Free Full Text from Publisher   Export ⌄   Add To Marked List

‹   18   of 22   ›

SOLAR THERMAL PROCESS PA' METERS FORECASTING FOR EVACUATED TUBE COLLECTORS (ETC) BASED ON RNN-LSTM

By: Akbar, MA (Akbar, Muhammad Ali) [1] ; Jazlan, A (Jazlan, Ahmad) [1] ; Rashid, MM (Rashid, Muhammad Mahbubur) [1] ; Zaki, HFM (Zaki, Hasan Firdaus Mohd) [1] ; Akhter, MN (Akhter, Muhammad Naveed) [2] ; Embong, A (Embong, Abd Halim) [1]

Abstract

Solar Heat for Industrial Process (SHIP) systems are a clean source of alternative and renewable energy for industrial processes. A typical SHIP system consists of a solar panel connected with a thermal storage system along with necessary piping. Predictive maintenance and condition monitoring of these SHIP systems arc essential to prevent system downtime and ensure a steady supply of heated water for a particular industrial process. This paper proposes the use of recurrent neural network-based predictive models to forecast solar thermal process parameters. Data of five process parameters namely - Solar Irradiance, Solar Collector Inlet & Outlet Temperature, and Flux Calorimeter Readings at two points were collected throughout a four-month period. Two variants of RNN, including LSTM and Gated Recurrent Units, were explored and the performance for this forecasting task was compared. The results show that Root Mean Square Errors (RMSE) between the actual and predicted values were 0.4346 (Solar Irradiance), 61.51 (Heat Meter 1), 23.85 (Heat Meter 2), Inlet Temperature (0.432) and Outlet Temperature (0.805) respectively. These results open up possibilities for employing a deep learning based forecasting method in the application of SHIP systems.

Keywords

Author Keywords: evacuated tube collectors; solar irradiance; flux calorimeter; recurrent neural networks; long short term memory
Keywords Plus: NONRENEWABLE ENERGY-CONSUMPTION; NETWORKS

Author Information

Corresponding Address: Rashid, Muhammad Mahbubur (corresponding author)

▼ Int Islamic Univ Malaysia, Dept Mechatron Engn, Kulliyyah Engn, Kuala Lumpur, Malaysia

Addresses:
1 Int Islamic Univ Malaysia, Dept Mechatron Engn, Kulliyyah Engn, Kuala Lumpur, Malaysia
2 Rachna Coll Engn & Technol, Dept Elect Engn, Gujranwala 52250, Pakistan

E-mail Addresses: mahbub@iium.edu.my

Categories/Classification

Citation Network

In Web of Science Core Collection

0
Citations

🔔 Create citation alert

26
Cited References
View Related Records

You may also like...

Yang, F; Shah, SL; Xiao, DY;
Signed Directed Graph Modeling of Industrial Processes and their Validation by Data-Based Methods
2010 CONFERENCE ON CONTROL AND FAULT-TOLERANT SYSTEMS (SYSTOL'10)

Dutta, KK;
Multi-class time series classification of EEG signals with Recurrent Neural Networks
2019 9TH INTERNATIONAL CONFERENCE ON CLOUD COMPUTING, DATA SCIENCE & ENGINEERING (CONFLUENCE 2019)

Ahmadzadeh, E; Kim, H; Moon, I; et al.
A Deep Bidirectional LSTM-GRU Network

Research Areas: Engineering

Citation Topics : [4 Electrical Engineering, Electronics & Computer Science](#) › [4.18 Power Systems & Electric Vehicles](#) › [4.18.575 MPPT](#)

Funding

Funding agency	Grant number
Malaysian Ministry of Higher Education	FRGS19-057-0665

View funding text

+ See more data fields

Journal information

0.18

Journal Citation Indicator ™ (2021)

IIUM ENGINEERING JOURNAL

ISSN: 1511-788X
eISSN: 2289-7860
Current Publisher: KULLIYYAH ENGINEERING, INT ISLAMIC UNIV MALAYSIA, JALAN GOMBAK 53100, MALAYSIA
Research Areas: Engineering
Web of Science Categories: Engineering, Multidisciplinary

Use in Web of Science

Web of Science Usage Count

1

Last 180 Days

1

Since 2013

Learn more

This record is from:
Web of Science Core Collection

- Emerging Sources Citation Index (ESCI)

Suggest a correction

If you would like to improve the quality of the data in this rec   16