

Abstract :

Forecasting solar irradiation is a primordial task for planning and sizing photovoltaic power systems. In this paper, the global solar irradiation is forecasted using the quaternion-valued neural network (QVNN). A new method to represent the meteorological values to the quaternion domain in the daily or the hourly indexes is proposed. This method specifies each location in the world with one parameter contains at the same time the latitude, the longitude, and the time indexes. The resulting network has two advantages which are: the input/output layers are reduced three times and the learning algorithm increased three times naturally. The measured data of Tamanrasset city, Algeria is used to validate the developed model. The 1–24 h ahead solar irradiation are forecasted using the mean quaternion values (i.e. the meteorological data combined with time indexes, the longitude, and the latitude in one quaternion value). To test the performance and the feasibility of the QVNN for forecasting 24 h ahead global solar irradiation, the meteorological parameters are combined. Results show that the QVNN technique is a promising method for forecasting solar irradiation.