DEVELOPING ARTIFICIAL NEURAL NETWORK BASED ON VISUAL STUDIO FOR DANCE ASSESSMENT

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ABSTRACT

The dance assessment test still uses a manual system that tend to have frequent errors in the calculation for the final results thus it requires a system that accelerate the assessment process with an accurate result. This study aimed at: (1) designing an artificial neural network application based on visual studio for the dance assessment. (2) examining the performance of the artificial neural network application based on visual studio for the dance assessment. The design method consists of (1) system design (2) interface design (3) database design for artificial neural network system. (4) design of artificial neural network model. (5) programming (6) system testing. The design of visual studio artificial neural network application for the dance assessment has two stages: main program and supporting program. This research built a system by implementing visual studio and artificial neural network to assess dance examination which can give the final result to each participant directly. The application of the dance assessment can assess 3 types of dance with a training set of at least 10 pairs to undertake learning that produces the load to be used in the assessment. Besides assessing, this application can also delete, repair, and store data in the form of .xls. Based on the test results, it can be concluded that the application operates effectively for determining the final load, data input and data storage.

Keywords: artificial neural network, dance assessment, visual studio

INTRODUCTION

Technology has grown rapidly, it is proved by the existence of artificial intelligence. A system made to resemble the thinking and working of the human brain, it is commonly called Artificial Neural Network or Artificial Neural Network System. The components of artificial neural networks similar to the human brain which consisting of several neurons connected to one another. As the process of learning from the brain, artificial neural network learning development consists of supervised learning and unsupervised learning. There are several methods in supervised learning such as Hebb Rule, Perceptron, and Backpropagation.

One method of supervised learning of this artificial neural network system is the method of backpropagation algorithm. This algorithm finds the weights value that match the targets to be achieved from the learning. Meanwhile, the weight value from the learning result is to test the unknown value of the result. It is expected that the gained result will fulfil the target. Software for making desktop-based applications has been produced. It includes visual basic and visual studio. The difference between visual basic and visual studio is on the interface, graphics, and its programming language. In visual basic refers directly to one programming language, while visual studio refers to many programming languagesThe artificial neural network system is widely applied. For instance, the application on the robots manufacture that can follow the human move, the medical devices that can diagnose a person's illness just by seeing the phlegm, or a security system with face and iris scan. However, the use of artificial intelligence or artificial neural networks for assessment system is still limited, epecially in the performing art of dance.

Almost all of the regions or islands in Indonesia have their own dance styles. Each style has its own uniqueness in motion, rhythm, costume, and story. Though the influence from the foreign affects the interest of learning

traditional dance, traditional dances were still practiced and learned in several places like Dance Studio of Pradnya Widya Faculty of Languages and Arts, Universitas Negeri Yogyakarta.

Pradnya Widya dance studio is managed by lecturers of Dance Education, Faculty of Languages and Arts, Universitas Negeri Yogyakarta, in cooperation with alumni and high-achieving students in the field of dance. Various dance styles are given to the participant such as Yogyakarta, Surakarta, Bali and new creation dance. This studio is also open for the public, so it has a lot of students and there are several classes with some diffrent levels. Every 6 months an evaluation or examination is conducted in the form of theoretical and performances assessment. There are several assessment criteria in the dance exam, for example in the basic Yogyakarta Dance exam, the criteria are *wirogo* or movement, *wiromo* or rhytm, *wiroso* or expression, and rote. for Surakarta Dance, the criretia namely *pancak, ulat, lulut*, rhythm, make up, and costume while Bali Dance is *agem, tandang, and tangkep.*

The dance test is conducted in one day with the big number of students. The assessment system in the Pradnya Widya Sanggar dance test is done manually where each juries write the score of each participant, then collected into one, calculated and dividedto be the final score. With this manual system, it takes a long time to get the best participants in each class. It also affects in the distribution of certificates that take several weeks to be accepted by each student.

