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# APPLICATION ARTIFICIAL NETWORK FROM DATABASE PREDICTED NORMALIZED TEMPERATURE AND HUMIDITY IN ROOM

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**Abstract:**

The Artificial neural network is a mathematical model that tries to simulate the structure and functionalities of biological neural networks. A neural network is a machine that is designed to model the way in which the brain performs a particular task or function of interest. Basic building block of every artificial neural network is neuron. Such a model has three simple sets of multiplication, summation and activation. The purpose of this network is to examine neural network and their emerging applications in the field of engineering focusing on control. The network is implemented by using electronic components and is simulated in software on a digital computer. In this work examined the application of neural network for predicted normalized temperature and humidity in room and the learning process. A neural network derives its computing through its massively parallel distributed structure and its ability to learn and generalize. Generalization refers to the neural network's production of reasonable outputs for inputs not encountered during training or learning. The function of which is to modify the synaptic weights of the network in an orderly fashion to attain a desired design objective. The needs for neural networks, training of neural networks and important algorithms have been discussed. Artificial Neuron is sum function that sums all weighted inputs and bias. At the exit of artificial neuron the sum of previously weighted inputs and bias is passing trough activation function that is also called transfer function. It

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concluded by identifying limitations, recent advances and promising future research directions.

**Keywords:**

Network, Temperature, Humidity, Learning, Weight

## Introduction

Humans have a brain that can learn. Computers have some processing units and memory. Without an algorithm a computer cannot do explore problems (David Kriesel, 2005; Sakshi Kohli, Surbhi Miglani and Rahul Rapariya, 2014). A neural network is an interconnected assembly of simple processing elements, units or nodes. The processing ability of the network is stored in the interunit connection strengths or weights obtained by a process of adaptation to or learning from a set of training patterns (Kevin Gurney, 1997). There are three basic elements of the neural model:

- The synapses are modeled as weights. A signal $x_j$ at the input of the synapse $j$ connected to the neuron $k$ is multiplied by the synaptic weight $w_{kj}$.
- An adder sums up all the inputs modified by their respective weights. The operations described constitute a linear combiner.
- An activation function for limiting the amplitude of the output. That it squashes the permissible amplitude range of the output signal to some finite value.

The block diagram of Fig. 1 shows the neural model [Christopher M. Bishop, 2006; R. Baghawati, K. Baghawati, A.K.K. Singh, R. Nongthombam, R. Sarmah and G. baghawati, 2015; T. Jayasree, D. Gowri Shankar, M. Murugan, M. Mathesan and S. Rajkumar, 2016; Jiuxiang Gu, Zhenhua Wang, Jason Kuen, Lianyang Ma, Amir Shahroudy, Bing Shuai, Ting Liu, Xingxing Wang, Gang Wang, Jianfei Cai, Tsuhan Chen, 2018; Navita Agarwal and Prachi Agarwal, 2013; Shorouq Salahat and Mohammad Awad, 2017; (Simon Haykin, 2009; A. D. Dongare, R. R. Kharde and Amit D. Khacare, 2012). The neural model of Fig. 1 includes an externally applied bias denoted by $b_k$. The formula is

$$u_k = \sum_{j=1}^{m} w_{kj} x_j \quad (1)$$

And

$$y_k = \varphi(u_k + b_k) \quad (2)$$

Where $x_1, x_2, x_m$ are the input signal; $w_{k1}, w_{k2}, w_{km}$ are the synaptic weights of neurons $k$; $u_k$ is the linear combiner output; $b_k$ is the bias;φ is the activation function; and $y_k$ is the output signal. The pattern of connections between the neurons $k$ generally each connection is defined by a synaptic weight $w_{kj}$ and the propagation of data which determines the linear combine output $u_k$ can make is (Takialddin Al Smadi, Huthaifa A. Al Issa, Esam Trad, Khalid A. Al Smadi, 2015):

- Feed forward networks. Connections extending from outputs of neurons $k$ to inputs of neurons $k$ in the same layer or previous layers.
- Recurrent networks. The network will evolve to a stable state in which this activations do not change.

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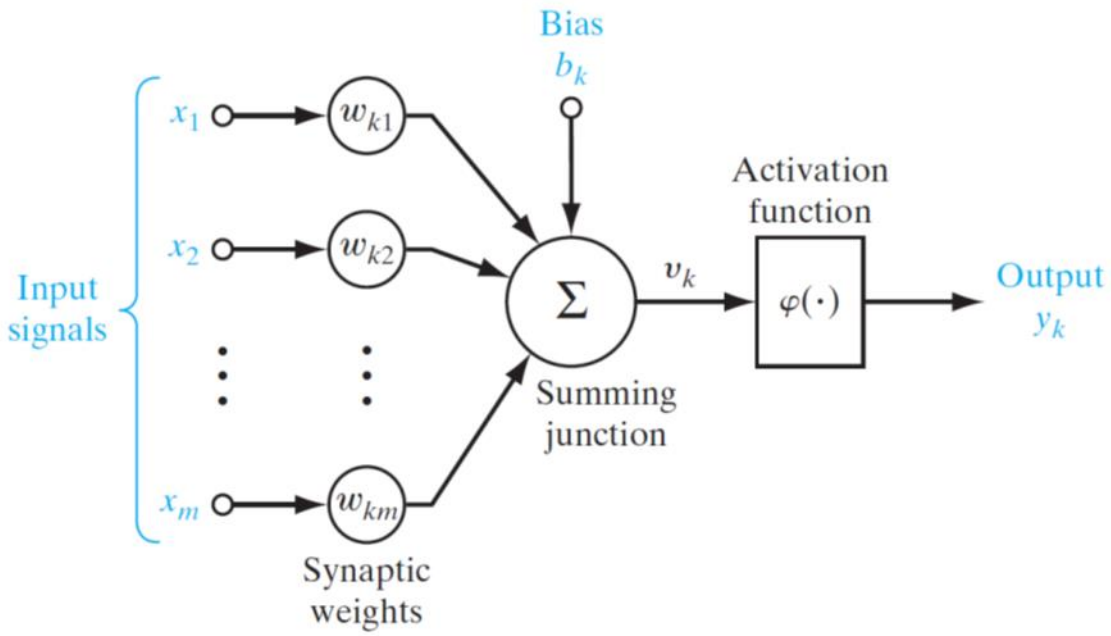


