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Design and Arduino Implementation of Artificial Neural Network Based Intelligent Power Management System of Bangladesh

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Abstract

The research contrivance is to maintain and control load detachment or shedding in local distribution area and also utilize different types of power generation units such as conventional and non-conventional energy sources. The artificial neural network will anticipate, predict and exploit idea when generation is insufficient to meet the load demand. If the demand for the load is more than a generation, the artificial neural network will acknowledge the specific area where load detachment would be appropriately needed. Basically, an intelligent power management system of Bangladesh is developed by using artificial neural network (ANN) and implemented using Arduino for validation this work. We have designed the artificial neural network by utilizing and manipulating different types of seasonal and occasional load data. For further utilization, we actually divided an area into different sub-areas such as residential-load, industrial-load, commercial-load and VIP-load. However, it can suggest the area where load-shedding would be preferable on the basis of priority. Hence, artificial neural network suggests the area where maximum load-shedding is desired which is demonstrated by Arduino.

Keywords: *Power system, artificial neural network, supervised learning, solar radiation, regression plot, error histogram*

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INTRODUCTION

Power cut or load shedding is a common phenomenon for developing countries where power generation is not enough to meet the demand. Due to the insufficient generation of electricity, load shedding occurs throughout the year in several countries. The control of load shedding and overall power system management is done fully manually in most of the countries. If an automated system could be constructed that would be able to control the load shedding and power management automatically, then it would drastically reduce the requirement of manpower, increase the efficiency and supervise precisely that load shedding is required or not [1]. Beforehand, so many development works have been accomplished in power sector related to artificial neural network (ANN) for pulling up accuracy and better efficiency.

For example, a combined genetic algorithm with three and four layered back propagation neural network was derived for short-term load forecasting model according to the load data of area like grid and relevant meteorological data of power system [2]. Also, a multi-layered feed-forward back propagation neural network has been used to train the input data, derived from Newton-Raphson load flow analysis for fast voltage stability indicator of power sector [3]. In another case, an approach of the back propagation network was implemented on an IEEE 14-bus power system for network observability and very accurate for ideal smart grid application [4]. Previously, a self-tuning adaptive power system stabilizer was built with backpropagation algorithm for stabilizing gain, time constant for lead PSS in real time by utilizing active and reactive power of generator as the input of artificial neural network [5]. Eventually, backpropagation training (BPT) algorithm is scratched to control reactive power of DIFG of wind turbine [6]. Previously, a reduced model for power system state has been estimated using multilayer artificial neural networks by capturing the nonlinearity of parameters data in power systems. To train this network here the error back-propagation (BP) algorithm is used which needs fewer measurement variables than conventional techniques [7]. Due to model of power sector loads characteristic dynamically and also obtaining power system controls, operations, stability limits backpropagation based artificial neural network and adaptive neural network-based fuzzy interface system (ANFIS) was induced [8]. Another study observes that the artificial neural network is an efficient tool for power loss allocation in the large and complicated power systems where two test bench method systems were proposed. The two test benches are IEEE 5-bus and 30-bus which were compared in 400 KV transmission systems. Using Z-Bus method, power losses in each bus is determined and compared with flow calculation results of artificial neural network [9]. Moreover, a three-layer feedforward neural network (NN) has been trained based on BP algorithm which controls generation automatically of a two-area hydro-electric power system. By investigating input-output mapping of hydro systems, the controller has been implemented on a two-area hydro-electric power system model using artificial neural network [10].

There are several artificial neural network learning paradigms. Here, we are using the feed-forward network with backpropagation algorithm [11]. This network would basically point out when and where load shedding is required. For this intention, using the neural network library of MATLAB a network system has been created. Latterly, the network has been trained by several seasonal and occasional conventional load data of a particular area consumed from a sub-station. In reality, for understanding the purpose, the area has been divided into four categories which are residential, commercial, industrial and VIP area. Then, seasonal and occasional data of a day was first used to train the network. After that, by assumptions and by varying data, the number of data has been increased and trained again for a better result.

PROPOSED MODEL

For resolution, data from both conventional and non-conventional power source was separately gathered. And also, the gathered data was analyzed and calculated to use it as an input to build and train the proposed artificial neural network (Figure 1).

Moreover, all the different power source input data was trained sequentially and curve fitting was completed which is built by the network to ensure the accuracy of prophecy. Further verification and modification, trained data was continually analyzed again and again. After all, the ANN network is generated the output. And the output could be further modified according to the overall efficiency and accuracy of the prophecy.

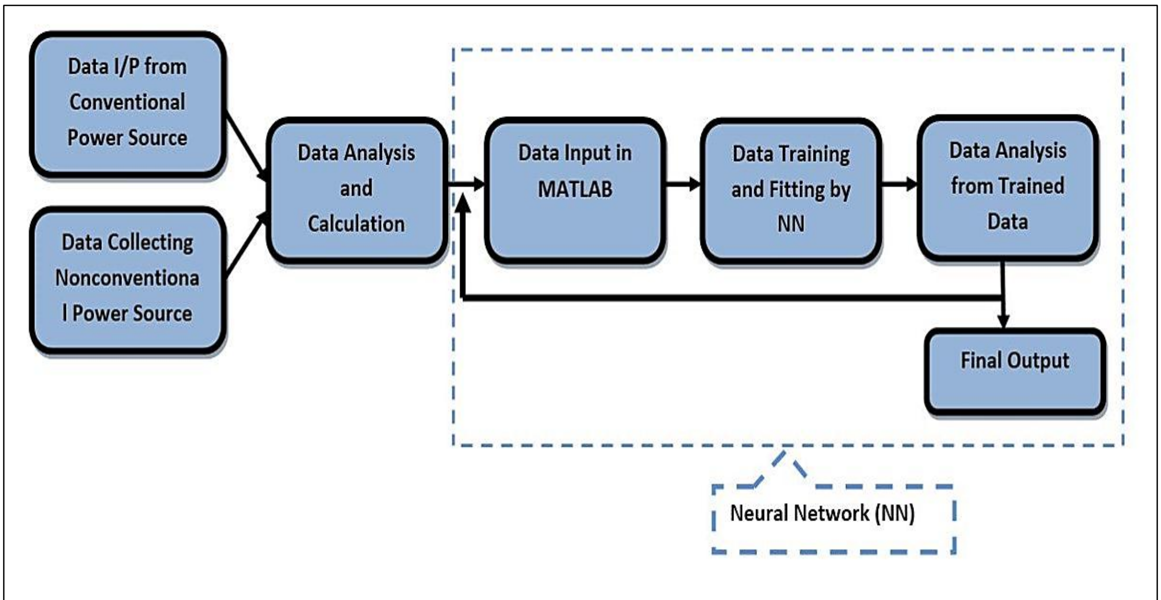

Fig. 1: *Block Diagram of this Network.*

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Mathematical Model of Artificial Neural Network (ANN)

