

# Implementation of Green Energy Information Management System by Using of ZigBee

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## ABSTRACT

ZigBee protocol of wireless techniques are applied in this article to manage the information for a solar energy system. It is well known that a lot of wired transmission methods are adopted as in the traditional solar energy monitoring system. There are some available spaces in the monitoring system for solar system, such as the implementation types, cost effective, maintenance, and spatial constraint. The novel results are obtained in this article via the advanced techniques of intelligent environments, in which the sensing skill, digital mobile devices are applied together. Partly, it is easy to handle up all the conditions of the charging system and to save the charging energy. Moreover, the purpose of this implementation can provide with most widely technologies of wireless communications and support much more new applications of IT (intelligent technology) to the end users. The implemented system has been experimented in Dayeh academy field, by using of ZigBee protocol shown that the shadowing effect still dominates the overall system performance of the monitoring system.

Keywords : ZigBee protocol、Green energy system、Sensor network、Solar cell

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## REFERENCES

- [1]L. S. Vargas, Senior Member and J. S. Rajoo, " The Role of New and Renewable Electricity Generation Technologies in APEC Region:Present and Future Perspectives " , IEEE Power Engineering Society Inaugural Conference and Exposition in Africa, pp. 18 - 24, 2005.
- [2]McLauchlan, L., Mehrubeoglu, M., " A Survey of Green Energy Technology and Policy " , Green Technologies Conference, IEEE, pp. 1 - 6, 2010.
- [3]Alippi, C., Galperti, C., " An Adaptive System for Optimal Solar Energy Harvesting in Wireless Sensor Network Nodes ' ' , Circuits and Systems I, IEEE Transactions on, Vol. 55, Issue 6, pp. 1742 - 1750, July 2008.
- [4]Wensi Wang, Ningning Wang, " Autonomous Wireless Sensor Network based Building Energy and Environment Monitoring System Design ' "