**Figure 1. Neural Model (Courtesy Of David Kriesel).**

A neural network has to be configured that the application of a set of inputs produces the desired set of outputs. Various methods to set the strengths of the connections in two sort (Giancarlo Zaccone, Md. Rezaul Karim and Ahmed Menshawy,2017; Vartika Sharma, Susheva Sharma, Dr. Noor Danish Ahrar Mundari, 2015). These are:

- Supervised learning or associative learning. These input and output pairs can be provided by an external teacher or by the system which contains the network.
- Unsupervised learning or self organisation. The system is supposed to discover statistically salient features of the database input population.

Generally, some sort of activation function is used (Alex Smola and S. V. N. Vishwanathan, 2008):

- A hard limiting activation function.
- A semi linear function.
- A sigmoid activation function.

**Methodology**

In this method use single layer feed forward networks. Single layer feed forward networks having only one layer of variable weights and one layer of output neurons k. $X_1$ is input censor of temperature and $X_2$ is input censor of humidity. Information must flow from input to output in only one direction with no back loop. In this methodology use microcontroller Arduino uno ATmega328P+ESP8266. With two input and eight neurons yield eight output like Fig. 2. In biner yield maximum output $2^8$=256.

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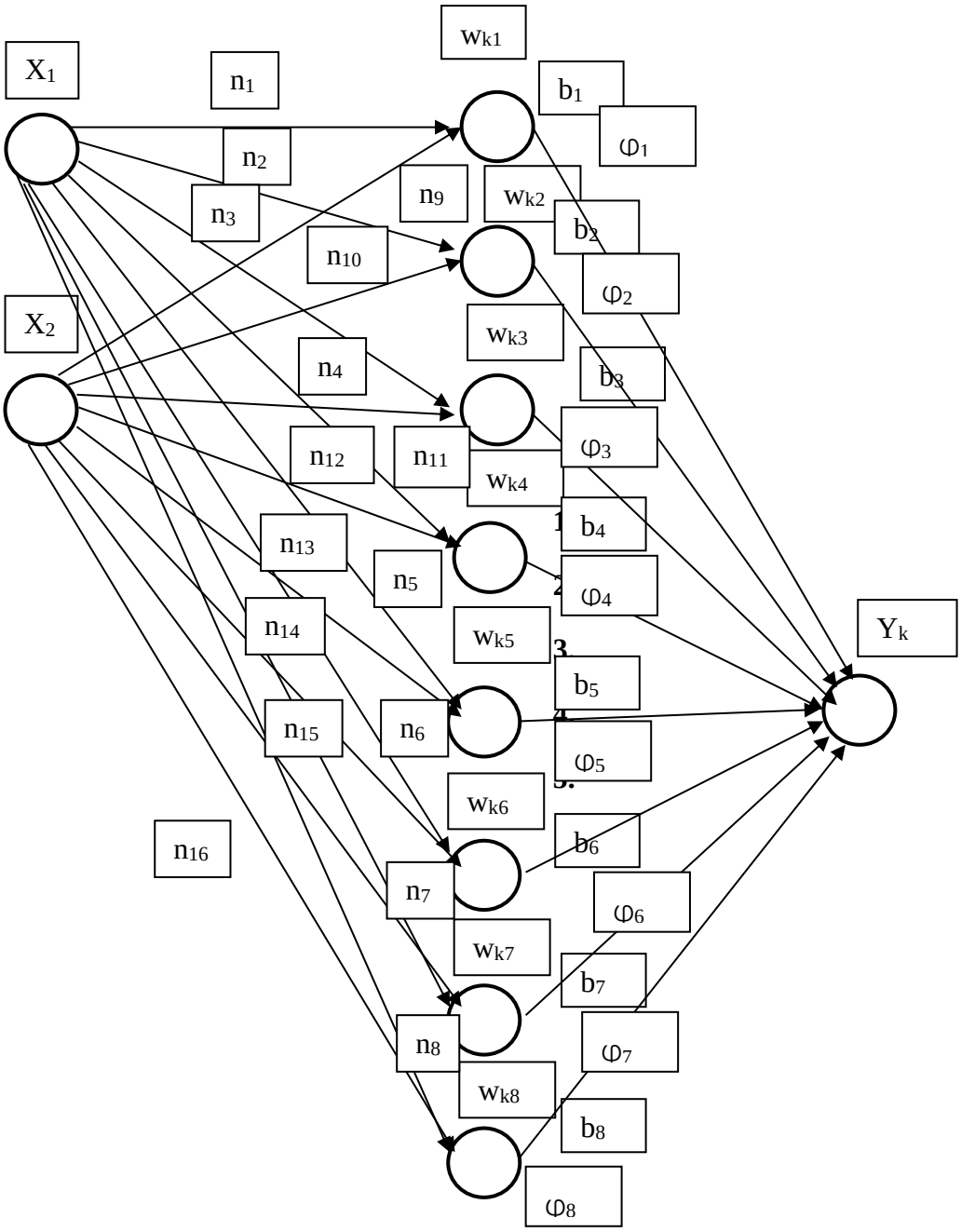