An artificial neural network network as a computing system is basically made of many simple but highly interconnected processing elements. These elements are processed by variations of external inputs. This artificial neural network structure has been built by multiple weighted hidden layers which are supervised by the feed-forward network using backpropagation algorithm which is the most popular and widely used method in many applications [12]. Artificial neural network(s) are best suited for human-like operations such as image processing, speech recognition, robotic controls and also nowadays in power sectors (power system protection and control management). An artificial neural network is basically compared to a human brain. Human brain functions fast and have many neurons or nodes (Figure 2). Each signal or information goes through every neuron and it is processed, calculated, manipulated and then it is transferred to the next neuron cell. The overall process speed of each neuron or node might be slow but it creates an overall network, which is surprisingly faster and more efficient.

Structure of Artificial Neural Network

The first layers used in this network are the input layer and the highest layer is the output layer. Each information is processed here through two layers which are hidden layers (the intermediate layer) and output layers. Signal or information data is manipulated, calculated, and processed in each layer and then it is transferred to the corresponding layer of the network. Because of the fact that information is processed through layers or nodes in an ANN network, the more we increase the number of hidden layers, the more efficient result or output we can achieve. ANN works through these layers and calculates and over write the results as it is trained with given data. So, it is quite efficient as a whole network which is also able to predict the future outcomes and takes necessary decisions. That's why ANN network is often compared with neuron cells of human brain.

In this contrast, we have been used seven inputs and three output layers whereas two inputs are convention and non-conventional power generation, and the other four inputs are the consumer load demand. Also, the outputs are the target layers have been introduced to predict whether load detachment is required or not. The intermediate layers are hidden layers and output layers. Apparently, the input and output layers could be handled and controlled direct manually. The results would be more efficient with the increasing the number of hidden layers. In the network model, 250 multiple weighted hidden layers have selected [13–15].

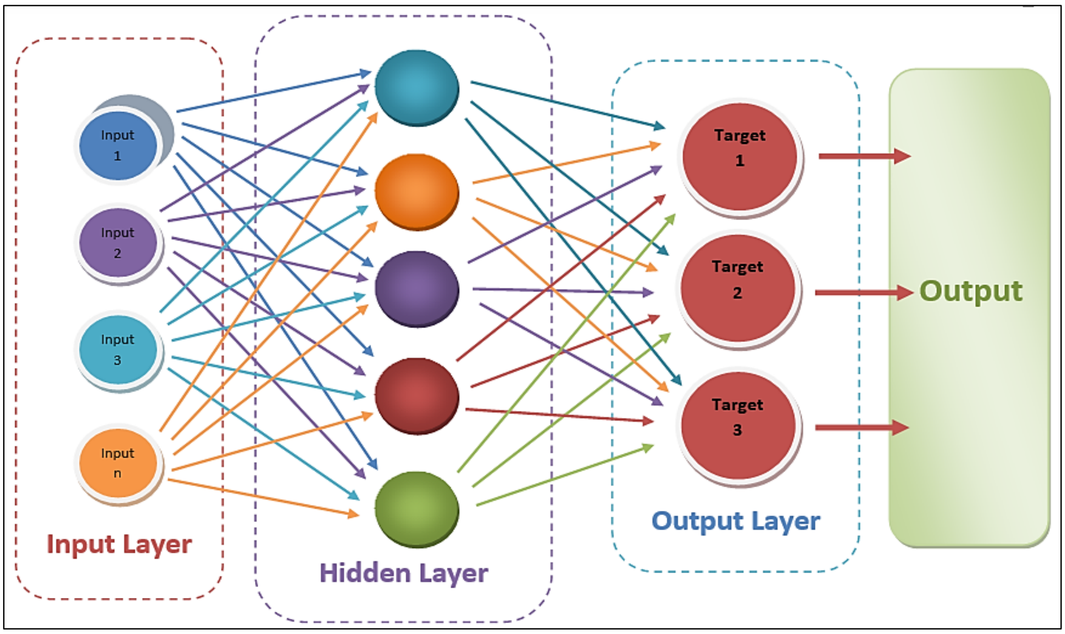

Fig. 2: *Basic Layer Structure of Artificial Neural Network.*

MATHEMATICAL MODEL OF ANN

We have used two layered feed-forward networks supervised by backpropagation algorithm. That's why, two functions are needed to be constructed, one for inputs to hidden layers and another for hidden layers to output layers or targets. In this network, we have considered n (=7) is the number of inputs, H (=250) is the number of hidden layers, and T (=3) is the number of output layers. The weight between inputs unit i and hidden unit j is $W_{1i,j.}$ Also the weight between hidden unit i and output unit j is $W_{2i,j.}$ [5, 16]. The block diagram for illustrating equations of final output is given below:

From the Figure 3 weight equations,

$$W_{1i,j} = n \times H \tag{1}$$

$$W_{2i,j} = T \times H \tag{2}$$

The input to hidden layer output,

$$A_1 = \tan sig(w_{1i,j}n + b_{1i}) = f(w_{1i,j}n + b_{1i}) \tag{3}$$

Final output equation,

$$Y = A_2 = purelin(w_{2i,j}A_1 + b_{2i}) = f(w_{2i,j}A_1 + b_{2i}) \tag{4}$$

DATA ANALYSIS FROM CONVENTIONAL ENERGY SOURCE

Real Data Analysis

Conventional energy sources are generally referred to non-renewable energy that includes many fossil fuels like coal, natural gas etc. Conventional energy is preferable energy source over the period. It covers a huge amount of energy that is being consumed by different power consumers throughout the entire world. Though, nowadays people are depending more on different renewable energy sources, but still more of our demand is mitigated through conventional energy. In the entire world (especially in the sub-continent region), conventional energy is being used to mitigate our base demand. So, we are using data of conventional power for our research work. Due to specify the work more effective, we are envisaged a particular power generation and also 24-hour load demand of different sectors of that particular area. That's why the entire area is divided into four sectors or sub-categories. According to the priority, load shedding will occur on those subcategories. Primarily, we trained our ANN network to obtained desired result using 24-hour load data. When ANN network is properly trained, the network would predict and indicate the sector of load shedding. For better utilization and assumption, the selected area 20% load is residential load, 65% load is commercial load, 5% load is VIP load and rest of 10% is industrial load is assumed.