- , ESIAT, pp. 367 - 372, 2010.
- [5]Huan Guo, Guohua Chen, Yong Tang, Lin Li, " Intelligent Solar Energy Monitoring System under Pervasive Computing Environment ", ICPCA, pp. 98 - 101, 2008.
- [6]Antonio M. Ortiz, Teresa Olivares and Luis Orozco – Barbosa , " Smart routing mechanism for green ZigBee-based wireless sensor networks ", IEEE Conference, pp. 397 - 403, 2011.
- [7]P. Diaz, T. Olivares, L. Orozco-Barbosa and F. Royo. ATON, " A Batteryless.power Supply with Dynamic Duty Cycle for Wireless Sensor Networks ", INFOCOM, 2009.
- [8]F. Royo, M. Lopez, L. Orozco-Barbosa and T.Olivares, " 2C-WSN: A Configuration Protocol based on TDMA Communications over WSN ", In Proceedings of the Globecom, 2009.
- [9]Ean A. Amon, Alphonse A. Schacher, Ted K. A. Brekken, " A Novel Maximum Power Point Tracking Algorithm for Ocean Wave Energy Devices ", IEEE Conferences ECCE, pp. 2635 - 2641, 2009.
- [10]黃文良譯, " 能源運用及環境(ENERGY: Its use and the Environment, Third Edition, Roger A. Hinrichs & Merlin Kleinbach 著) ", 第三版, 滄海書局, December 2003.
- [11] " Benign Energy the Environmental Implications of Renewables ", IEA, pp. 45, 1998.
- [12]李聖明, " 國際再生能源發展現況與策略研析 ", 行政院環境保護署, 能源報導第8期經濟部能源局, 經濟部能源局, 經濟部能源局97年報。
- [13]王耀諄、李東諭, " 獨立型太陽能發電系統動態模擬及最佳容量設計 ", 能源季刊, 2001年7月。
- [14] " IEA World Energy Outlook 2001 ", Chapter 5 - " Global Renewable Energy Supply Outlook ", IEA, 2001.
- [15]施顏祥、李明哲、康國裕, " 能源技術-如何有效使用能源 ", 聯經出版事業, July 1985。
- [16]溫宗修, " 風力發電機之混合式最大功率追蹤法 ", 大同大學電機工程研究所碩士論文, January 2009.
- [17]黃秉鈞, " 我國太陽能發展的現況與展望 ", 光訊第六十八期, 1997年10月。
- [18]振堯禎, " 太陽能最大功率追蹤器之研究 ", 大同大學電機工程研究所碩士論文, June 2008。
- [19]馮堃生, " 太陽光能發電原理與運用 ", 五南圖書, January 2009。
- [20]顧鴻濤, " 太陽能電池元件導論 ", 全威圖書, May 2008。
- [21]黃忠仁、蔡立德、王家濬, " 矽基太陽能電池表面微結構相關製程之研究 ", 機械工業雜誌94期。
- [22]Chris Townsend, Steven Arms Micro Strain, Inc., " Wireless Sensor Networks ", Chapter 22: " Principles and Applications " .
- [23]Robert Johnson, Tele monitor, Inc. Kang Lee, NIST James Wiczler, Sensor Synergy, Inc. Stan Woods, Agilent Technologies, Inc, " A Standard Smart Transducer Interface - IEEE 1451 " .
- [24]盧明智、盧鵬任, " 感測器應用與線路分析 ", 全華科技圖書, September 2003。
- [25]盧明智, " 電子實習與專題製作-感測器應用篇 ", 全華科技圖書, May 2002。
- [26]王崇飛, " 類比數位資料轉換器ADC (Analog to Digital Converter) 簡介 ", 元智大學機械系, July 1999 , <http://designer.mech.yzu.edu.tw/>。
- [27]Intersil Americas Inc., " ADC0803、ADC0804 8-Bit, Microprocessor-Compatible, A/D Converters Data Sheet ", FN3094.4. August 2002
- [28]Atmel Corporation., " 8-bit Microcontroller with 4K Bytes Flash AT89C51 ", <http://www.atmel.com/atmel/acrobat/doc0265.pdf>.
- [29]武偉亭, Helicomm IP-Link2220(2220H) ZigBeeTM M2M Terminal, 用戶手冊, July 2007。
- [30]李國鳴, " ZigBee訊息傳輸實作與探討 ", 大葉大學電信工程系碩士論文, July 2008。
- [31]Chengbo Yu, Yanzhe Cui, " ZigBee Wireless Sensor Network in Environmental Monitoring Applications ", WiCom '09, 5th International Conference on 2009 , pp. 1 - 5. 2009.
- [32]謝永培, " 應用RFID於綠色能源監控之實現 ", 大葉大學電信工程系碩士論文, July 2008。
- [33] " ADC0803、ADC0804 8-Bit, Microprocessor-Compatible, A/D Converters Data Sheet ", Intersil Americas Inc., FN3094.4, August 2002.
- [34] " 8-bit Microcontroller with 4K Bytes FlashAT89C51 ", Atmel Corporation., <http://www.atmel.com/atmel/acrobat/doc0265.pdf>.
- [35]B. Visweswaran and Anoop R. Kulkarni, " Green Luxury " -Technology and solutions for energy management ", IEEE Conferences (ICM), pp. 138 - 140, 2009.
- [36]陳勇嘉, " 應用RFID於綠能資訊管理系統之實現 ", 大葉大學電信工程系碩士論文, 2011年出版。
- [37]HoSeong Cho, DaeHeon Park, Chul-Young Park, Hong-Geun Kim, Chang-Sun Shin, Yong-Yun Cho, Jang-Woo Park, " A study on localization based Zigbee and Monitoringsystem in Greenhouse environment ", Data Mining and Intelligent Information Technology Applications (ICMiA), pp. 190 - 195, 2011.