**Figure 2. Neural Model From Arduino ATmega328P+ESP8266(Courtesy of Author).**

In Fig. 2 the formula for $n_1$ until $n_{16}$ is:

$$n_1 = \varphi(w_{k1}x_1 + b_1)$$
$$n_2 = \varphi(w_{k2}x_1 + b_2)$$
$$n_3 = \varphi(w_{k3}x_1 + b_3)$$
$$n_4 = \varphi(w_{k4}x_1 + b_4)$$
$$n_5 = \varphi(w_{k5}x_1 + b_5)$$
$$n_6 = \varphi(w_{k6}x_1 + b_6)$$

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$$n_7 = \varphi(w_{k7}x_1 + b_7)$$
$$n_8 = \varphi(w_{k8}x_1 + b_8)$$
$$n_9 = \varphi(w_{k1}x_2 + b_9)$$
$$n_{10} = \varphi(w_{k2}x_2 + b_{10})$$
$$n_{11} = \varphi(w_{k3}x_2 + b_{11})$$
$$n_{12} = \varphi(w_{k4}x_2 + b_{12})$$
$$n_{13} = \varphi(w_{k5}x_2 + b_{13})$$
$$n_{14} = \varphi(w_{k6}x_1 + b_{14})$$
$$n_{15} = \varphi(w_{k7}x_1 + b_{15})$$
$$n_{16} = \varphi(w_{k8}x_1 + b_{16})$$

Activation function φ use hard limit function. If φ equal 1, all $w_{km}$ equal 1, all $b_k$ equal 0, $x_1$ and $x_2$ equal 1. Then $n_1$ until $n_8$ equal 1111 1111=255 and $n_9$ until $n_{16}$ equal 1111 1111=255 in biner. If temperature and humidity is too high can use $Y_k$ as alarm or led. $Y_k$ equal 1.
Block diagram in hardware like in Fig. 3.

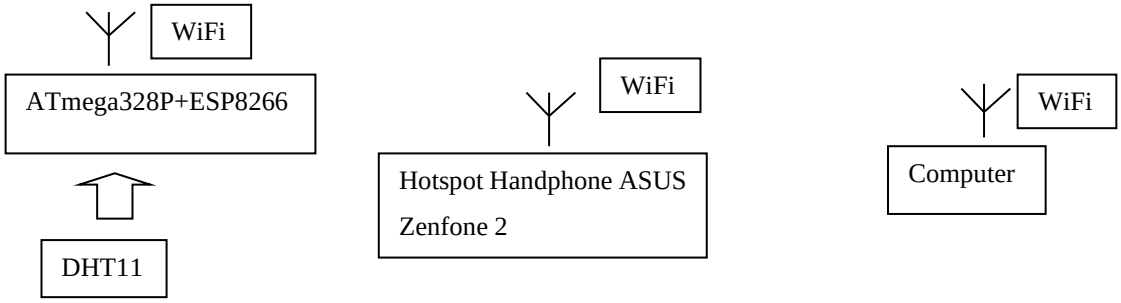


**Figure 3. Block Diagram In Hardware(Courtesy Of Author).**

In figure 3 connected pin 1 (VCC) DHT 11 to pin VCC Atmega328+ESP8266. Data signal temperature and humidity from pin 2 DHT 11 connected to RXD Atmega328+ESP8266. Data signal from Atmega328+ESP8266 transmit to hotspot handphone ASUS zenfone 2 through wifi antenna. Data signal from hotspot handphone ASUS zenfone 2 transmit to computer through wifi antenna. Data signal temperature and humidity will be display in computer.

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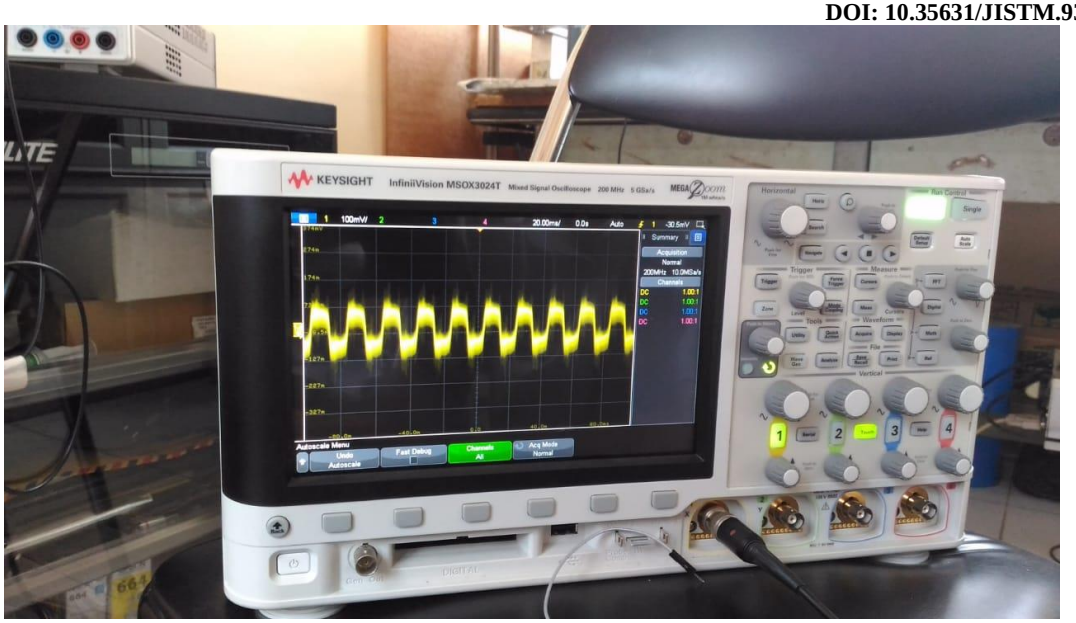


**Figure 4. The Signal Activation Function In DHT11 (Courtesy Of Author).**

The signal activation function like data signal in DHT11 see Fig. 4. Like figure 5 to initial software Apache and MySQL open XAMPP control panel in C:/xampp with name xampp.exe and display like Fig. 5.