METHOD

The design method of artificial neural network application based on the visual studio for the dance evaluation test consists of: (1) system design (2) interface design. (3) database design for artificial neural network system. (4) design of artificial neural network model. (5) programming implementation (6) system testing. The design of visual studio artificial neural network application for the assessment of dance test has two stages: main program and supporting program. The chart block system is presented in Figure 1.

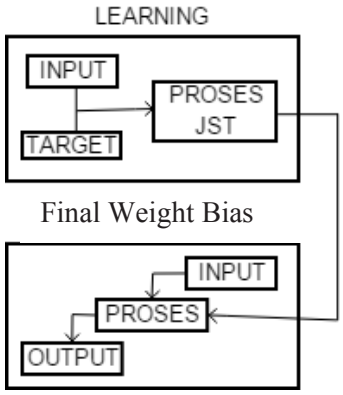

Figure 1. Chart Block System

The design of the dance exam assessment application consists of two main stages. The first stage is learning, i.e. the learning process on the application system by providing the training set of the desired input and output or targets to regulate the load and bias. In this research the output is level up or repetition. The second stage is the execution of the learning outcomes from the the learning stage. In this stage, there are inputs, processes, and outputs. In the input stage is to enter the score of each aspect of the assessment. The score of the participant which has been entered is calculated using backpropagation algorithm with the weights that have been obtained from learning result system. Lastly, the output stage ends with the result of that the participants are level up or repeatation.

The design of this interface using visual studio consisting of home sketch, sketch menu of about, help menu, profile menu, sub menu of help, the design of learning on the application, and the design of testing. This database serves as information provider for the users and it is used to store the data. The main task of the database is to store the information data such as assessment aspects like the assessment for the Yogyakarta Dance of *wiraga, wirama, wirasa,* appearance, rote and decisions as well as assessment aspects for Surakarta and Bali

Dance, calculation result, error score system, epoch score, final load, bias score, participant number, assessment aspects for Yogyakarta, Surakarta and Bali dance.

Artificial neural network model for three types of dance namely Yogyakarta, Bali, and Surakarta Dance is using backpropagation algorithm which has 5 inputs X0, X1, X2, X3, X4 as the aspects of assessment of dance test, 1 output with 1 neurons i.e. Y1 is the target or result, 1 hidden layer with 4 neurons i.e. Z1, Z2, Z3, and Z4, and bias is b1. For the number of neurons from the hidden layer there are 4 neurons to reduce the complexity in the source code. The architectural design for the three types of dance can be seen in Figure 2.

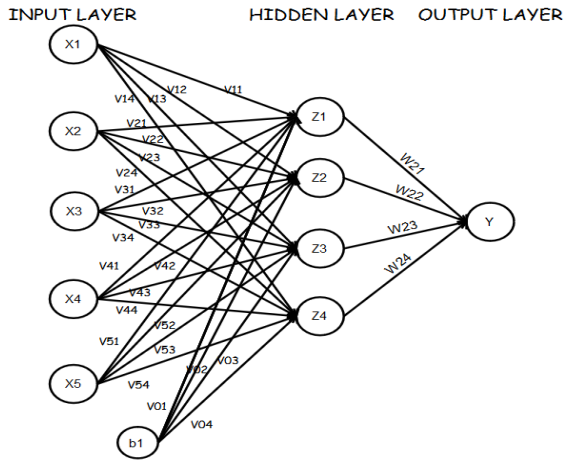

Figure 2. Artificial Neural Network Architecture for Dance Examination Assessment

Flowchart is a chart that shows the flow in the program or system procedures logically. It is used mainly for communication aids and for documentation. The flow diagram for learning process consists of 3 processes. The first learning process is the flowchart to calculate the amount of data that can be seen in Figure 3, it describes the calculation of the amount of training data sets to perform the learning.