Different seasonal and various occasional per hour data has been used for the ANN network training. The purpose of training network, the overall load demand was varied between 25 KW. Load shedding is controlled from control room of a sub-station. That's why, in this research, data of a sub-station was required that is recorded in KW per hour rating. Primarily, 24-hour load data of seven different seasonal days was acquired from the control room of a sub-station (Table 1). These different seasonal data represent different seasonal load variations and also demand variations. As example, during a festival, the load data and demand changes drastically. Also during any occasion or rainy day, the power demand is affected. So, we are also considering these particular cases.

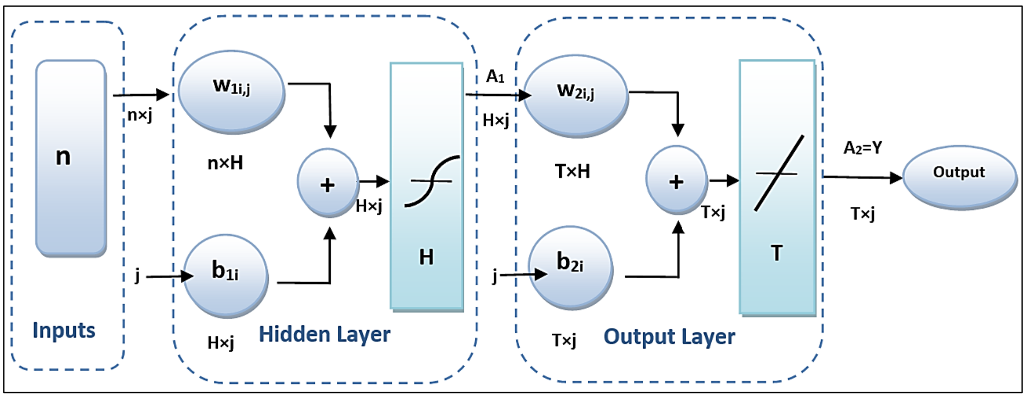

Fig. 3: *Tow Layer Network Supervised by Back Propagation.*

Table 1: *24-hour Load Data from Conventional Energy Source.*

Hour	Off Day (KW)	Peak Load (KW)	Before Rain (KW)	AT Rain (KW)	Winter (KW)	Festival (KW)	Occasion (KW)
1	6083	6416	6566	5600	5133	5700	6200
2	5916	6333	6200	5466	5033	5450	6166
3	5750	5833	6000	5350	4850	5516	6083
4	5666	5833	5916	5200	4766	5416	6033
5	5500	5833	5466	5016	4683	5200	5966
6	5250	5566	4050	4816	4383	5300	5783
7	5250	6350	5750	5350	4116	5516	6283
8	5350	8516	8016	7150	4766	5250	8150
9	5700	14267	15150	13066	5800	5133	13983
10	4850	18350	18766	15950	11233	5016	18516
11	5366	19366	19816	14266	13033	5116	18883
12	5366	20516	19816	15850	13300	4966	20800
13	6566	20833	18466	15916	13366	4983	20983
14	5216	19850	17300	15516	13633	5033	21133
15	6866	20166	17300	15366	13766	4950	20450
16	6866	20466	17116	15366	13750	4800	19650
17	6866	18016	15266	13533	13733	5666	18183
18	6250	14250	12366	11200	11383	5800	13500
19	6866	12450	10633	9800	7300	6300	13166
20	6750	10066	9133	8466	8016	6350	11000
21	6750	8400	7550	7000	5366	6366	10500
22	6916	7550	5250	6316	5283	6283	9500
23	6916	6816	6883	5850	5200	6083	8150
24	5900	6416	6466	5700	5183	5966	6200

ASSUMED DATA ANALYSIS

Artificial neural network works more efficiently if it is trained with larger amount of input data. For this reason, the amount of data was increased to acquire more efficient result, by assumptions and observing the variations of load data. Different types of scenarios were considered for which there were acute load variations. By observing and manipulating the real data which was acquired from sub-station, the amount of data was increased to a greater extent considering many cases.

Many different scenarios like seasonal-wise (such as rainy or winter season), occasional-wise (such as public holidays) and also festival-wise (such as festival days like Eid, Puja or Christmas day) was considered. Because of the fact that, these days have different load demand and variations, so training with these types of assumed data would give a more accurate and more acceptable load shedding outcome. For example, seasonal-wise data could be divided into many sub-categories like rainy season or winter season. During rainy season, the load variation is different than the winter season. Also, to be precise, a rainy day has different load demand variations than before rain or after rain. As well as during winter season, the load demand is a lot less than summer or any other season because the power consumption is less than another season. However, during different festivals and occasional days, the load demand of different areas also varies to a greater extent. So, these different criterions of load variations were considered and data was assumed accordingly to acquire more flexibility.