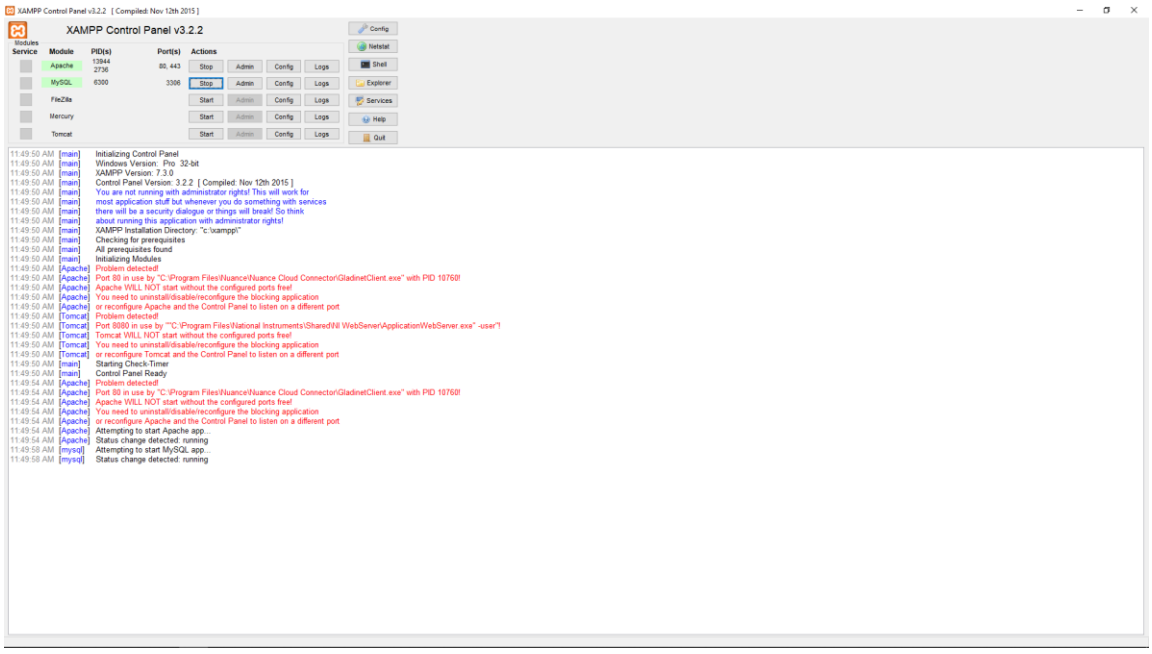


**Figure 5. XAMPP (Courtesy of Author).**

The first row in Fig. 6 write library ESP8266WiFi.h and DHT.h. Next row declare pin data signal from DHT11. Use pin 2 with command "#define DHTPIN 2". Next row define kind of censor DHT for use. For this case use module censor DHT11. Write "#define DHTTYPE DHT11". After define pin GPIO and kind of DHT to use, then make object dht to direct library DHT.h. Next row determine data type for temperature variable call t and humidity call h. Both

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variable have data type float. Next row define SSID (Service Set Identifier) and password for connection WiFi to use. After define SSID and password then make host variable to direct with write web address or IP address from server. In routine “void setup” next adjust baudrate use to program debug to serial monitor Atmega328+ESP8266. The baudrate is 115200bps. After adjust baudrate, program will initial object dht with command dht.begin and give delay 10 ms. Next row module send string “connecting to” with server address in serial monitor Atmega328+ESP8266 to get IP address is correctly. Next row to get connection wireless with WiFi connection direct with command "WiFi.begin(ssid, password)”. If connection to WiFi network in process connection then serial monitor Atmega328+ESP8266 will print dot until connecting got there with time delay 500ms. If connection to WiFi network got there then “WiFi connected” will print. Next row serial monitor Atmega328+ESP8266 will print IP address local itself. In routine “void loop” next make object WiFiClient with command “WiFiClient client” and initial constant with httpPort. Default port for HTTP is port 80 with command “constant int httpPort 80;”. Next row client in module WiFi Atmega328+ESP8266 try to connect server appropriate with host and port already declare. If connection not got there then program will print string “connection failed” to serial monitor Atmega328+ESP8266 and try to connect again. If connection got there then program will process next command. After process connection got there then give delay 1 second in order to censor is ready and read data from censor DHT11. Data humidity (kelembaban) will save in variable h and data temperature (suhu) is direct “celcius” will save in variable t. Next row investigate data from censor can read with instruction “ if (isnan(h) || isnan(t))” purpose if variable h not content or variable t not content. If data from censor can not read then Atmega328+ESP8266 will send string “Pembacaan gagal” to serial monitor Atmega328+ESP8266. If data humidity (kelembaban) and temperature (suhu) can read then data t will save in variable temperature (suhu) and data h will save in variable humidity (kelembaban). After data temperature (suhu) and data humidity (kelembaban) obtain then send data to server with command:

```
client .print(String("GET /tes/add.php?"));
client .print("suhu=");
client .print(suhu);
client .print("&kelembaban=");
client .print(kelembaban);
client .print(" HTTP/1.1\r\nHost: host\r\nConnection: keep-alive\r\nAccept: */*\r\n\r\n");
```

Part of command above can send data with GET method to program add.php in folder tes in server follow by variable name send to PHP that is variable temperature (suhu) and variable humidity (kelembaban).