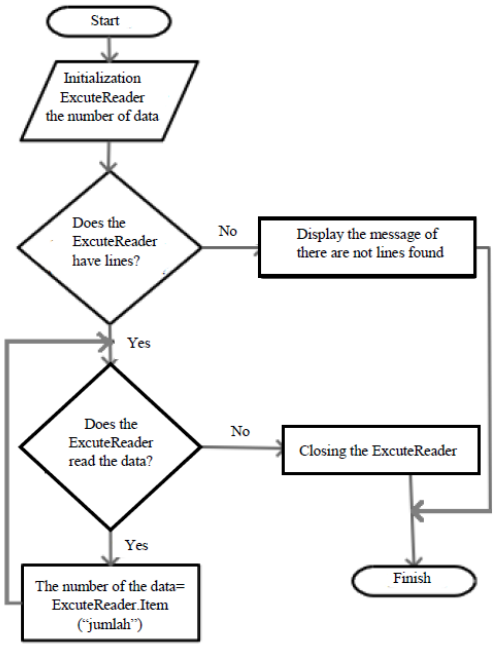

Figure 3. Flowchart to Calculate the Number of Data

The next process is to read the data from the database which can be seen in Figure 4, it describes the score of the data stored on the variable x where x is the training set input.

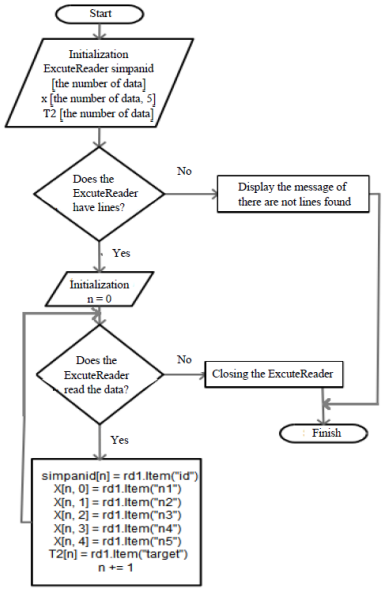

Figure 4. Flowchart to Read the Data from Database

The last process is the main flowchart of learning that can be seen in Figure 5, it describes the process of calculation or learning which is conducted backpropagation program.