DATA ANALYSIS FROM NON-CONVENTIONAL ENERGY SOURCE

Assumed Data Analysis

Non-conventional energy sources are known as renewable energy which is harnessed from sunlight or other natural sources. There are numerical types of renewable energy such as solar energy, wind energy, biomass, geothermal energy, tidal energy, wave energy, fuel cell and others (ocean, thermal energy conversion, MHD generator etc.). From the statistical analysis, it is observed that solar and wind energy is the most acceptable and applicable renewable energy sources all over the world. In this part, PV module based 1 MW solar power plant has been considered which produces maximum 800 KW AC, if the installed solar power plant is 80% efficient because of solar system losses some energy due to wiring, power, inverter efficiency, interfacing with grid connection etc. But practically, to produce 800 KW AC power from a solar PV based power plant, we have to install a plant which is more than 1 MW capacity. On the other hand, solar panel produces direct current (DC) but we need alternating current (AC) for the purpose of grid connection. Because of the physics, some losses arise for converting the energy from sun into DC power and also turning power into AC power. The ratio of AC to DC is called the 'Derate Factor' which is typically 0.8. This means that the 80% of DC power converted into AC power. So, we need 875 KW DC power to produce 700 KW AC power which could be obtained by dividing AC power by 0.8. Accordingly, for installing 1MW solar power plant, we are using or considering 250 Wp (For every 250 W SOLAR PANEL, 17.6 square feet space is required), 4000 PV panel to fulfill our requirement.

Because of the seasons and weather conditions, the sunlight's radiation is being affected several times. Also, the radiation varies on the time to time of a day that's why it is not possible to extract maximum power from solar panel. After all, a solar PV grid connected 1 MW solar power plant generates 14, 60, 000 UNITS (KWh) per year which has been measured by multiplying the power in KW DC times the derate factor times the day of a year (365) times average sunshine's or irradiation 5 hours per day. Eventually, we are dividing the annual production of power by 12 and getting 1, 21, 666.67 KWh per month. Also, we got 4,055.56 KWh per day which is sufficient enough production to distribute power to our consumer when the main power is not available. Some fundamental equations have been used to fulfill our assumed per hour production from the solar PV power plant accordingly, based on the sun radiation which has been extracted from the sun light that comes towards the earth (Figure 4).

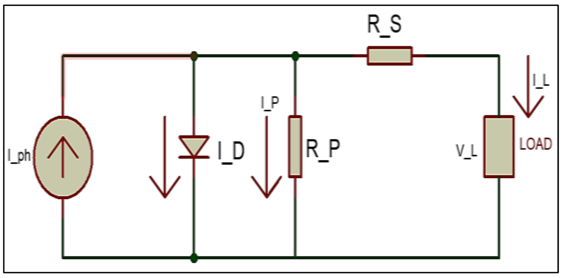

Fig. 4: *Equivalent Circuit of a Solar Cell or Solar PV.*

Load Current Equation of a Solar Cell:

$$I_L = I_{ph} - I_0\left(e^{\frac{qV_L}{KT}} - 1\right) - \frac{V_L}{R_P} \quad (5)$$

Short circuit current of a solar cell:

$$I_{sc} = I_{ph} - I_0\left(e^{\frac{qI_{sc}R_s}{KT}} - 1\right) - \frac{I_{sc}R_s}{R_p} \quad (6)$$

Open circuit voltage of a solar cell:

$$V_{oc} = \frac{KT}{q}\ln\left(\frac{I_{ph}}{I_0} - \frac{V_{oc}}{I_0 R_p} + 1\right) \quad (7)$$

Maximum Power of a Solar Cell:

$$P_{\max} = \left(\frac{qI_{ph}V_{mpp}^2}{qV_{mpp} + KT}\right) \quad (8)$$

Here,
I_{ph} = Source current; I_0 = Reveres saturation current; V_L = Load voltage; R_P =Parallel resistance; R_S = Series resistance; K = Boltzmann's constant; q = Electron charge; T = Temperature.

The above equations are used to calculate the current, voltage and maximum power of a solar cell or solar PV panel using the solar radiation [17, 18].

From the above Figures (5 and 6) and equations, we can see that when the solar radiation (I_{ph}) varies, the load current (I_L) also varies. If short circuit current (I_{sc}) varies, then maximum power (P_{max}) will also vary. That is the reason, we don't get maximum power output from the installed solar PV power plant [17, 18].

