



Optimizing the producing and consuming the Energy in Smart houses by using Neural Networks

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Abstract

Goal: *introducing a hybrid solar cell system and wind turbine for optimizing the production of electric energy and consequently decreasing the consumption of town electricity*
For accessing to thesis goal and presenting a more accurate method, 7 districts of different climates were chosen in Iran. By providing sun shine and wind data of these districts and analyzing them we started the operation. The daily sun shine data and wind related data were set based on every 10 minute time, and it made the deduction more difficult. The format of all data was in PDF. By working hard for some hours a joint interval of date were chosen between them, and it made their format similar. By analyzing the data by Excel and Visual Basic, the amount of energy for every district were obtained. Then by using neural network of the Matlab software of 2015 and 2016, the amount of receiving wind and sun energy were anticipated. The result of these measures was the possibility of evaluating the ability of hybrid production of energy in the districts which we are surviving on them, in the districts with high and low production, the possibility of making the intelligent house with very low level of town electricity consumption and even with zero level of consumption.

Key words: *production and consumption of energy, intelligent house, neurotic network, and hybrid sun cell system and turbine.*

Introduction

By increasingly development of industry in a world that is called industrial, the increase in energy consumption is tangible and its existence in the all parts of human life is inevitable. Population growth and technology development is simultaneous with more consumption of energies which have fossil source and this increase will arise the concerns about standard life for future generations. Decreasing the fossil sources, global warming, melting the natural ices, Ozone layer getting thin, arising the sea levels, daily increase of water and atmosphere pollution, ecological problems and spreading the pollutant gases resulted from fossil fuel burning and etc. [1]

Development in identifying new and optimal ways of generating energy is very important in today world. Maybe at the first glance, the best way in decreasing the risks of mentioned factors is the replacement of fossil fuels by the nuclear fuels, but keeping the security of the



environment in these powerhouses and burial of the trashes resulted from nuclear fuels is so risky that the intensive claim of environment proponents followed it for years. By considering the inappropriate usage of atomic energy in recent years, human has continued the research about the repeatable energies like the energies resulted from wind, water, sun, and earth. By considering the explained factors in above, in this paper the author intend to investigate about generating and optimizing the energy in the smart houses.

Application of the photovoltaic cells

Some of the applications of photovoltaic cells are as follow:

Supplying the required energy of light for the remote districts, remote telecommunication systems, pumping the water, water purifying systems, electricity supply of rural districts, calculator, watch and toys, emergency systems, the refrigerators for keeping vaccines and blood for remote districts, ventilation systems of swimming pools, satellites and the space equipments[2].

Windy turbines

Windy turbine is a turbine that is applied for transforming the wind energy to the mechanic energy. Windy turbines are made in two types: horizontal and vertical. Small windy turbines are used for applications like charging the battery, while the larger windy turbines are considered as thegenerating energy sources.[3]

In general we can categorize the methods of using the photovoltaic cells and windy turbines to three groups:

1. Related to network applications
2. Not related to network applications
3. Backer systems applications

The characteristics of equipments of generating the energy of mentioned smarthome

solar electricity package 8000 watt, timer and inventor 1500 watt, panel 1000 watt.

This package includes some sun cells with total power of 1000 watt that if expose to the sun light for eight hours will generate 8000 watt energy in a day. The high power of sun panels of this package (1000 watt) enables the system to supply the required daily electricity of the consumers in addition to storing the energy for usage in the night time.

Windy turbine, Whisper 500

Whisper 500, is a strong generator for every kind of consumption. Whisper 500 has very high efficiency in dust and storm due to its two wings. Exclusive mechanism that Whisper models owe makes this turbine to be protected in front of storm, and have the best output in every wind speed. In average wind speed of 4/5 m/s, this turbine will generate 500 kw/h electricity in a month, that this amount of electricity will supply all requirements of a house.

