

An application of the Multilayer Perceptron: Estimation of Global Solar Radiation and the Establishment of Solar Radiation Maps of Togo

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Abstract :

This paper presents a new neural network approach for the generation of synthetic monthly radiation data for nine localities in Togo. Because of the fact that, classical methods can't allowed us to obtain solar irradiation of other localities, the MLP method (Multi Layer Perceptron) and the backpropagation of the gradient were used to involve a network of neurons in order to determine the relation between solar irradiation of Togo and the parameters which are the average temperature, the relative humidity and the latitude of the place. The neural model employed is the well-known Multi-Layer Perceptron (MLP) paradigm, in feedback architecture, using a record of historical values for the supervised network training. The method is based on the MLP ability to extract, from a sufficiently general training set, the existing relationships between variables whose interdependence is unknown a priori. Simulation results are compared to the measured values for the three towns where solar irradiation is measured in Togo. The results show that the generated values are of the real values. The method has been developed using data values from Lomé, Atakpamé and Mango, and is generalized to generate data of any location for the establishment of solar maps. Indeed, the proposed methodology is of general applicability to the estimation of highly complex temporal series. This work is devoted to the determination of the solar irradiation in Togo which resolves the problem of weak of data of solar irradiation in Togo.

Keywords: estimation ; neural model ; multi Layer Perceptron (MLP) ; solar radiation maps