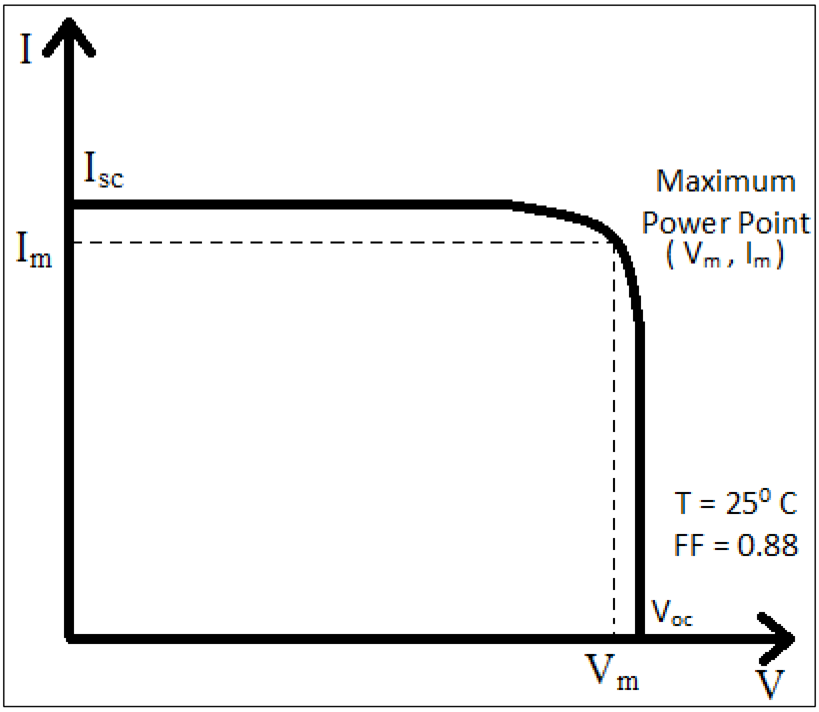

Fig. 5: *Maximum Power Extracted from Solar PV [12].*

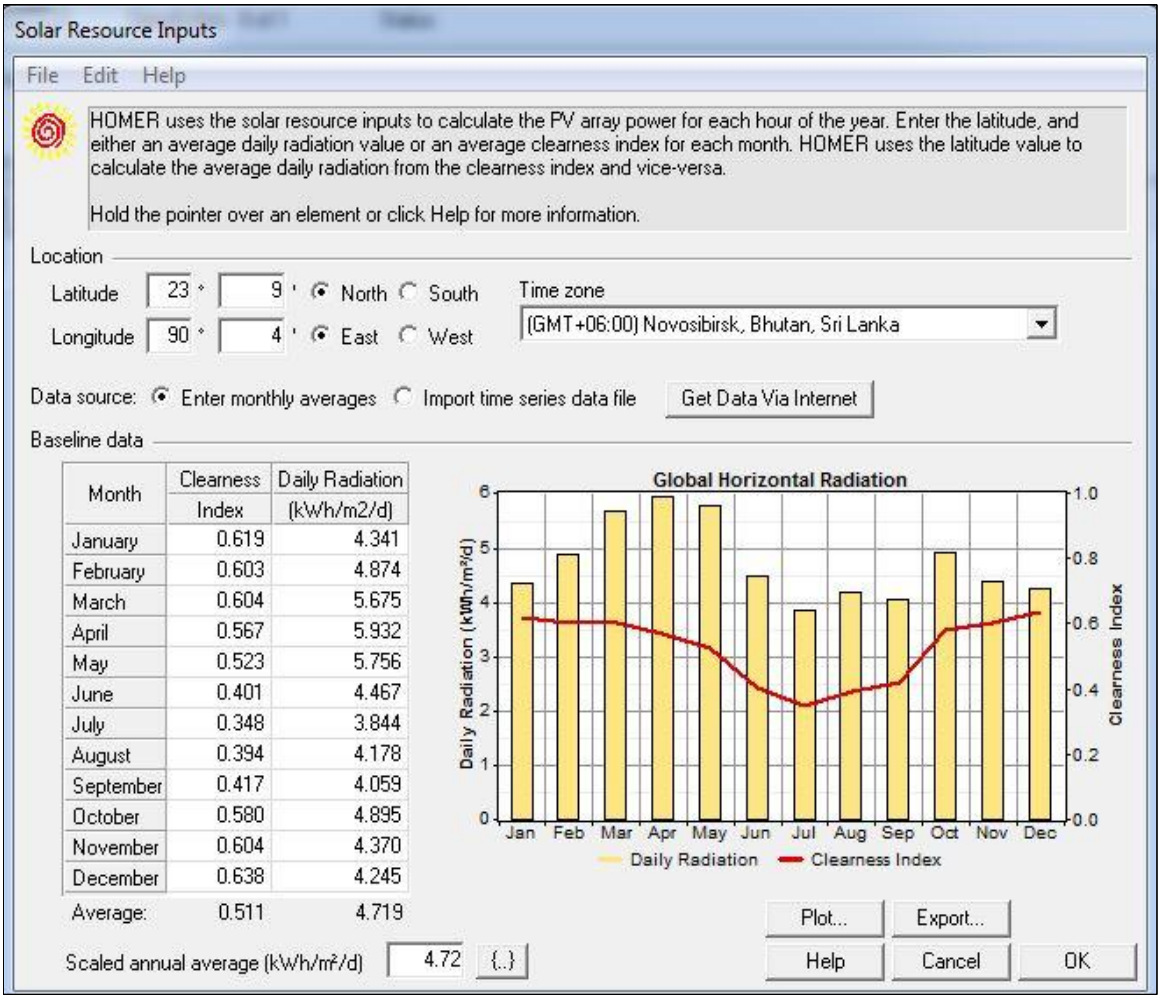

Fig. 6: *Solar Radiation using Homer.*

Table 2: *Different Types of Solar Data Per Hour in Kilowatt.*

Time(hour)	Solar(KW)	Time(hour)	Solar(KW)
1	0	13	469
2	0	14	567
3	0	15	410
4	0	16	201
5	0	17	44
6	90	18	0
7	373	19	0
8	589	20	0
9	671	21	0
10	694	22	0
11	694	23	0
12	686	24	0

Above data has been used several times by arbitrary assumption for creating the network where solar radiation is available (Table 2).

SOLAR RADIATION CALCULATION USING HOMER FOR DATA PREDICTION

In our research work, specifically, Homer software has been used to calculate solar radiation at different times of the year.

The latitude (23.7°N) and longitude (90.366°W) has been used for solar radiation calculation. We obtained solar radiation per month of a whole year. By observing this solar radiation, we would get average radiation 4.719 KWh/m2/d, which is approximately 5 KWh/m2/d [18]. According to all the above observations, analysis and assumptions, it could be stated that identically from 1MW solar power plant we could achieve maximum power generation which is 800 KWh when the sunshine is available. The solar PV power plant could be connected to the grid but the interfacing of power plant with the grid is difficult and very complicated to synchronize the solar energy. Also, it is difficult to calculate three phase harmonics when PV panel power output is interfaced with the grid. Using power electronics, the solar power integrations could be optimized and resolved but here this matter is not taken under consideration because of the possibility of power loss and interfacing complexities that might arise during grid connection. Finally, solar energy has been utilized for the peak load demand which is more convenient to reduce or overcome the power inconsistency.

Procedure of Training Neural Network

As this research is mainly data-based research work, plenty of data is being used to complete the training structure of artificial neural network. Since seven different categories of data has been used, training of each category of data was done individually to create artificial neural network which basically uses two-layer Feed-Forward network supervised by back propagation algorithm. The most common Levenberg-Marquardt (LM) algorithm is generated to train the network which is faster and have high performance than back propagation algorithm (Figure 7).

The whole training process is completed in several steps for acquiring the artificial neural network(s) structure. At first, our primary load data was inputted into MATLAB using an excel file. Then, the data was loaded to MATLAB by an input command which has been initially executed to build the network to go forward for utilizing the further work. Then, the fitting app of the neural network library was used for input-output and curve fitting. After that, input and target have been set for initializing the result and 'matrix rows' was selected for the conversion of columns into rows on the purpose of the better structure when showing the results after the training process. According to the next step of the training process, the overall network architecture has been completed. Basically, seven inputs and three targets were set for our training. There are two layers which are hidden layer and output layer for getting the desired output from input. The input and the output layer were selected for training and also the hidden layers were given afterward. A specific number of hidden layers were selected as more hidden layers also increase the efficiency of the prediction. The whole artificial neural network training could be dedicated as shown below:

So, the whole training process was for building a neural network and training of each category of data was done individually to complete the procedure. Training was done several times to complete our research work. The validation error is periodically observed several times during the training artificial neural network. The validation error is decreased with growing the iteration. We the performance of artificial neural network is satisfactory and validation error is comparatively low, then the artificial neural network training is stopped.