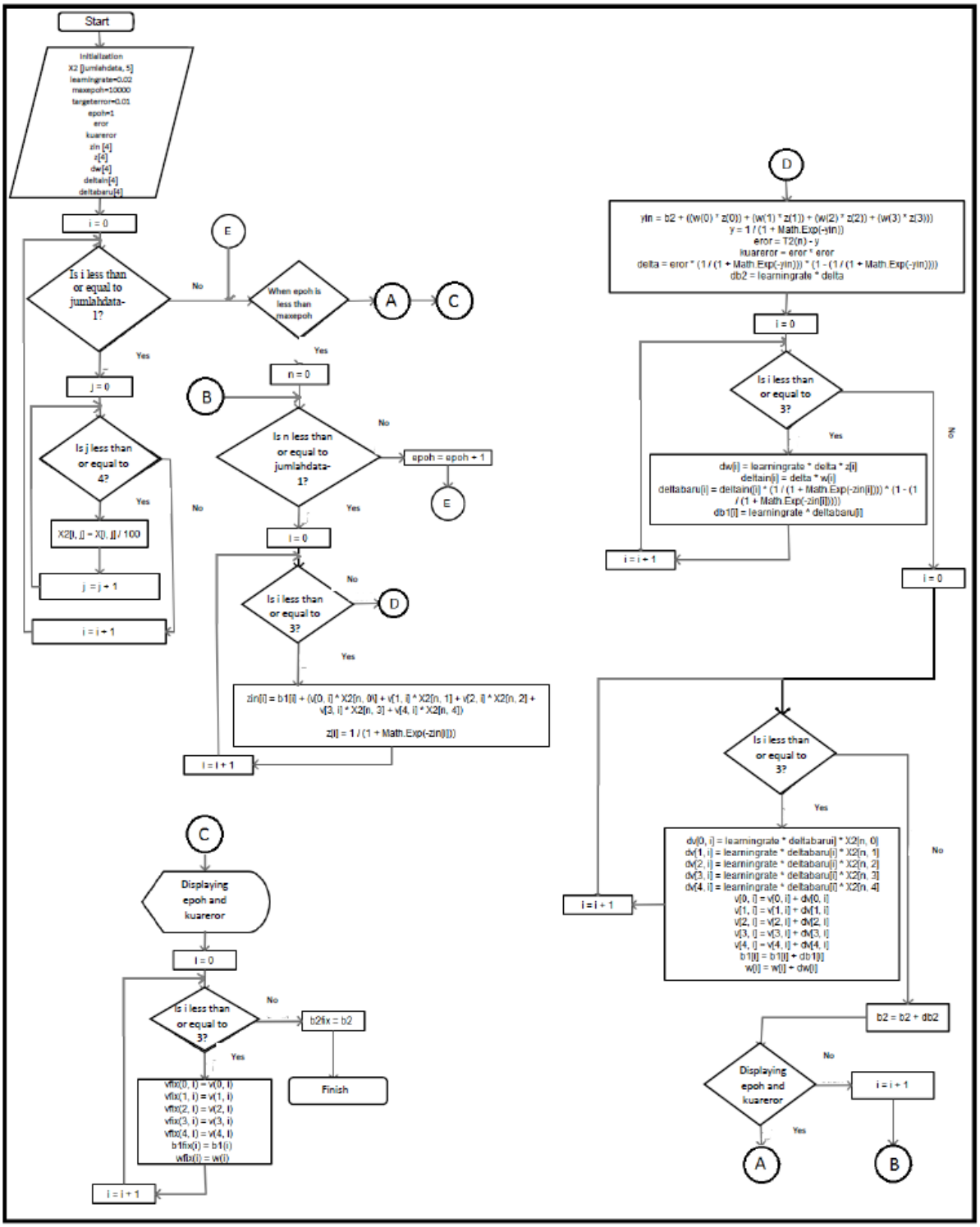

Figure 5. Flowchart of Artificial Neural Network with Backpropagaton Algoritm

The first step is creating the main program by using the software of Visual Studio 2010 to create the interface of the application and the score calculation using artificial neural network with backpropagation algorithm method. Visual Studio 2010 software is using VB.net language.

RESULTS AND DISCUSSION

This dance examination assessment system was built to assist the assessment of dance examination with 3 types of dance. This application system is divided into 2 main parts namely learning and testing. The output of this scoring system is the list of the participants who pass the examination and those who fail based on the scores category programmed into the application. The form contained in this application system consists of four menus and one sub menu. The learning and testing menu consists of (1) data processing of training sets on the learning tab to obtain the correct weight.and will be used on tab testing, (2) inputting data participants and directly displaying the results, (3) the storage of participants' scores in data tables in the form of xls, (4) deletion of wrong data on the tab learning and tab testing, (5) data improvement on the learning tab.

In the menu of about there is information about the usage of the application and a short description about artificial neural networks. In the menu of help, there is explanantion about the function of the menu button and the back button. In the menu of profile, there is information about the developer of the application and the supervisors. The sub menu of help contained in the learning and testing menu, provides information about understanding the aspects of assessment and about how to run the application. The interface of each form are presented in Figures 6 through Figure 11.

