The Role of Solar PV Energy in the Arabic Traditional Tent for Raising the Quality of Tourism Services in Taghit City

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Abstract. Taghit is one of the famous towns in desert of Algeria, it is situated exactly in Bechar, where tourists frequent it from all over the world. This city is rich with many monuments and attractions, as well as customs and traditions, where their residents offering good services for tourists. However they face many obstacles, such as electricity lack in some touristic areas, which decreases the quality of some services. In order to improve the quality and diversification of tourism services, we propose solutions by introducing PV solar energy into the traditional Arabian tents, aiming to be developed in diversify tourism space. Furthermore, these solutions create jobs and reduce electricity costs. These guests will stay in the traditional Arab tents, in hotels or in rental houses. In order to guarantee a good reception and satisfaction, we propose an accommodation optimization using genetic algorithm.

Keywords: PV solar · Arabic traditional tent · Taghit · Guests · Genetic algorithms

1 Introduction

The objective of this paper is to determinate the number of traditional Arabic tents supplied by PV solar energy, hotels and rental houses by using the genetic algorithms, from one hand. On the other hand the demonstration of the renewable energies importance, especially solar energy, this is to raise the level of tourism services in many ways. That is way we have devoted our study to the Arabic traditional tent because of its social, cultural and tourist impact. Therefore, we have proposed some axis of study in this domain in order to stimulate the national economy and get a strong investment basing on solving of the following problems: Limited use of this tent, electricity lack, lack of hotels, lot of tourists congestion in a particular area at peak times and lack of service facilities. Note that each PV solar energy system is normalized and dimensioned according to the number of tents and the requested loads [1–5]. The Arabic traditional tent represented a home, but now it's rare. Therefore, it is presented and

exploited as a cultural heritage, generally in tourism investment. With renewable energies, this tent gives more solutions for economic investment exploitation.

2 The Role of the PV Solar Energy in the Arabic Traditional Tent

A. Economic Energy

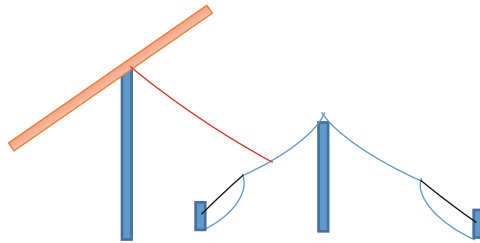With PV solar system, we obtain an economic energy and more independence (Fig. 1).

Fig. 1. PV solar energy for Arabic traditional tent

B. More Activities in Arabic Traditional Tent with PV Solar System

In this case, with the autonomous electricity, we can use television, refrigerator, lamp, tele-operation and others. Therefore, this tent will be a full home where we find all necessaries needs without forgetting toilet and shower.

C. Arabic Traditional Tent with PV Solar System as Supermarket

By installing of the renewable energy system, this removes big limits due to autonomous electricity. So, new roles have been given to this tent. Thanks to this system the tent can be transformed to the supermarket, where tourists will be able to shop and buy their needs, like foods, clothes and all things requiring storage in refrigerator.

D. Arabic Traditional Tent with PV Solar System as Hotel

The big problem which disturbs the tourists is the accommodation when Taghit undergoes a rent crisis, especially during some peak month period, because of hotels and rental houses filling. For these raisons, we proposed a magnificent solution, which is building hotels from Arabic traditional tent with PV solar energy (Fig. 2).
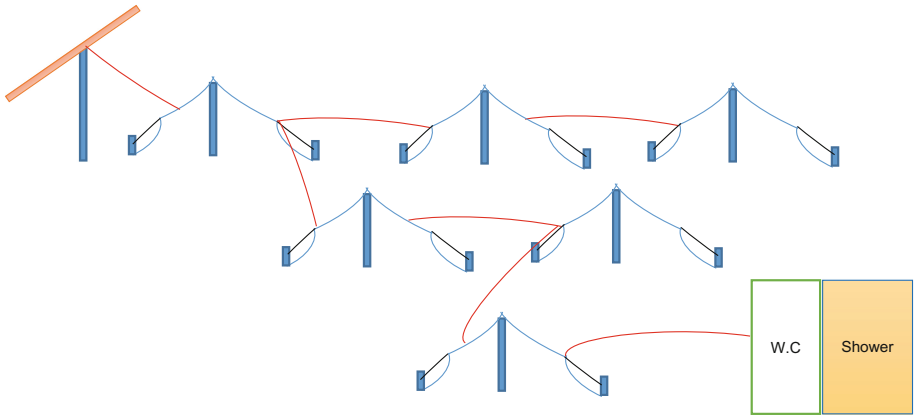
Fig. 2. PV solar hotel made by Arabic traditional tents

E. Good Dispatching and Exploitation in all Interesting Zones

Another advantage of this proposed system allows displacing the Arabic traditional tents in any importance area in Taghit for good dispatching and more exploitation for all interesting zones, moreover, it gives comfort and blessing to tourists without hassle. The proposed places for installing these tents with PV solar system are shown on Figs. 3 and 4. In order to determinate the best dispatching of PV solar systems in Taghit area, we have used artificial intelligence algorithms, as like genetic algorithm and particle swarm optimization [6, 7].