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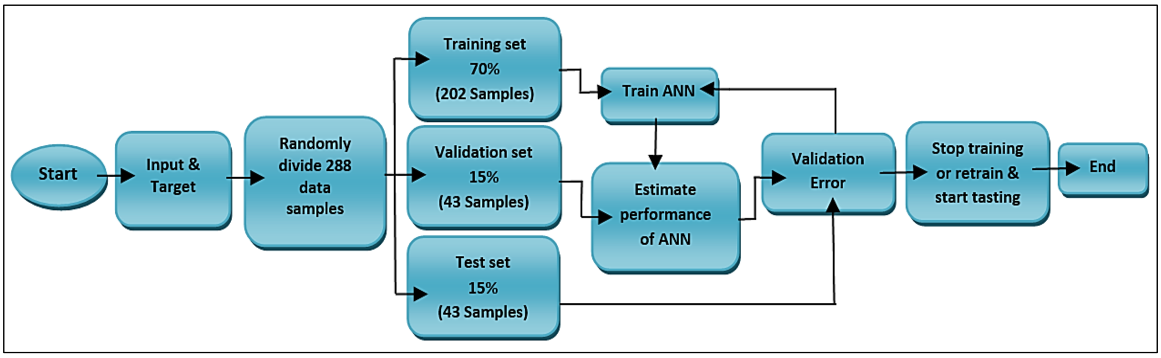

***Fig. 7:** Flow Chart for Training Artificial Neural Network.*

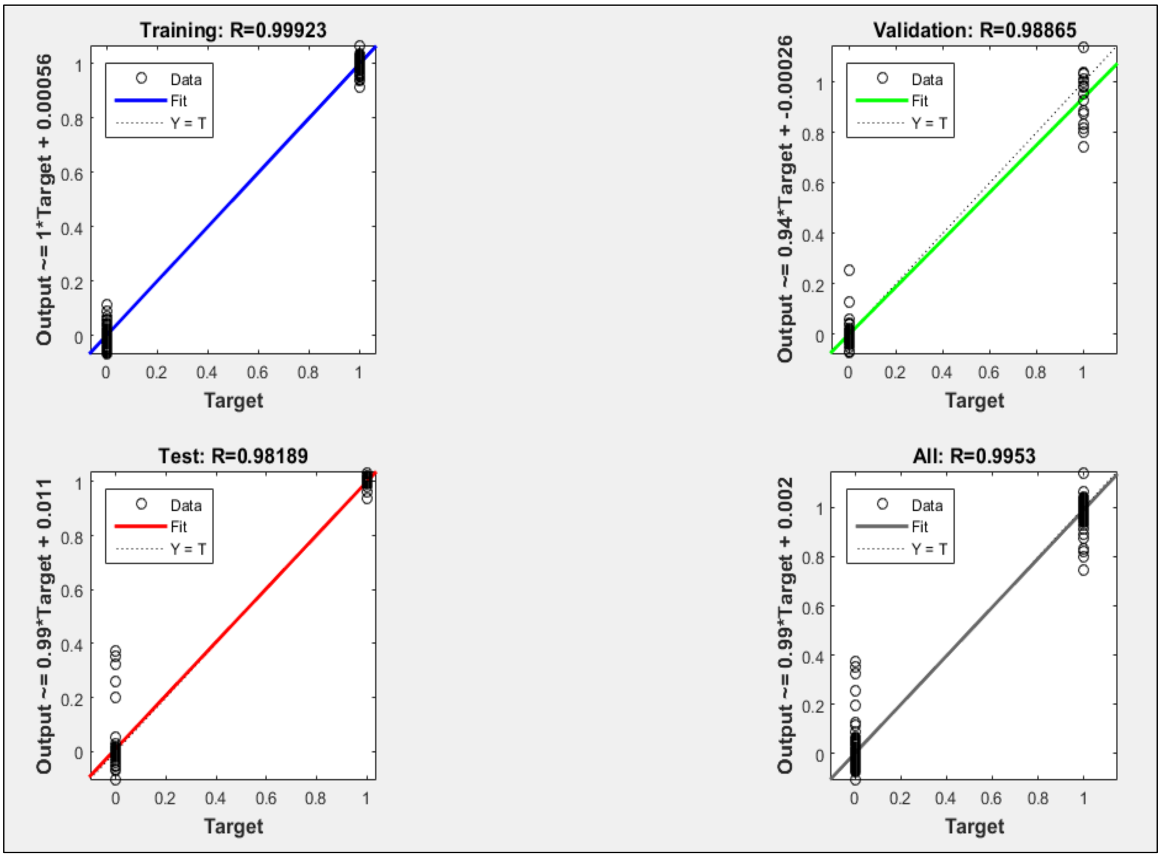

***Fig. 8:** Regression Plot of Artificial Neural Network.*

RESULT AND OPTIMIZATION

These research objectives are optimized and predict the load shedding requirements automatically applying artificial neural network. As far as possible, we want to show result (at a specific hour), in a particular sector of an area, whether load detachment is required or not.

After building the artificial neural network and training the network with load data, we intend to present only '0' and '1' as outputs. When the artificial neural network predicts the output '0', actually that means that load shedding is not required in that particular case. Similarly, when the ANN network predicts the output '1' that means that load shedding is needed in that particular case. To initiate the result, we need to input the amount of power generation and also the required power demand at a specific hour. As it was mentioned previously, for the purpose of load shedding requirements, the observed area has been divided into four different sub-categories which are residential, commercial, and industrial and VIP. Undisrupted power is needed to be supplied in the VIP area. So, VIP area is not considered the result.

