Sudan University of Science and Technology

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Design of Security System for Remotely Installing Solar Panels

تصميم نظام الأمان لتثبيت الالواح الشمسية عن بعد

A thesis submitted in partial fulfillment of the requirements of the degree of M.Sc. in computer and networks engineering

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DEDICATION

Specially dedicated to my beloved father, my mother and all of my friends

I couldn't have done this without you

Thank you for all your support along the way

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I express my gratitude towards The Almighty God for His blessings upon me. First and foremost, I would like to convey my supervisor Dr. Hisham Ahmed for her valuable guidance and helpful advices throughout the process of project building.

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مستخلص البحث

تم تصممت أنظمة أمداد المياه معتده علي الطاقه الشمسية للحفاظ على إمداد المياه المستمرة للسكان ,الحيوانات والري في المناطق النائية التي لا يوجد بها كهرباء.أصبحت سرقة ألواح الطاقه الشمسية مشكلة مستمرة في جميع أنحاء العالم، وتحديات أكبر تاتي من قبل المجرمين . في هذه الأطروحة، يعرض تصميم نظام الأمان عن بعد لحماية ألواح الطاقه الشمسية وضمان استمرارية عملية وحدات الضخ الشمسية. نظام تصميم الأمان عن بعد للألواح الطاقه الشمسيه ينتج أصوات إنذار عاليه وإرسال رسالة قصيره (SMS) وصورة (MMS) الي مدير المحطة عند اقتراب الدخيل أو اللصوص من الواح الطاقه الشمسيه .يستخدم هذا النظام أجهزة الاستشعار بالموجات فوق الصوتية، متحكم، مودم GSM يدعم أوامر (TA) لإرسال أمر البيانات عبر (SMS), شاشه الكريستال السائل (LCD) التي تعرض رسائل التنبيه والمسافه ، الجرس والكاميرا تعتبر مكونات رئيسية. تم برمجة الكود باستخدام لغة (BASIC) وتنفيذ تصميم في الأجهزة المستخدمة باستخدام برنامج (Proteus 7.7 ISIS) . وإستنادا الي النتائج يمكن أستنتاج أن النظام المقترح هو مستقر وموثوق به وعملي جدا . ولديه مزايا مثل سهل التشغيل وإنخفاض استهلاك الطاقه .

ABSTRACT

Solar pumping systems are specially designed to maintain constant water supplies for the population, animals and irrigation in remote areas where there's no electricity. Solar panels theft has been a persisting problem around the world and greater challenges come from criminals. In this thesis, presents design of security system remotely installed solar panels to protect the solar panels and to ensure the continuity of the solar pumping units operation. The design of security system remotely installed solar panels produce high alarm sounds, send SMS and picture (MMS) message to station administrator when solar panels approached or touched by an intruder. This system uses ultrasonic sensor, microcontroller, GSM modem supports AT command set to send data command via SMS, Liquid Crystal Display (LCD) displays the distance and message, buzzer and camera as main components. The software was programmed use BASIC language. The designed was implemented in the hardware used Proteus 7.7 ISIS. Basing on results, one can conclude that the proposed method is stable, reliable and very practical. It has the advantages such as easy to operate, very efficient and low power consumption.

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ABBREVIATIONS

AT	-	Attention Commands
CCTV	-	Closed Circuit Television
CISC	-	Complex Instruction Set Computer
DC	-	Direct Current
GIS	-	Geographic Information System
GPRS	-	General Packet Radio Service
GSM	-	Global System Mobile
HB	-	Hybrid
IDP	-	Internally Displaced Person
ISIS	-	Intelligent Schematic Input System
LCD	-	Liquid Crystal Display
LED	-	Light Emitting Diodes
MCU	-	Microcontroller Unite
MMS	-	Multimedia Messaging Service
NAS	-	Network Attached Storage
NVR	-	Network Video Recorder
PCB	-	Printed Circuit Board

PLC	-	programmable Logic Controller
PM	-	Permanent Magnet
POTS	-	Plain Old Telephone Service
RISC	-	Reduced Instruction Set Computer
ROM	-	Read Only Memory
SMS	-	Short Message Service
VR	-	Variable Reluctance
WSN	-	Wireless Sensor Network