Using turbine hybrid system and sun cell

Hyterkibiftoltaico system accompanied by charging battery system is a proper alternative to generate the required electricity of the different districts with different climates, and this is due to the low cost of maintenance, easy usage, and high security. A compound system of generating sun and wind power is include photovoltaic, wind turbine, battery bank, convertor, and other required tools and cables. The operation method of this system is in a way that photovoltaic and wind turbine for supplying the demand work together.



Introducing the research centers

By considering the different climates and considering the valid centers, the following districts are choosing to measure their amount of wind [6].

Types of weather	Latitude	Longitude	Province	city
Cold Mountain	38 25	48 29	Ardebil	Namin
Moist forest	37 11	50 10	Gillan	Langroud
Semi-temperate and humid with cold winters and hot summers.	37 27	57 18	North khorasan	Bojnurd
Moderate	23 22	48 24	Hamedan	Nahavand
Cold and dry - dry and hot	35 34	51 20	Tehran	Tehran
Hot, dry, low rainfall and high humidity	26 29	53 53	Hormozgan	Kish
Temperate and tropical humidity	25 17	60 37	Sistan and Baluchestan	Chabahar

Used algorithms in neural network for anticipating the amount of energy generation

Prepared data by Matlabsoftware are evaluated by the neural network and the anticipation is done for 2015 and 2016.

In the designed neurotic network, an input vector and a target vector are used for approximating a function. The stages of the network training are as follow:

- Preparing the training data
Data is categorize to 3 parts by the network,25 percent of data for training, 50 percent of data for validation, 25 percent of data for test
- Making the network
- Network training
- Simulating the network by the new data
In this stage the parameters of 2015 and 2016 are given to the network as the input data and the anticipation results are obtained.

Vectors

In the following, the amount of energy generation in a month is calculated by using sun shine and wind data. We have mentioned just one city as the sample, and this is because of their huge volume.

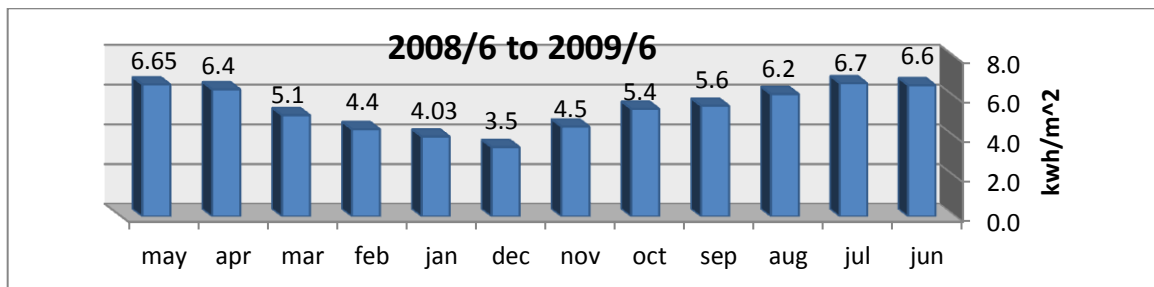


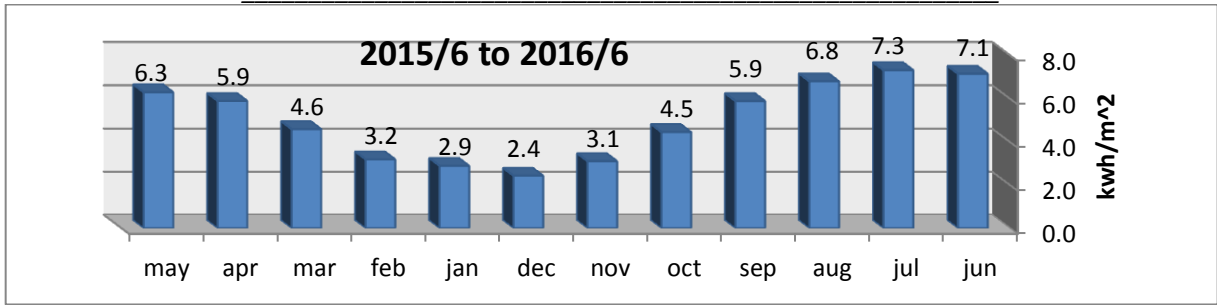
Figure out Chabahar radiation data from 01/06/2008 to 01/06/2009