Then, after executing the command, the neural network will show the output with different combinations like 0, 1, 0 or 1, 0, 0 etc. First digit in the output is assigned for residential area, second digit is assigned for commercial area, and third digit is assigned for industrial area. As an example, when the result is (0, 1, 0), that means that, load shedding is required in the commercial area. But after the load shedding in that area, the demand is mitigated by the power generation. So, in the residential and industrial area, load shedding is not necessary. Similarly, when the result is (1, 1, 0) that means load shedding is required both in the residential and commercial area. Another combination could be (0, 0, 0) as well, then no load shedding is required at that hour. So, this part of our work represents the different combinations of our results and also explains their meanings for each case.

Regression plot represents the combination and comparison between the given target and the generated output after training. By analyzing the above figure (Figure 8.), we can see that R is 0.9953 which is closer to 1. So, the predicted output of artificial neural network is quite accurate in comparison with the given target. After the training process of ANN is completed successfully, Error histogram of that training is obtained which could be used to compare the results and observe the accuracy of the prediction. Error histogram is basically an observation of overall efficiency and also the percentage of error in that prediction. For example, as shown in the (Figure 9), a very small percentage of error (0.00039) has occurred maximum times (approximately 600 times) and higher percentage of error (0.3196) has occurred a lot less (approximately 10 times) during the training process. So, the overall efficiency of the prediction of artificial neural network is quite satisfactory for that particular training. This way accurate training could be done by artificial neural network and data could be retrained again and again unless the efficiency would be satisfactory.

Flow Chart of Arduino Implementation for Validation

Arduino has been interfaced with MATLAB to show a model representation of this paper. Basically, Arduino selects the pins which would glow or would not glow as a representation of load shedding in the corresponding area according to the artificial neural network output.