Fig. 3. The proposed zones for installing PV solar system with Arabic traditional tent in Taghit [8]
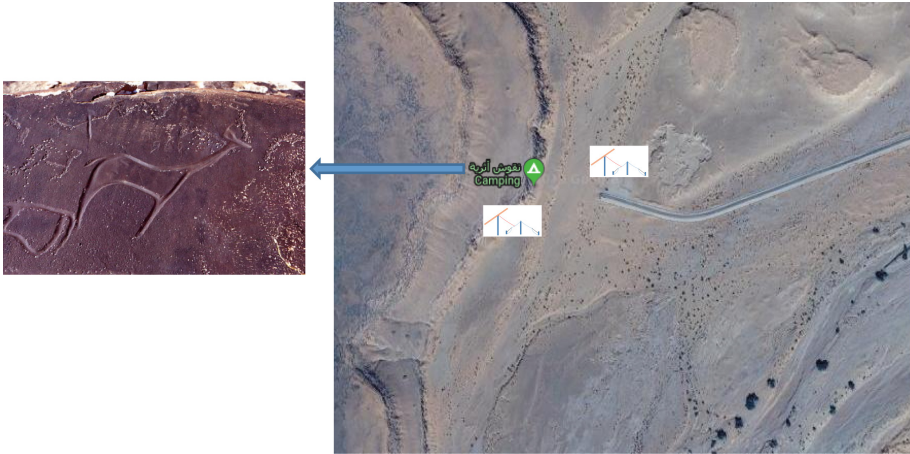
Fig. 4. The proposed zones for installing PV solar system with Arabic traditional tent in south of Taghit [9, 10]

A. The Impact of "The Third International Conference on Artificial Intelligence in Renewable Energetic Systems" on the Exploitation of Arabic Traditional Tents Equipped with Solar PV System

In this conference, we can exploit the renewable energy in the Arabic traditional tent even at night by integrating storage battery system, for example after finishing works in the first day, desert theater show can be organized (Fig. 5), or introducing an applied fieldwork, which contributes in dissemination, publicity and awareness about this renewable energy.
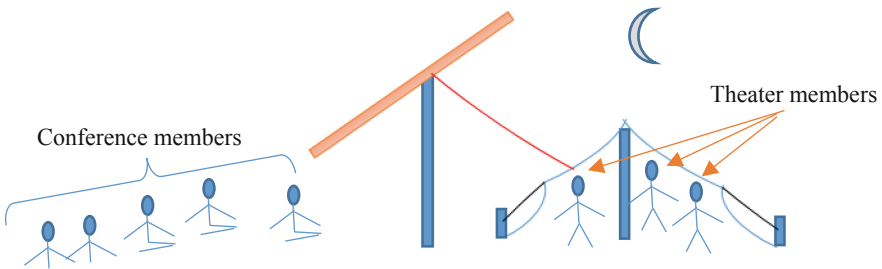

Fig. 5. Applied fieldwork for PV solar energy with Arabic traditional tent in international conference (At night)

3 Sufficiency Optimization of Traditional Arabic Tents Supplied by Solar Energy for Taghit Guests Using Genetic Algorithm

In this case, we have proposed a new model as shown on the first equation; so, the goal is to determinate sufficiency numbers of traditional Arabic tents supplied by solar energy, hotels and rental houses for Taghit guests especially tourists. All proposed data in this study are illustrated in Table 1.

Table 1. Data of proposed mode

Data	Value
Number of tourists	$N_{Tourists} = 3100$
Number of persons in one tent	$n_{PTent} = 10$
Number of persons in one hotel	$n_{PHotel} = 200$
Number of persons in one rental house	$n_{PHouse} = 200$

Our proposed model is presented by the objective function $F(N_{Tent}, N_{Hotel}, N_{House})$ as below:

$$F(N_{Tent}, N_{Hotel}, N_{House}) = N_{Tourists} - (n_{PTent}N_{Tent} + n_{PHotel}N_{Hotel} + n_{PHouse}N_{House}) \tag{1}$$

Where:

N_{Tent} is the number of traditional Arabic tents.
N_{Hotel} is the number of hotels.
N_{House} is the number of rental houses.

The constraints are given as below:

$$-N_{Tent} + N_{House} \leq 0 \tag{2}$$

$$N_{Tent} + N_{House} \leq 200 \tag{3}$$

$$N_{Hotel} + N_{House} \leq 0 \tag{4}$$

$$N_{Tent} + N_{Hotel} \leq 150 \tag{5}$$

$$\begin{cases} 1 \leq N_{Tent} \leq 150 \\ 1 \leq N_{Hotel} \leq 4 \\ 1 \leq N_{House} \leq 150 \end{cases} \tag{6}$$

The solution of this problem is needed to find the best target variables, so, an introducing of an artificial intelligence by using genetic algorithms [6, 7, 11] as

illustrated in Fig. 6 have given an optimization solution for the sited objective function, where the best results are shown on Table 2.

```
clear all
clc
i=0;
while true
A=[-1 0 1;1 0 1 ;0 1 -1;1 1 0];
b=[0;200;0;150];
ub=[150;4;150];
lb=[1;1;1];
Tourists=@(x)(-(10*x(1)+200*x(2)+15*x(3))+3100);
[x,feval]=ga(Tourists,3,A,b,[],[],lb,ub)
i=i+1
if abs(feval)<2
   x
   feval
   i
   break
end
end
```

Fig. 6. The proposed source code for genetic algorithm optimization of the proposed objective function

Table 2. Data of proposed model

Number of iteration i	Number of traditional Arabic tents	Number of hotels	Number of rental houses
$I = 571$	$N_{Tent} = 140.0658$	$N_{Hotel} = 4.000$	$N_{House} = 59.9352$

4 Conclusion

In this work, we have given some interesting axis to prove the importance of introducing the PV solar energy system in Arabic traditional tent for raising the quality of tourism services in Taghit city. Finally, this conference about artificial intelligence in renewable energetic systems will be a first step to encourage Taghit's residents to invest in renewable energy. An optimization in sufficiency of traditional Arabic tents supplied by solar energy, hotels and rental houses for Taghit guests by genetic algorithms had given the best values.

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