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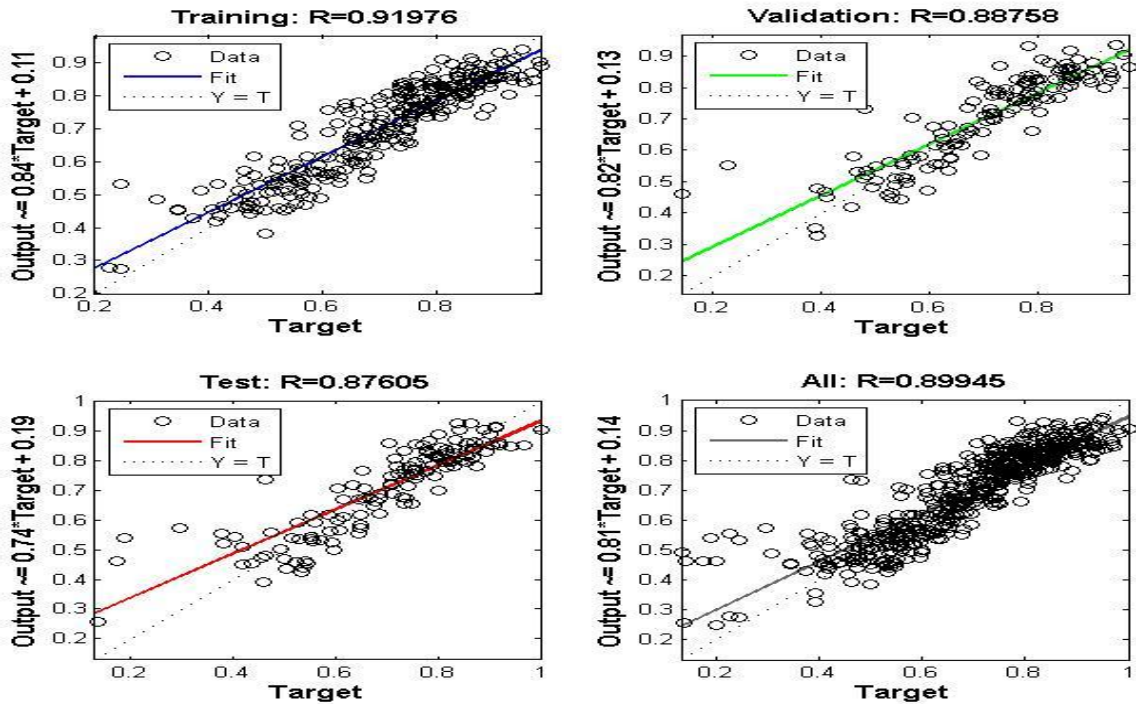
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Graph of predicted

Result: by considering the original data vector and the anticipated data vector and by considering the sun cell package which is selected for smart house, in this city not only we receive the enough amount of sun energy in one year, but also we will have the excessive power in all seasons.