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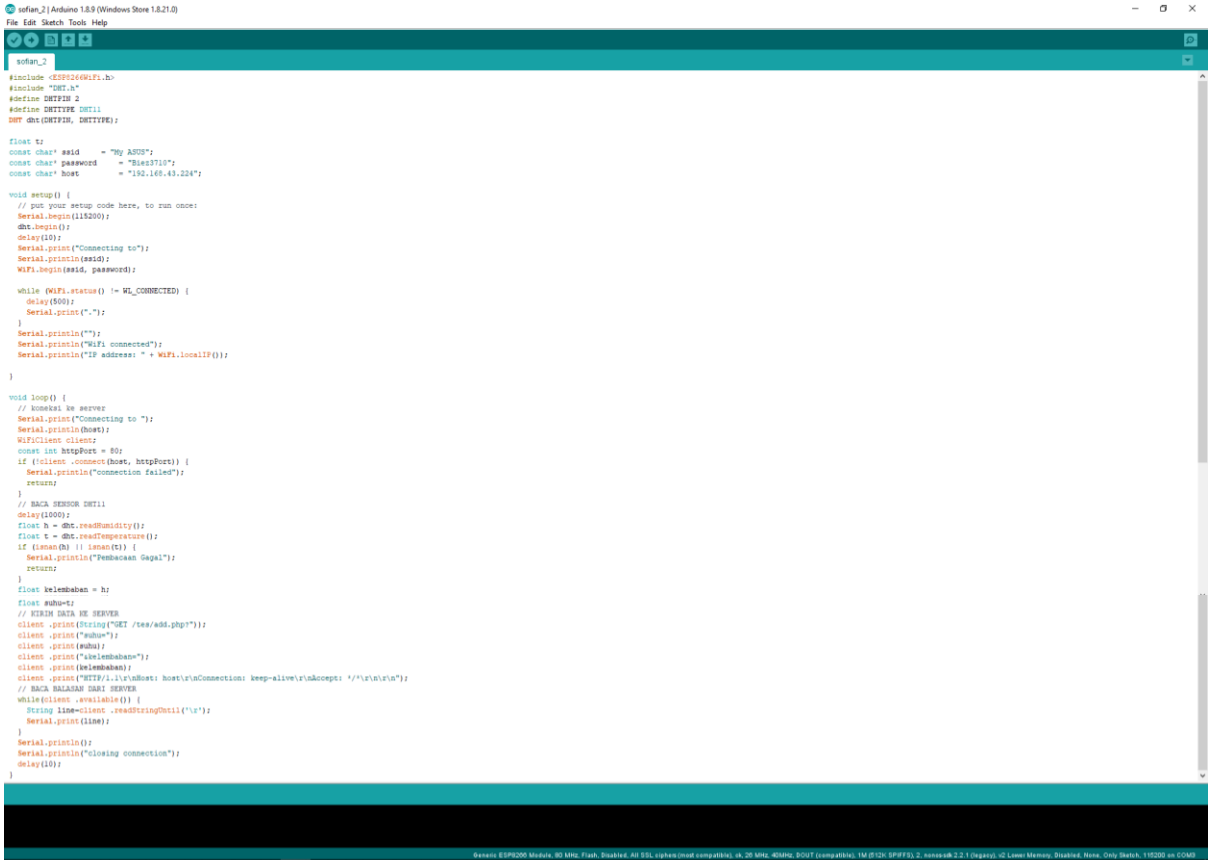


**Figure 6. Programming in Arduino (Courtesy of Author).**

In figure 7 function “mysqli_connect” use to connect to server that is configuration about host, user and password. Host is localhost and user is root. Name from database is “espclient”.