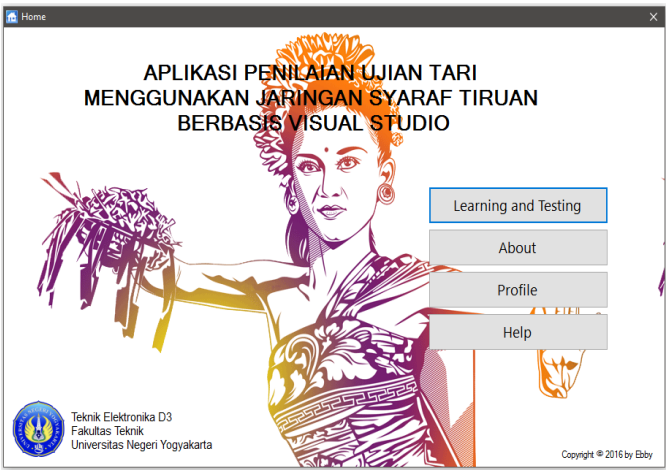

Figure 6. Home Menu

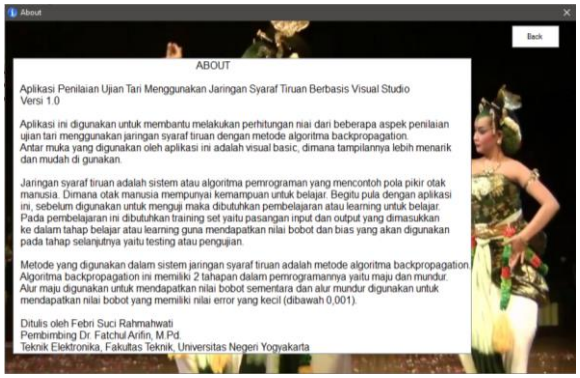

Figure 7. About Menu

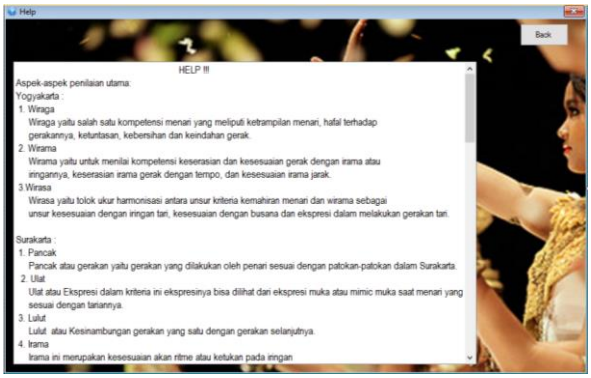

Figure 10. Help Sub Menu

Figure 8. Help Menu

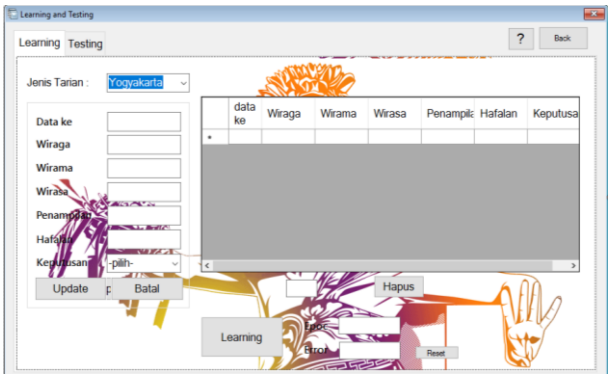

Figure 11. Learning and Testing Menu

Figure 9. Profile Menu

The functional testing was a test performed to examine the functions of the buttons or menu of the application. The results of functional testing is presented in Table 3.

Table 3. The Results of Functional Testing

No	Display	Evaluation Activity	Input	Output	Result is achieved	
					Yes	No
1	Main Menu	Display the about page	Click the about button	The about page	✓	
		Display the help page	Click the help button	The help page	✓	
		Display the profile page	Click the profile button	The profile page	✓	
		Display the learning and testing page	Click the learning and testing button	The learning and testing page	✓	
2	Back Button	Back to the home page	Click the back button	Back to the home page	✓	
3	Help Button	Display the help page	Click the help icon	The help page	✓	
4	Learning and Testing Page	Display the learning page	Click the learning tab	The learning page	✓	
		Display the testing page	Click the testing tab	The testing page	✓	
5	Learning	Display the assessment aspects and the data table of Yogyakarta dance	Choose the Yogyakarta dance	Assessment aspects and the data table of Yogyakarta dance page	✓	
		Display the assessment aspects and the data table of Surakarta dance	Choose the Surakarta dance	Assessment aspects and the data table of Surakarta dance page	✓	
		Display the assessment aspects and the data table of Bali dance	Choose the Bali dance	Assessment aspects and the data table of Bali dance page	✓	
		Input the data into the table	Click the input button	Display the data on the table	✓	
		Display the data that will be changed	Click the data in the table	The data is displayed on each assessment aspect	✓	
		Cancel the changes of the data	Click the cancel button	Deleting the scores displayed in each assessment aspect	✓	
		Update the data on the table	Click the update button	Display the new data table	✓	
		Delete the data on the table	Click delete button	The data in table is deleted	✓	
		Do the learning	Click the learning button	Display the epoch values and errors	✓	
		Reset the assessment calculation	Click the reset button	Neutralize epoch values and errors	✓	
6	Testing	Display the assessment aspect and the data table of Surakarta dance	Choose the Surakarta dance	the assessment aspect and the data table of Surakarta dance	✓	
		Display the assessment aspect and the data table of Bali dance	Choose the Bali dance	the assessment aspect and the data table of Bali dance	✓	
		Inputting the participant data	Click the input button	Display the participants data on the table	✓	
		Deleting the last data being inputted	Click the delete button	The last data on the table is deleted	✓	
		Saving the data table in excel format	Click the excel button	Save dialog box	✓	

