

Development of a low-cost GHI monitoring system based on IoT technology

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Abstract

It necessitates the implementation of a monitoring and forecasting system for solar projects which often requires data on solar irradiance - GHI (for both short-term forecasting and long-term forecasting). However, there is a serious lack of data for GHI preventing researchers from estimating precisely the development potential of solar power in certain areas and also exploring modern forecasting technologies. The industrial solar irradiance monitoring devices (often called pyranometer) have already been utilized in the SCADA system of solar farms for many years. Nevertheless, this standard supervising system is rather expensive to afford, leading to the low applicability in term of urban scale (residential roof-top systems). Realizing this practical problem, we come up with the solution of building a low-cost solar irradiance monitoring system for collecting, storing data for further interpreting such as GHI forecasting methods. Instead of using a standard pyranometer, the low-cost illuminance sensor is used as an indirect measurement of GHI. The main objectives of the research are: (i) Develop an electronic board to collect the data and transfer the data to the server through Wi-Fi connection to the internet; (ii) Using information tools (Python and Javascript Programming Language) and algorithms to estimate the GHI level from measurement the illuminance; (iii) Build a prototype of the monitoring system. This paper establishes a theoretical and laboratory measurement guide for the conversion between solar irradiance and illuminance. This approach concept is expected not only to solve the financial problem stated above but also to provide materials for educational purposes.

Keywords

Solar Irradiance, W/m² lux conversion, Systems Design, Internet of Things, Data Acquisition Platform.

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Biographies

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