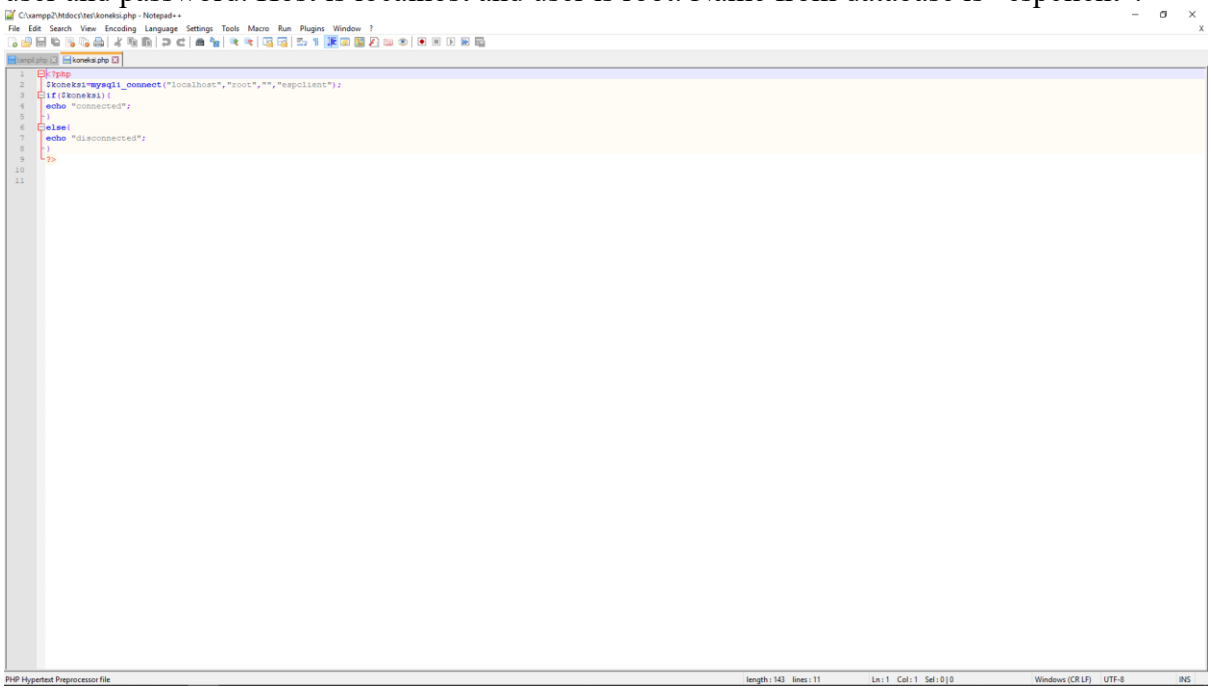


**Figure 7. File koneksi.php (Courtesy of Author).**

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In figure 8 row 2 that is file koneksi.php will open connection and select database will use. In row 3 and 4 data temperature (suhu) and humidity (kelembaban) from module Atmega328+ESP8266 will save in variable temperature (suhu) and humidity (kelembaban). In row 5 get to branch and investigate type of variable temperature (suhu). If variable is shape then content of variable temperature (suhu) and humidity (kelembaban) will save in database in table datatask will show in row 6. In row 7 query will execute. If success variable result value true or 1. Row 12 will execute if variable temperature (suhu) and humidity (kelembaban) not shape. Row 15 will done while address from this page open and automatic show page tampil.php will show record table datatask.

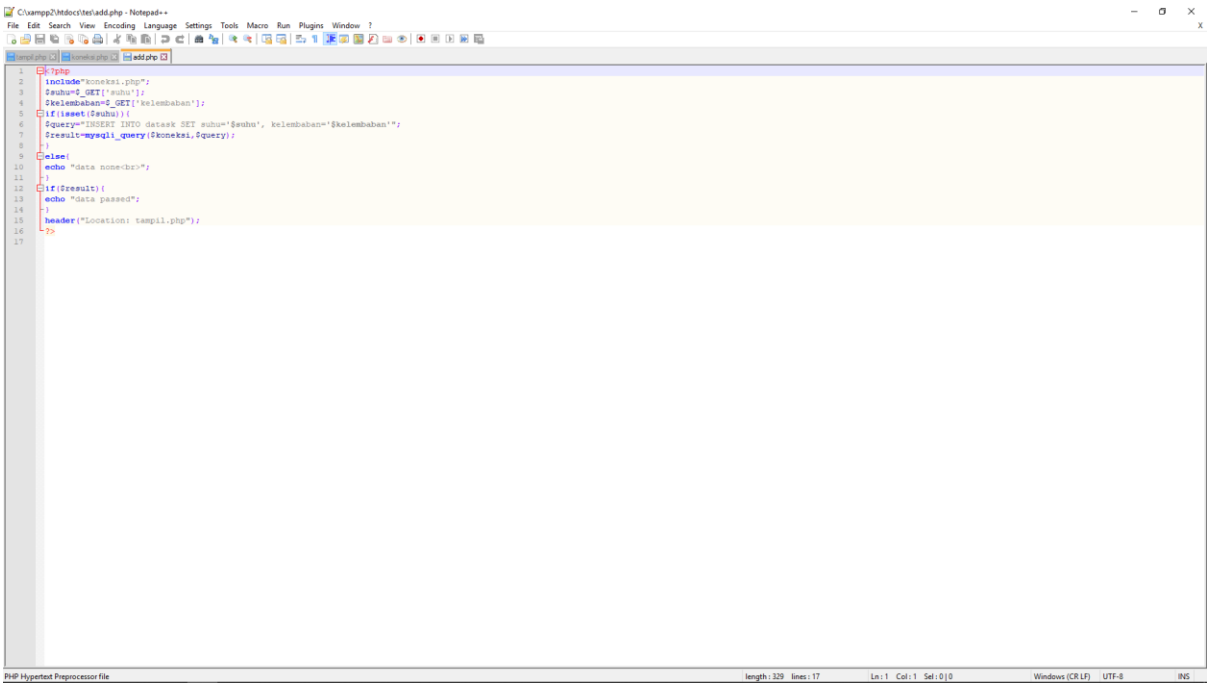


**Figure 8. File add.php (Courtesy of Author).**

In figure 9 row 2 write file koneksi.php to open connection and select database will use. From row 4 until row 12 is script html begin tag html, head and title. Row 7 until row 12 make header for display a table. Script PHP for take data from table database begin row 13 until row 22. Row 14 is query to take data from table datatask. Data consist of id, waktu, suhu and kelembaban. Row 15 execute query with use function mysqli_query. Result about query will save in variable sql. If execute query got there then variable sql will value TRUE or 1. Row 16 until row 21 is process to take data from table appropriate field show that is field id, waktu, suhu and kelembaban to variable id, waktu, suhu and kelembaban. Row 23 until 28 is program html gather together with php to display content every field.