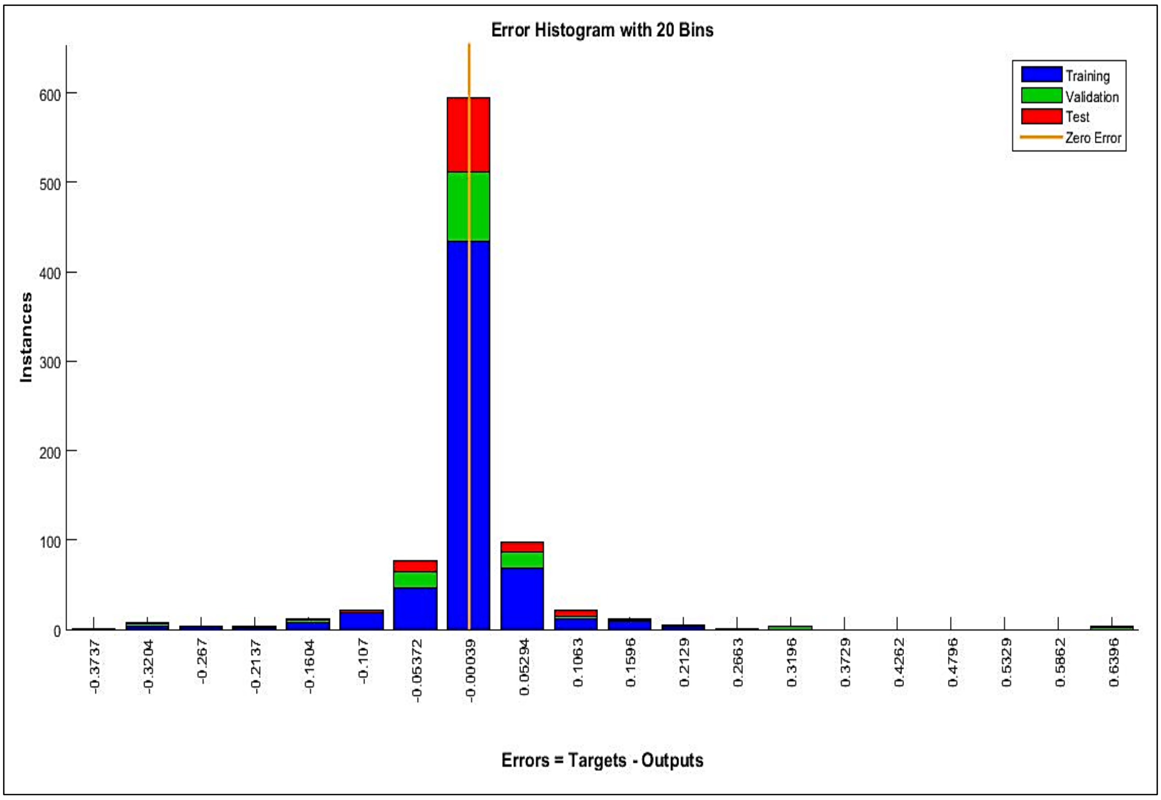

Fig. 9: *Error Histogram.*

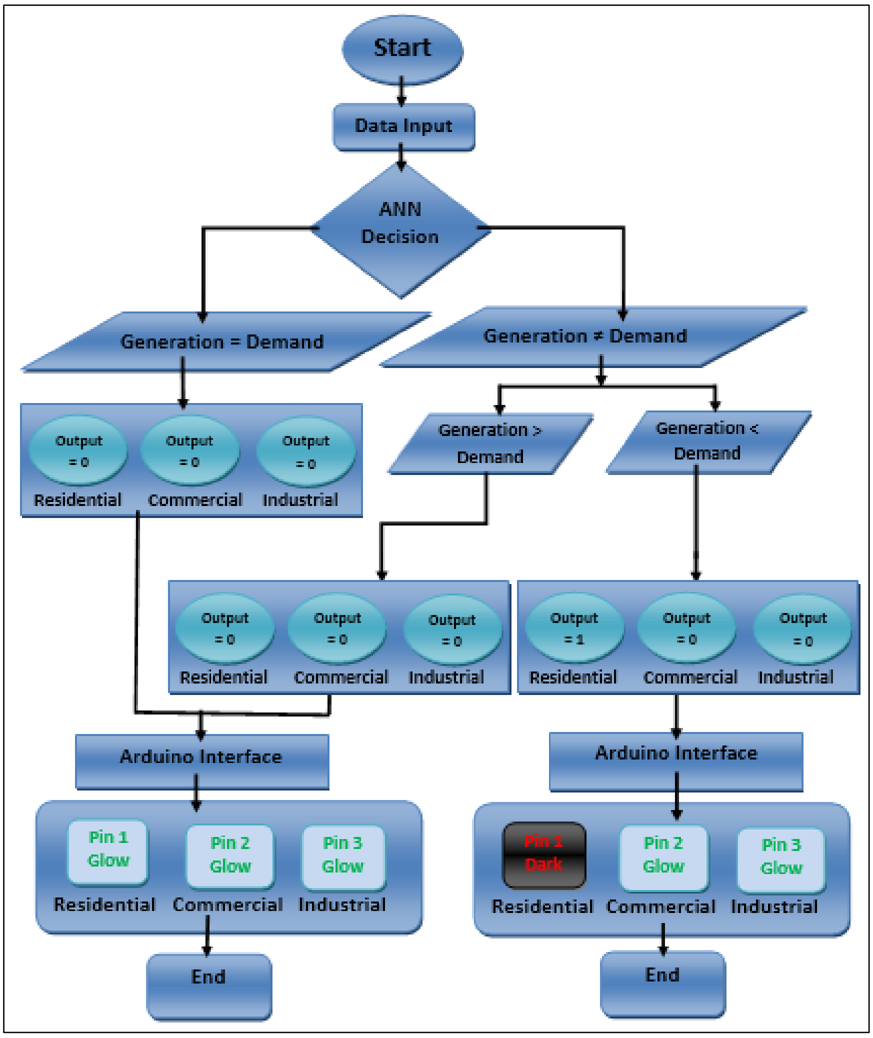

Fig. 10: *Flow chart of Interfacing Arduino with MATLAB (Model).*

There are various steps to interface Arduino with MATLAB in order to show our desired results in a model representation. First, the input data is given to artificial neural network of MATLAB and after data training and calculation, artificial neural network gives a result of load shedding in our desired divided areas (Figure 10). Our goal is to implement the artificial neural network results into real-life scenarios. That's why, we have used Arduino as a method of hardware implementation to justify our outputs. So, after successfully interfacing the Arduino with artificial neural network of MATLAB, the results of artificial neural network are delivered to Arduino and unsigned Arduino pins are set as outputs.

Basically, from the above flowchart, when the generation is equal or greater than the load demand, there are no load shedding requirements in any area. So, all the output pins will glow (showed in green color), that means these corresponding sub-areas (residential, commercial and industrial) are out of load shedding. Again, when the generation is less than the load demand, load shedding is required in one or more sub-areas. And also, the sub-areas where load shedding is occurring is one or more than one which actually depends on the input generation data and load demand data. From the above flow chart, the pin number one which is identified as a residential area will glow in dark (showed in red color) that means load shedding is occurred in that sub area. Here, we have showed only one combination, there might be several combinations like two pins (number one and two) may be dark (showed in red color) means residential and commercial area have fallen under load shedding.

PROTOTYPE IMPLEMENTATION AND VALIDATION

The prototype of the hardware implementation has been given below with some necessary picture. In the picture, we were implemented or developed the required sub-sectors which were being essential to describe the whole area and to complete of our thought. Here we have connected the whole area with the Arduino which has been also chosen in the pictures shown in Figure 11:

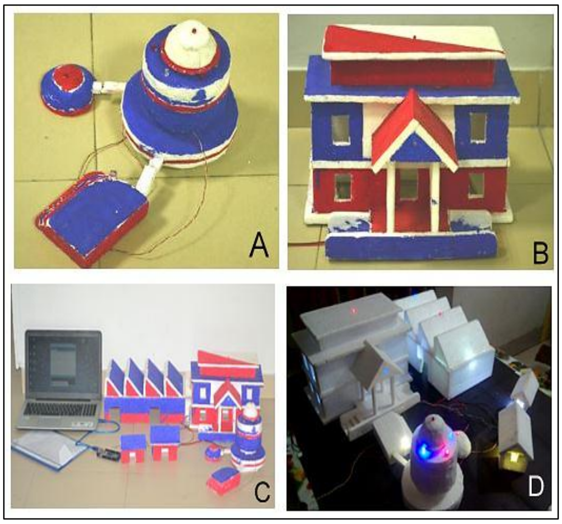

Fig. 11: *The Prototype of a Whole Area Supplied by ANN Connecting through Arduino.*

In the above pictures, Picture-A shows a residential area and Picture-b shows a commercial area. Picture-C and D are the combinations of four different sub-sectors included industrial and VIP area. All of these sub-sectors are connected to Arduino which is interfaced with artificial neural network of MATLAB for connecting a whole area. So, after training of neural network, when artificial neural network suggests an appropriate area for load shedding, then that particular sub-area is switched off through Arduino. In the pic-D, the red light was glowing. So, residential area is under load shedding.

CONCLUSION

The main target of this research is to control the load shedding and load variations of an area automatically with the help of artificial neural network. If this research work could be implemented to power system, then the overall accuracy would increase and also the chances of error would reduce because the load shedding controlling would be fully automated. Another important application of artificial neural network in the power system could be controlling of different feeders of sub-stations automatically. And under the feeders, the transformers could also be controlled automatically. Besides, it is possible to control the generation of power by knowing the overall load demand of the consumers. Moreover, the maintenance of sub-stations could also be automated as well which would be easier process than manual controlling. Similarly, each and every single or insignificant part of a power system could be brought together in a single automated network and using that powerful automated network specifically the whole power sector of a country could be controlled. Overall, this idea of automated system might open the door for a lot of future works related to artificial neural network and power systems.

The overall and computing world has a huge gain from artificial neural network(s) and also has a lot of growing interest. Its ability is that it learns quickly that makes the artificial neural network very powerful and flexible. Actually, neural networks have a big potential and has performed successfully where other methods are not compatible and are not recognized exactly. Artificial intelligence is being proposed to improve the power system management based on several techniques. Because of their fast response, there is no need to describe an internal algorithm in order to perform a specific task. It is also very well suited for our real-time operation. The techniques of artificial neural network(s) proposes us the efficient use of the computer as an operator aid instead of use of the predefined operating system procedure for load shedding which is done manually. This paper proposes the use of artificial neural network(s) or creates an artificial neural network for the service of automatic load shedding. A large number of generation and load demand data has been provided, and also load shedding plan has been provided in favor to compensate of this technique for building the network.

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