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SOLAR ENERGY HARVESTING FOR WIRELESS SENSOR NETWORKS IN AQUACULTURE

Shi-Feng Yang[1], Xue Long[2*], Daudi S. Simbeye[3]

[1]College of Electronic Information and Automation, Tianjin University of Science and Technology, 1038 Dagu South Road, Hexi District, Tianjin 300222, P. R. China
[2]Tianjin eco-city urban resource operation and management co., Ltd., 276 Hexu Road, Tianjin eco-city, Tianjin 300467, P.R. China
[3]Dar es Salaam Institute of Technology (DIT), Computer Studies Department, P. O. Box 2958 Dar es Salaam, Tanzania

Abstract

Despite improvements in battery technology and declines in electronics power demands, many new applications in wireless sensor networks (WSNs) are taking into account increasing power requirements. Furthermore, since in WSNs it is frequently desirable to deploy nodes in unobtainable places, it might be impossible to provide large enough power for such applications given the fact that battery replacement is not practicable. This results in significant interests in designing sensor nodes with the capability of extracting electrical energy from surrounding ambient sources. Solar energy conversion and battery energy storage can provide enough electricity for the system to power sensor nodes and drive the submersible pump continuously in order to increase oxygen of fishponds efficiently. The system also manages and stores additional energy using rechargeable batteries which are environmentally friendly with very low self-discharge and can be recharged thousands of times. The overall system cost can be reduced using high efficiency power conditioners which are designed to extract the maximum possible power from the photovoltaic (PV) arrays under different operating conditions. The ultimate goal of this research is to achieve a perpetually powered system without a necessary periodical maintenance for battery replacement or recharging. The energy harvesting system developed for this research has been experimentally verified and can increase the lifetime of an entire network to reach that of its individual hardware components. We realized a maximum power point tracking (MPPT) algorithm that could switch power source according to light conditions to ensure the continuous stable operation.

Key words: harvester, WSN, solar energy, MPPT, PV, aquaculture

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* Author to whom all correspondence should be addressed: e-mail: xuelong1102@163.com