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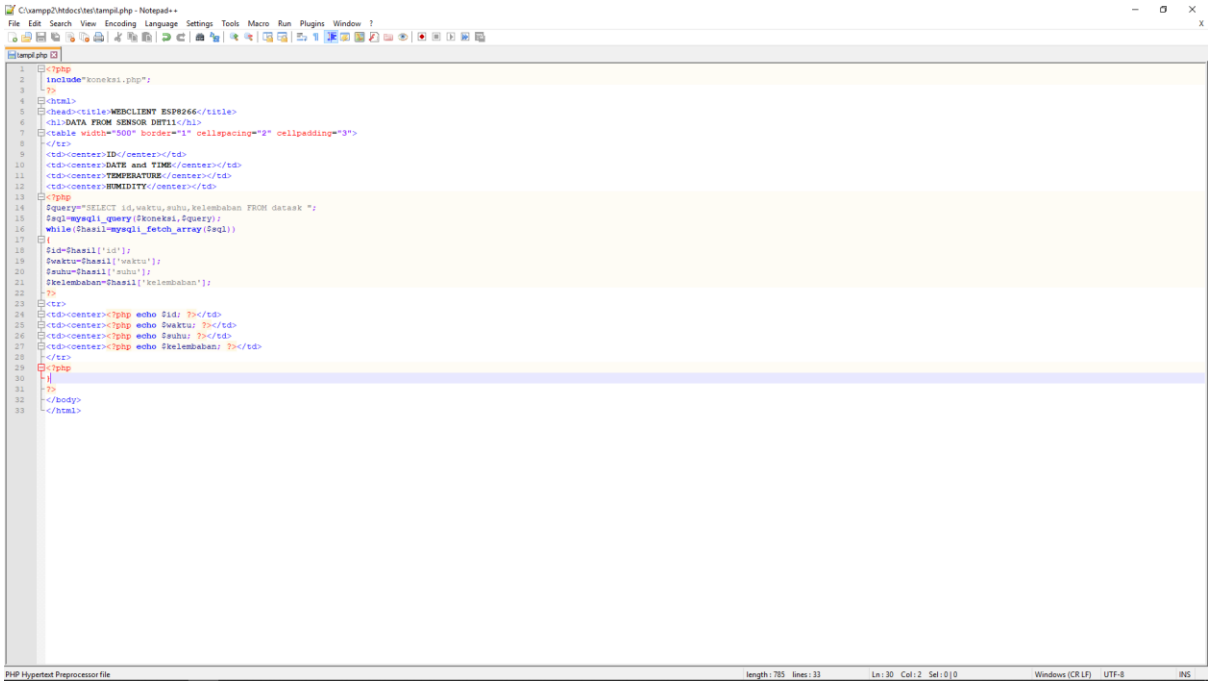
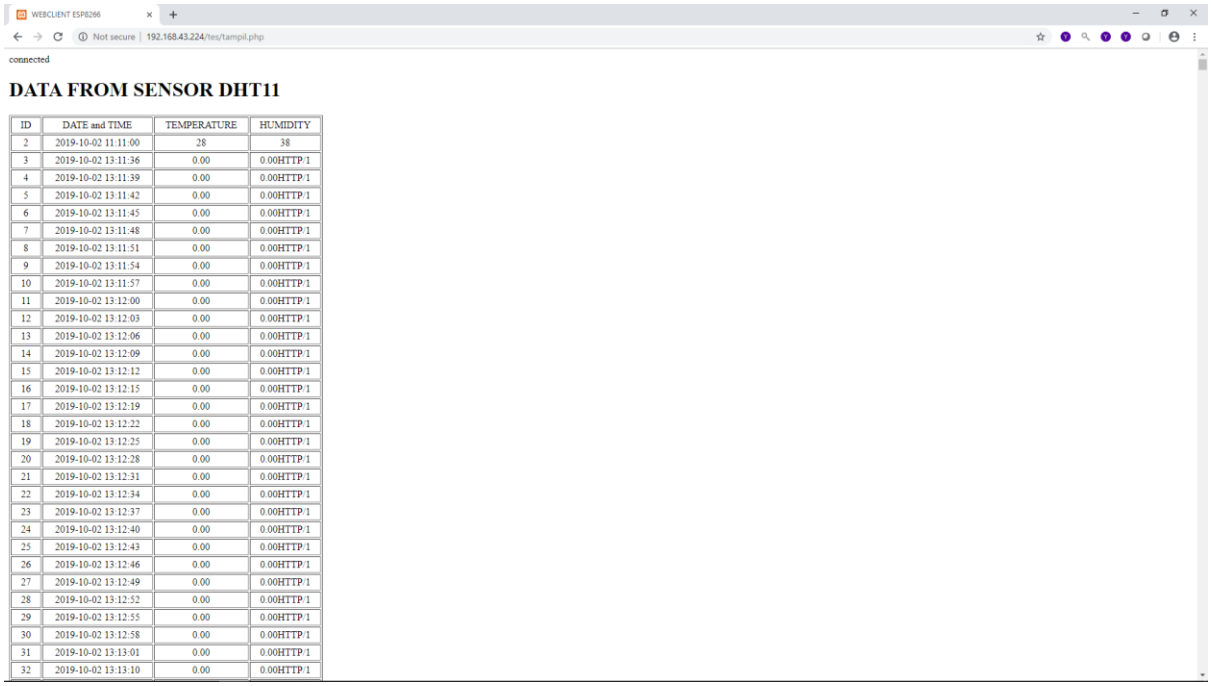


```
<?php
 include"koneksi.php";
?>
<html>
<head><title>WEBCLIENT ESP8266</title>
 <h1>DATA FROM SENSOR DHT11</h1>
<table width="500" border="1" cellspacing="2" cellpadding="3">
</tr>
 <td><center>ID</center></td>
 <td><center>DATE and TIME</center></td>
 <td><center>TEMPERATURE</center></td>
 <td><center>HUMIDITY</center></td>
<?php
 $query="SELECT id,waktu,suhu,kelembaban FROM datask ";
 $sql=mysqli_query($koneksi,$query);
 while($hasil=mysqli_fetch_array($sql))
 {
 $id=$hasil['id'];
 $waktu=$hasil['waktu'];
 $suhu=$hasil['suhu'];
 $kelembaban=$hasil['kelembaban'];
 ?>
 <tr>
 <td><center><?php echo $id; ?></td>
 <td><center><?php echo $waktu; ?></td>
 <td><center><?php echo $suhu; ?></td>
 <td><center><?php echo $kelembaban; ?></td>
 </tr>
 <?php
 }
 ?>
 </body>
 </html>
```