The results of functional testing concluded that the application function runs 100% effectively. Calculation in this application is the result of learning data processing conducted by the application. In this

discussion, it was taken data from the Dance of Surakarta in Table 4. After the Learning button on the menu Learning and Testing was clicked, after epoch to - 2069 with error value of 0.009, it was obtained the final weight of input to hidden, the final weight of bias to hidden , the final weight of hidden to the output, the final weight of bias to the output were as follows:

The final weights of input to hidden:

v = 0.71 0.65 1.30 0.23
0.31 0.84 1.31 0.90
0.81 0.81 2.14 0.89
0.82 0.89 0.61 0.72
0.81 0.15 2.02 0.43

The final weight of bias to hidden:

v0 = 0.56 1.22 -4.70 -1.65

The final weight is hidden to the output: =
-.43
-1.05
5.85
2.07

The final weight of bias to the output:
w0 = -2.92

To test that the program runs effectively, one of the data from the Surakarta dance in Table 4 was calculated. From the data in Table 4, the second data was taken for the previous test divided by 100: x = [0.88 0.8 0.9 0.9 0.86] using the result of data processing learning done by application after epoch to - 2069 with error value 0.009 obtained the final weight of input to hidden, the final weight of bias to hidden, the final weight of hidden to the output, the final weight of bias to the output.

Tabel 4. Data Learning Surakarta Dance

No	Pancak	Ulat	Lulut	Rhythm	Performance	Result
1	85	80	90	90	86	Pass
2	88	80	90	90	86	Pass
3	80	85	85	85	85	Pass
4	80	80	85	85	85	Pass
5	80	80	85	85	84	Pass
6	70	90	80	80	80	Pass
7	70	70	80	75	74	Pass
8	75	80	85	70	76	Pass
9	75	70	80	80	76	Pass
10	70	85	90	80	81	Pass
11	56	50	45	60	53	Fail
12	50	50	50	56	52	Fail
13	50	50	50	55	51	Fail
14	56	50	50	60	54	Fail
15	55	50	50	60	54	Fail
16	50	50	55	60	54	Fail
17	50	55	55	55	54	Fail
18	40	40	50	50	45	Fail
19	40	50	40	55	46	Fail
20	50	50	50	55	51	Fail

Operation on the hidden layer:

$$z\_in_1 = v0_1 + (v_{11} \times x_1) + (v_{21} \times x_2) + (v_{31} \times x_3) + (v_{41} \times x_4) + (v_{51} \times x_5)$$
$$= 0.56 + (0.71 \times 0.88) + (0.31 \times 0.8) + (0.81 \times 0.9) + (0.82 \times 0.9) + (0.81 \times 0.86)$$
$$= 3.5964$$
$$z_1 = f(3.5964) = \frac{1}{1 + e^{-3.5964}} = 0.9733$$

