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Artificial Neural Network based Controller for solar Energy Management

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ABSTRACT

An Artificial Neural Network is presented in this research (ANN). The Energy Management Algorithm is intended to meet the energy demands of a grid-connected solar PV system. The system will monitor the solar PV system's power output, and the ANN model will switch the power supply from solar to grid based on that information.

KEYWORDS: ANN, FHEM, MATLAB

I. INTRODUCTION

As the population grows, so does the demand for energy. Many businesses have been working on different strategies to manage the world's energy needs. With rising energy demand, we must better manage our energy consumption. We will construct an Artificial Neural Network (ANN) model to regulate the loads in the system in order to reduce energy usage. Solar PV output is fed into the ANN. The technology will switch the power supply from solar to grid automatically.

Artificial Neural Network based Controller for Energy Management in a Solar Home in Algeria(2018), An artificial neural network-based controller for energy management was built in a solar home in Algeria. This research presents an Artificial Neural Network (ANN) Energy Management Algorithm that is applied in Bou-Ismael to fulfil the energy demand of a PV home with a backup (Algeria). To meet the house's energy needs, the energy management system mostly relies on local PV production. The efficiency of the suggested algorithm was evaluated during a favourable week in July 2018 and an unfavourable week in January 2018 based on meteorological circumstances at the Bou-Ismail site. The results show that by implementing the proposed ANN algorithm, the home's energy consumption may be lowered while keeping the same level of comfort.

Artificial Neural Network Based Controller for Home Energy Management Considering Demand Response Events(2017), Electric demand response and residential load modelling are crucial in the construction of a home energy management system. Accurate load models are necessary to establish a load profile at the residential level. In this study, MATLAB/Simulink is used to model four different load types, including air

conditioners, electric water heaters, washing machines, and refrigerators, while taking into account the client's lifestyle and priorities. Furthermore, an artificial neural network (ANN) is used to predict the best ON/OFF status for household appliances in a home energy management controller. The feedforward neural network type and Levenberg–Marquardt (LM) training algorithm are used to train the ANN in the MATLAB toolbox.

Use of Artificial Neural Networks for Prediction of Solar Energy Potential in Southern States of India (2018), This research uses the Multi-layer, Feed-forward with back propagation neural networks (FBPNN) model to estimate solar radiations based on geographical parameters and monthly mean meteorological data. The ANN model has been chosen as the most successful among a range of ANNs, including the multilayer perceptron (MLP), generalised regression neural network, and radial basis function networks. In the majority of cases, the Feedforward approach with one layer and backpropagation as the learning algorithm proved to be the best predictor for the present data, with the highest correlation coefficient values.

Fuzzy logic energy management for a photovoltaic solar home (2019), A brand new energy management method is presented in this work, which is based on fuzzy logic and takes into account the production profile, load profile, state of charge (SOC), and appliance use priority. The simulation demonstrated that the fuzzy technique used can provide the optimal energy management in the solar home under investigation. When comparing the strategy established and thus the planned strategy, the principal one offered associate energy flow management algorithmic programme that controls the energy flow revealed that while the energy flow algorithmic programme is important, it is not sufficient. Furthermore, the second (the proposed FHEM) allows for load control, which allows for lower energy use.

Optimization of Solar Energy Using ANN Techniques(2019),An intelligent approach is created and assessed for applications in smart grid using MATLAB/SIMULINK to trace maximum power point under rapid changes in environmental variables. This model includes system components as well as a power flow controller that is suited for the application. According to the statistical investigation, the Mean Square Error and Regression Ratio values are 0.01 and 0.99, respectively. This shows that the proposed control algorithm functions well in a variety of environmental conditions with higher precision for any PV panels. The results show that the suggested MPPT approach follows the MPP rapidly and with few oscillations; load fluctuations have little effect on performance, i.e., load varies at first but the system responds to the MPP smoothly after a while.

