium AND the rotation of water wheelis not moving.
3. IF pH is base AND temperature is medium AND salinity is medium AND Dissolved Oxygen is medium, THEN the quality of water is low AND the rotation of water wheelis moving.
4. IF pH is base AND temperature is hot AND salinity is medium AND Dissolved Oxygen is medium, THEN the quality of water is low AND the rotation of water wheelis moving.
5. IF pH is base AND temperature is hot AND salinity is high AND Dissolved Oxygen is medium, THEN the quality of water is low AND the rotation of water wheelis not moving.
6. IF pH is base AND temperature is hot AND salinity is high AND Dissolved Oxygen is medium, THEN the quality of water is low AND the rotation of water wheelis moving.
7. IF pH is base AND temperature is hot AND salinity is high AND Dissolved Oxygen is high, THEN the quality of water is low AND the rotation of water wheelis moving.
8. IF PH is neutral AND temperature is hot AND salinity is high AND Dissolved Oxygen is high, THEN the quality of water is low AND the rotation of water wheelis moving.
9. IF PH is neutral AND temperature is neutral AND salinity is high AND Dissolved Oxygen is high, THEN the quality of water is low AND the rotation of water wheelis moving.
10. IF PH is neutral AND temperature is neutral AND salinity is neutral AND Dissolved Oxygen is high, THEN the quality of water is low AND the rotation of water wheelis moving.
11. IF PH is neutral AND temperature is neutral AND salinity is neutral AND Dissolved Oxygen is high, THEN the quality of water is good AND the rotation of water wheelis not moving.
12. IF PH is neutral AND temperature is hot AND salinity is neutral AND Dissolved Oxygen is high, THEN the quality of water is low AND the rotation of water wheelis moving.
13. IF PH is neutral AND temperature is hot AND salinity is high AND Dissolved Oxygen is high, THEN the quality of water is low AND the rotation of water wheel is moving.
14. IF PH is neutral AND temperature is hot AND salinity is high AND Dissolved Oxygen is medium, THEN the quality of water is low AND the rotation of water wheelis moving.
15. IF PH is base AND temperature is hot AND salinity is high AND Dissolved Oxygen is medium, THEN the quality of water is low AND the rotation of water wheelis moving [17].

From the rules above,it can be concluded that if it is minimum for temperature, pH,salinity and dissolved oxygen with medium, neutral and medium in the degree of membership, then the quality of water is good and the rotation of water wheelis not moving.

And so conducting the logical operation of OR or seeking out the maximum value on the variable of temperature is cold, medium or hot, the maximum (1;1;0) = 1. It is also for the variable of DO, pH and salinity in every variable, as it is seen in the figure 4.4 below:

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Table 4.4 Data From Each Variable With The Target

NO	temp. (^{0}C)	(DO(mg/l))	pH	salinity	target
1	1	1	0.8	1	1
2	1	1	0.84	1	1
3	1	1	0.88	1	1
4	1	1	0.60	1	1
5	1	1	0.94	1	1
6	1	1	098	1	1
7	1	1	0	1	1
8	0.75	1	1	1	1
9	0.50	1	1	1	1
10	075.	1	1	1	1
11	1	1	1	1	1
12	1	1	1	1	1
13	0.50	1	1	1	0
14	0.75	1	1	1	0
15	1	1	1	1	0
16	1	1	1	1	0

- Membentuk matriks mxn (n= banyak row, m= banyak colomn).

data. $\begin{bmatrix} a11 & a12 & \cdots & a1n \\ a21 & a22 & \cdots & a2n \\ & & \cdots & \\ & & \cdots & anxm \end{bmatrix}$

Row Vector (RV) 1 :[$a1,1$ $a1,2$ $a1,3$ $a1,4$], RV2 :[$a2,1$ $a2,2$ $a2,3$ $a2,4$]
RV3 :[$a3,1$ $a3,2$ $a3,3$ $a3,4$], VR 4 :[$a4,1$ $a4,2$ $a4,3$ $a4,4$]
RW5 :[$a5,1$ $a5,2$ $a5,3$ $a5,4$], RW6 :[$a6,1$ $a6,2$ $a6,3$ $a6,4$]
RV7 :[$a7,1$ $a7,2$ $a7,3$ $a7,4$], RV8:[$a8,1$ $a8,2$ $a8,3$ $a8,4$]
RV9 :[$a9,1$ $a9,2$ $a9,3$ $a9,4$], RV10 :[$a10,1$ $a10,2$ $a10,3$ $a10,4$]
RV11:[$a11,1$ $a11,2$ $a11,3$ $a11,4$], RV12 :[$a12,1$ $a12,2$ $a12,3$ $a12,4$]
RV13 :[$a13,1$ $a13,2$ $a13,3$ $a13,4$], RV14 :[$a14,1$ $a14,2$ $a14,3$ $a14,4$]
RV15 :[$a15,1$ $a15,2$ $a15,3$ $a15,4$], RV16 :[$a16,1$ $a16,2$ $a16,3$ $a16,4$]

4.3. Selection

To select the vector data, use the following steps:

Compare every individual by making the highest rank to represent the input by calculating the euclidean distance. The ideal water quality based on the weight of preference are neutral pH, medium temperature, modium salinity and high dissolved Oxygen = [0.7; 0.7; 0.7; 0.7].