$$z\_in_2 = v0_2 + (v_{12} \times x_1) + (v_{22} \times x_2) + (v_{32} \times x_3) + (v_{42} \times x_4) + (v_{52} \times x_5)$$
$$= 1.22 + (0.65 \times 0.88) + (0.84 \times 0.8) + (0.81 \times 0.9) + (0.82 \times 0.9) + (0.81 \times 0.86)$$
$$= 4.123$$
$$z_2 = f(4.123) = \frac{1}{1 + e^{-4.123}} = 0.984$$

$$z\_in_3 = v0_3 + (v_{13} \times x_1) + (v_{23} \times x_2) + (v_{33} \times x_3) + (v_{43} \times x_4) + (v_{53} \times x_5)$$
$$= -4.70 + (1.30 \times 0.88) + (1.31 \times 0.8) + (2.14 \times 0.9) + (0.61 \times 0.9) + (2.02 \times 0.86)$$
$$= 1.7042$$
$$z_3 = f(1.7042) = \frac{1}{1 + e^{-1.7042}} = 0.846$$
$$z\_in_4 = v0_4 + (v_{14} \times x_1) + (v_{24} \times x_2) + (v_{34} \times x_3) + (v_{44} \times x_4) + (v_{54} \times x_5)$$
$$= -1.65 + (0.23 \times 0.88) + (0.9 \times 0.8) + (0.89 \times 0.9) + (0.72 \times 0.9) + (0.43 \times 0.86)$$
$$= 1.0912$$
$$z_4 = f(1.0912) = \frac{1}{1 + e^{-1.0912}} = 0.7486$$

Operation on the output layer:

$$y\_in = w0 + (z_1 \times w_1) + (z_2 \times w_2) + (z_3 \times w_3) + (z_4 \times w_4)$$
$$+(0.846 \times 5.85) + (0.7486 \times 2.07)$$
$$= 2.126983$$
$$y = f(2.126983) = \frac{1}{1 + e^{-2.126983}} = 0.89349825 = 0.89$$

For example the threshold is 0.5; it means if y ≥ 0.5 then the given output is 1, but if y <0.5 then the given output is 0. So the output of x = [0.88 0.8 0.9 0.9 0.86] is 1 (because 0.89> 0.5). thus the output matches the expected target. The discussion of testing included the comparison between the examination results through judge assessment of 10 dancers who danced Yogyakarta dance with the examination results through the calculation of the application. The comparation is presented in Table 5.

Table 5. Assessment Results of the Application

No	Pancak	Ulat	Lulut	Rhythm	Performance	Judge Examination	Aplication
1	85	80	90	90	86	Pass	Pass
2	80	85	90	85	85	Pass	Pass
3	80	80	80	85	84	Pass	Pass
4	70	70	80	75	74	Pass	Pass
5	75	70	80	80	75	Pass	Pass
6	56	50	45	60	53	Fail	Fail
7	50	50	50	55	51	Fail	Fail
8	55	50	50	60	54	Fail	Fail
9	50	55	55	55	54	Fail	Fail
10	40	50	40	55	46	Fail	Fail

From Table 3, it can be concluded that the application run correctly. This was proved by the judging result and the result of the calculation of the application had the same results

CONCLUSION

Based on the the explanation, it can be concluded that: (1) The design of this system has been successfully created with the interface that uses Visual Studio and artificial neural network method backpropagation algorithm written in VB.net programming language. The program has features such as learning and testing, help, delete data, data input, and save data in .xls format. (2) This system works effectively. The performance of the dance examination assessment application can be seen from the following points: (a) The final weighting and bias resulted from the calculation of the training set in the learning process fits the theory. (b) After entering the data of the dance participant to be assessed by entering the participant's number and the evaluation aspects, the examination results will be immediately provided once the examiner chooses the input button. (c) This application may store assessment data in .xls format. The necessary further development to improve the application in the future are: (1) Designing Visual Studio Application Neural Network for Dance Examination Assessment that is a portable or plug and play application without having to install database server (XAMPP Control Panel). (2) The application is expected to cover more dance types and the assessment can be devoted to the name of the dance.

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