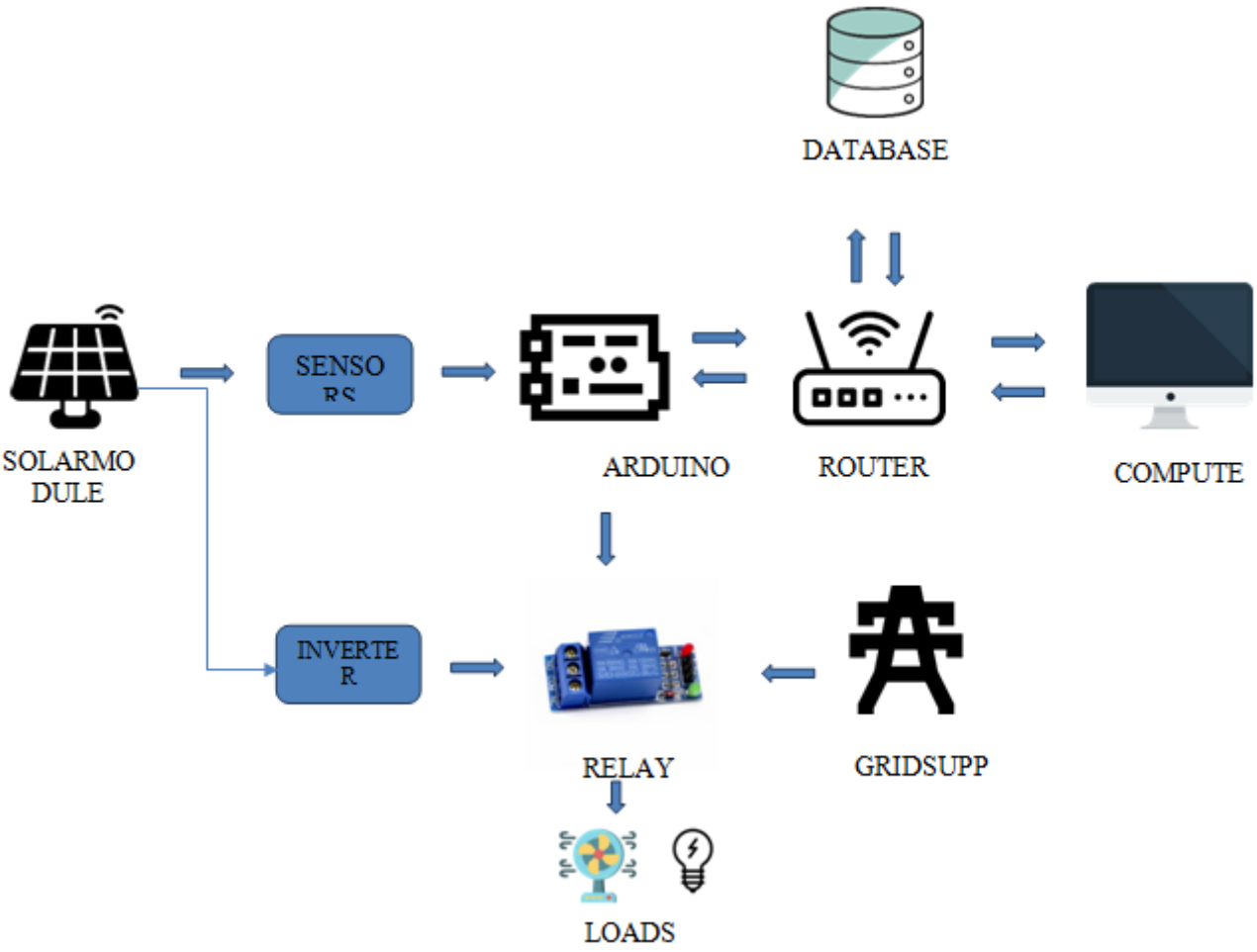
II. CONVENTIONAL METHOD

An ideal ANN model for predicting solar radiation at any given place was built in the AP and TS areas. The geographical and meteorological characteristics of 28 places in AP and TS are analysed to provide a trustworthy prediction. Twenty stations were used to train the network, with the remaining eight being used for various purposes such as validating and testing the examinations to improve the model's accuracy. To avoid using data in the network's training, provide an indicator of the system's performance in unidentified locations. For the mean absolute percentage error, a study was undertaken in terms of statistical error analysis (MAPE). Data is used to assess the ANN model's performance. The best model for this investigation has a MAPE of 2.16.According to the study, the ANN-based model had a high accuracy rate. Having an acceptable level of precision in the correlation coefficient (r-value). For sun radiation prediction, AP received a score of 0.9888.

III. PROPOSED METHOD

The proposed system is an artificial neural network (ANN) model that takes solar power readings as input data and switches the supply from solar to grid electricity based on that data. The first layer of the model predicts load power consumption, while the second layer selects which loads will be powered by solar energy and which by grid energy.

IV. BLOCK DIAGRAM



V. CONCLUSION

In this study, an artificial neural network-based controller for solar energy management was developed. This controller will help to reduce energy use by switching the supply from solar to grid. With the help of this technology, we will be able to utilise solar energy more efficiently.

VI. REFERENCES

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