Percentage error of prediction accuracy and radiation data Chabahar

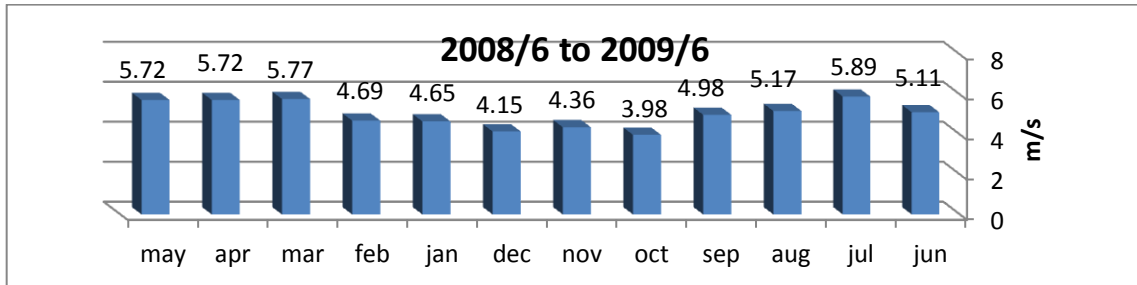
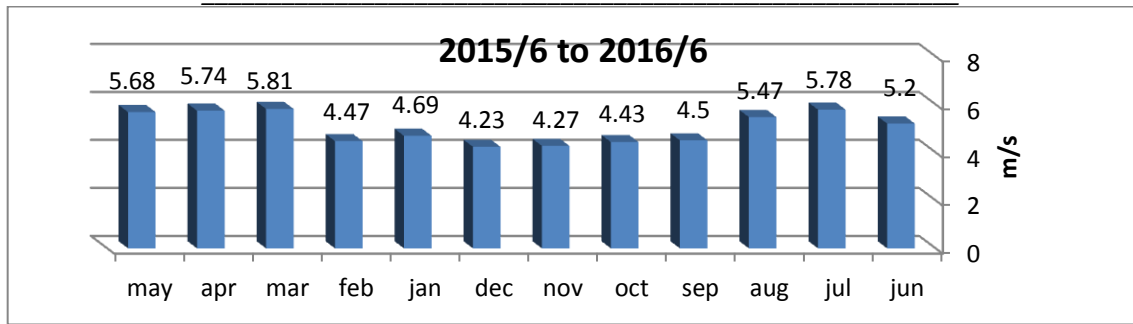
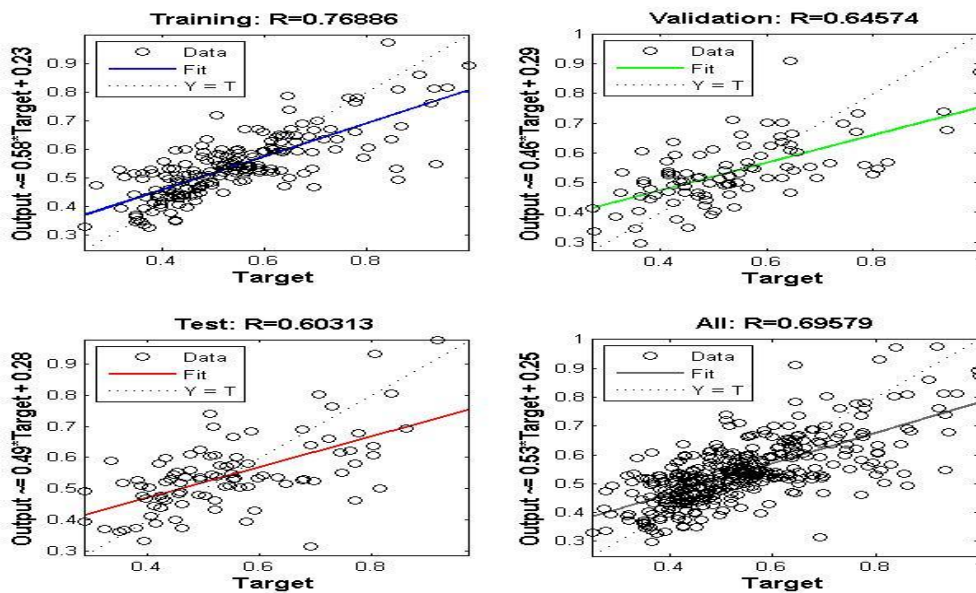


Figure out Chabahar wind data from 01/06/2008 to 01/06/2009



Graph of predicted

By considering the anticipated data and by considering the used wind turbine in the smart house and by considering the wind speed at 10 meter height, the turbine had the best utilization in May, April, March, February, January, September, August, July, June, and has generated 500 kw/h electric energy in a month.