**Figure 9. File tampil.php (Courtesy of Author).**

In figure 10 open browser and write IP address computer as server in address bar follow address file tampil.php. Number ID begin 2 because ID 1 already use try out save data.



connected

**DATA FROM SENSOR DHT11**

| ID | DATE and TIME | TEMPERATURE | HUMIDITY |
|---|---|---|---|
| 2 | 2019-10-02 11:11:00 | 28 | 38 |
| 3 | 2019-10-02 13:11:36 | 0.00 | 0.00HTTP/1 |
| 4 | 2019-10-02 13:11:39 | 0.00 | 0.00HTTP/1 |
| 5 | 2019-10-02 13:11:42 | 0.00 | 0.00HTTP/1 |
| 6 | 2019-10-02 13:11:45 | 0.00 | 0.00HTTP/1 |
| 7 | 2019-10-02 13:11:48 | 0.00 | 0.00HTTP/1 |
| 8 | 2019-10-02 13:11:51 | 0.00 | 0.00HTTP/1 |
| 9 | 2019-10-02 13:11:54 | 0.00 | 0.00HTTP/1 |
| 10 | 2019-10-02 13:11:57 | 0.00 | 0.00HTTP/1 |
| 11 | 2019-10-02 13:12:00 | 0.00 | 0.00HTTP/1 |
| 12 | 2019-10-02 13:12:03 | 0.00 | 0.00HTTP/1 |
| 13 | 2019-10-02 13:12:06 | 0.00 | 0.00HTTP/1 |
| 14 | 2019-10-02 13:12:09 | 0.00 | 0.00HTTP/1 |
| 15 | 2019-10-02 13:12:12 | 0.00 | 0.00HTTP/1 |
| 16 | 2019-10-02 13:12:15 | 0.00 | 0.00HTTP/1 |
| 17 | 2019-10-02 13:12:19 | 0.00 | 0.00HTTP/1 |
| 18 | 2019-10-02 13:12:22 | 0.00 | 0.00HTTP/1 |
| 19 | 2019-10-02 13:12:25 | 0.00 | 0.00HTTP/1 |
| 20 | 2019-10-02 13:12:28 | 0.00 | 0.00HTTP/1 |
| 21 | 2019-10-02 13:12:31 | 0.00 | 0.00HTTP/1 |
| 22 | 2019-10-02 13:12:34 | 0.00 | 0.00HTTP/1 |
| 23 | 2019-10-02 13:12:37 | 0.00 | 0.00HTTP/1 |
| 24 | 2019-10-02 13:12:40 | 0.00 | 0.00HTTP/1 |
| 25 | 2019-10-02 13:12:43 | 0.00 | 0.00HTTP/1 |
| 26 | 2019-10-02 13:12:46 | 0.00 | 0.00HTTP/1 |
| 27 | 2019-10-02 13:12:49 | 0.00 | 0.00HTTP/1 |
| 28 | 2019-10-02 13:12:52 | 0.00 | 0.00HTTP/1 |
| 29 | 2019-10-02 13:12:55 | 0.00 | 0.00HTTP/1 |
| 30 | 2019-10-02 13:12:58 | 0.00 | 0.00HTTP/1 |
| 31 | 2019-10-02 13:13:01 | 0.00 | 0.00HTTP/1 |
| 32 | 2019-10-02 13:13:10 | 0.00 | 0.00HTTP/1 |

**Figure 10. Browser (Courtesy of Author).**

To proof connection between Arduino uno Atmega328P+ESP8266 in Fig. 11. In first row show date and close connection. Second row show date and connecting to IP address computer. Third show date and connection show “Read fail” or “Pembacaan gagal”. Fourth try to connecting. Fifth show date and delay time 500ms.

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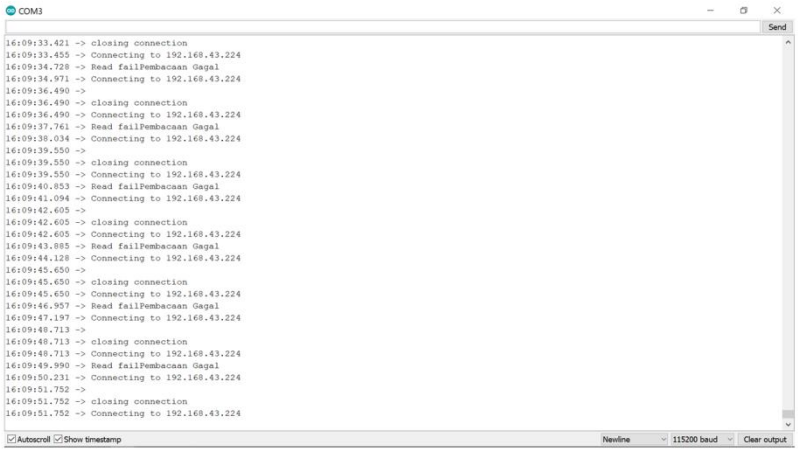


**Figure 11. The Connection (Courtesy Of Author).**

## Conclusion

Neural network may be thought of as simplified models of the network of neurons that occur naturally in the brain. From the biological viewpoint that the essential requirement for a neural network is that it should attempt to capture what are the essential information processing features of the corresponding real network. Neural network offers an alternative form of parallel computing that might be more appropriate for solving the task in hand. Neural network widely spread in applications. Although modern software enables easy handling with neural network that their creation, optimisation and usage in real life situations it is necessary to understand theory that stands behind them.

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