RowVector (RV) 1st : [$a1,1$ $a1,2$ $a1,3$ $a1,4$]: [1 ; 1 : 0.8 : 1]

RV 1st :$\sqrt{(1-0.7)^2+(1-0.7)^2+((0.8-0.7)^2+(1-0.7)^2}$= 0.53
RV 2st :[a2,1 a2,2 a2,3 a2,4] : [1 ; 1 : 0.84 : 1]
RV 2st :$\sqrt{(1-0.7)^2+(1-0.7)^2+((0.84-0.7)^2+(1-0.7)^2}$ = 0.54
RV 3st: 0.55, RV 4st: 0.55
RV 5st: 0.57, RV 6st: 0.57, RV 7st : 0,87, RV 8st = 0.52
RV 9st : 0.56, RV 10st : 0.54, RV 11st : 0.6, RV 12st : 0.6
RV 13st : 0,63, RV 14st : 0,60, RV 15st : 0.6, RV 16st : 0.6

Table 4.5 Rank Data For Each Row Vector

No	Row	Smallest euclidean distance	Rank
1	8	0.52	1
2	1	0.53	2
3	2	0.54	3
4	10	0.54	3
5	3	0,55	4
6	4	0,55	4
7	9	0,56	5
8	5	0,57	6
9	6	0,57	6
10	11	0,60	7
11	12	0,60	7
12	15	0,60	7
13	13	0,50	9
14	10	0,50	9
15	9	0,50	9
16	14	0.75	10

Then, the used input is those with smallest euclidean distance in each line vector, namely RW–8, i.e (a8,1, a8,2, a 8,3, a,8,4) : (0.75 : 1 : 1 : 1). And, for the analysis, it is selected 3 best inputs for training.It is in accordance with Table 4.6 below.

Table 4.6 The Highest Rank For Sixteen Input

No	Individu ke-	smallest euclidean distance	Rank
1	8	0.52	1
2	1	0.53	2
3	2	0.54	3
4	10	0.54	3

Training for individuals: 8st,1st,2 st,10st

Data rangking no. 1 (RV 8st)

x1=0,75, x2=1, x3=1, x4=1, bias =0,1, w1=w2=w3=w4=0, θ=0,5, α=0,8

Y-in = bias+ (x1.w1 + x2.w2 + x3.w3 +x4.w4)

= 0,1 +(0,75.0+1.0+1.0+1.0) =0.1

- Input into activation function:

$$f(x)=Y=\begin{cases} 1, if\ y_{-in} > \theta \\ 0, if\ -\theta \leq y_{-in} \leq \theta \\ -1, if\ y_{-in} < \theta \end{cases}$$

Y= -1 ≠ T (Make changes in weight and bias).

If the output value y≠t doesn't change the weight and bias.

w_1 (new)=w_1(old) + α.t.x_1= 0 + 0,8.1.0,75= 0,6.

w_2 (new)= 0,8, w_3 (new)= 0,8, w_4 (new)= 0,8.

bias (new)= bias (old) + α.t=0,1 +0,8.1=0,9

Data rangk 2nd (RV 1st)

y-in= 3,74, Y=1= T (no changes in weight and bias were made).

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Data rangk 3st (RV 2st)

y-in = 3,972, Y=1= T (no changes in weight and bias were made).

The data of rank of No. 4 (the 10st individual), y-in = 3.024, Y =1, then water wheel is moving. It is the same for the next up to the forth data (1 epoch). This process can be continued up to the output results are similar to the stop target, so the iteration is stopped.

4.4. Data Testing Model

Further, the testing of data with the 13rd line vector can be seen in Table 4.7 below.

Table 4.7 Training Data

No	x1	x2	x3	x4	x5
13	0.50	1	1	1	0

Data 13st

The final weight used after the 10th epoch is obtained, w_1=0,3726, w_2=2,37254, w_3= 0,3726, w_4=2,37254 and bias =0,58633

So with input; x1=0,5, x2=1,x3=1, x4=1,T=1, θ=0,5, α=0,8,

y-in = bias+ (x1.w1 + x2.w2 + x3.w3 +x4.w4)

=0,58633+(0,5.(0,3726)+1.(2,37254)+1.(0,3726)+1.(2,37254))=5,89031

$$f(x)=Y=\begin{cases} 0, if\ y_{-in} < \theta \\ 1, if\ y_{-in} \geq \theta \end{cases}$$

Y=1, so (water whell is moving)

The training on data is carried out on the selected input with laboratory matrix with the training for 10 iteration and the perforanmance value for 0, 000720, as it can be seen in Table 4.5 below.

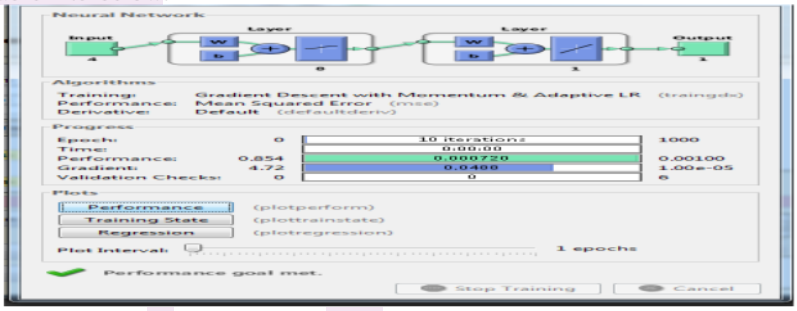

Figure 4.5 The performance results of Uncertain Input Selection Model for Neuron

5. CONCLUSION

Neuron Model for Uncertain Input Selection is as a model of neural network to improve the form of learning by using the approach of uncertain input selection and learning speed to know the pattern.The process in uncertain input selection model for neurons is by conducting the input selection by calculating the biggest euclidean distance to represent all inputs in reducing the learning process for more real time.

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