Percent accuracy of wind forecasting error of Chabahar

Results

The hybrid feature	The amount of wind energy	The amount of solar energy	city
Yes	Very good	Excellent	Bojnurd
Yes	Good	Excellent	Teharan
Yes	Very good	Excellent	Chabahar
Yes	Very good	Excellent	kish
Yes	Good	Excellent	Nahavand
No	bad	Excellent	Langroud
Yes	middling	Excellent	Namin



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In all evaluated cities, the amount of receiving the sun energy has the highest efficiency, but as we showed in the above table the amount of wind energy is not desirable, for example, in Langroud city, the system is not able to become hybrid.

In the following table, the amount of energy generation by the designed hybrid system, with separating the month from city, by the neurotic network, from June 2015 to May 2016 is anticipated and presented in kw/h.

Namin	Nahavand	Langroud	Kish	Chabahar	Tehran	Bojnurd	
740 kw	640 kw	240 kw	690 kw	740 kw	640 kw	740 kw	JUN
648 kw	648 kw	248 kw	698 kw	748 kw	648 kw	748 kw	JUL
648 kw	648 kw	248 kw	648 kw	748 kw	648 kw	748 kw	AUG
640 kw	640 kw	240 kw	640 kw	740 kw	540 kw	640 kw	SEP
648 kw	648 kw	248 kw	698 kw	748 kw	548 kw	648 kw	OCT
240 kw	590 kw	240 kw	740 kw	640 kw	540 kw	640 kw	NOV
248 kw	598 kw	248 kw	698 kw	648 kw	548 kw	648 kw	DEC
548 kw	648 kw	248 kw	748 kw	748 kw	548 kw	648 kw	JAN
624 kw	624 kw	224 kw	724 kw	724 kw	624 kw	624 kw	FEB
748 kw	748 kw	248 kw	748 kw	748 kw	748 kw	748 kw	MAR
740 kw	740 kw	240 kw	740 kw	740 kw	740 kw	740 kw	APR
698 kw	548 kw	248 kw	748 kw	748 kw	548 kw	748 kw	MAY

for example, in August,

the amount of power consumption that the designed intelligent houses in different cities obtained from this system is as follow:

Bojnurd: 748 kw; Tehran: 648 kw; Chabahar: 748 kw; Kish: 648; Langroud: 248 kw; Nahavand: 648; Namin: 648 kw.

Estimating the amount of energy consumption

If the average electricity consumption of an intelligent house be 1000kw/h in the hot months and 700 kw/h in the cold months [5], by considering the done anticipation for each city, the following table will show the providence in the AC power consumption in each city.

Namin	Nahavand	Langroud	Kish	Chabahar	Tehran	Bojnurd	
74%	64%	24%	69%	74%	64%	74%	JUN
64%	64%	24%	69%	74%	64%	74%	JUL
64%	64%	24%	64%	74%	64%	74%	AUG
64%	64%	24%	64%	74%	54%	64%	SEP
64%	64%	24%	69%	74%	54%	64%	OCT
35%	85%	35%	100%	90%	78%	90%	NOV
35%	85%	35%	95%	90%	78%	90%	DEC



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75%	90%	35%	100%	100%	78%	90%	JAN
88%	90%	30%	100%	100%	78%	90%	FEB
100%	100%	35%	100%	100%	100%	100%	MAR
100%	100%	35%	100%	100%	100%	100%	APR
69%	54%	24%	74%	74%	54%	74%	MAY

As we conclude from the above table, this system has the considerable providence in AC power consumption in all cities, except for Langroud which its system does not have the ability to become hybrid.

Conclusion

In this project, by studying different climates, and discussing and analyzing their sun shine and wind data, and designing a hybrid system for using sun and wind energy, the possibility of making the intelligent houses in different cities, by considering the done anticipations by neurotic network for the amount of energy generation in 2015 and 2016, were investigated. The practical implementation of this project considerably caused the reduction in amount of AC power consumption, and as the result brought the economic providence for the families.

RESOURCES

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