بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

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MONA MAGHRABY

AUTOMATIC MONITORING OF THE MEDICAL EQUIPMENT PERFORMANCE USING ELECTRICAL SIGNATURE ANALYSIS

By

Essam El-Deen Naguib Mohammed Tawfik

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
DOCTOR OF PHILOSOPHY
in
Biomedical Engineering and Systems

FACULTY OF ENGINEERING, CAIRO UNIVERSITY

GIZA, EGYPT

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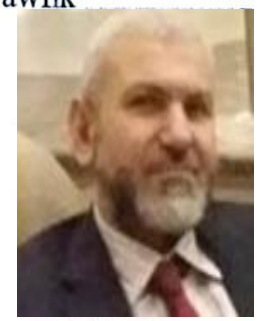

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Title of Thesis:
AUTOMATIC MONITORING OF THE MEDICAL EQUIPMENT PERFORMANCE USING ELECTRICAL SIGNATURE ANALYSIS

Key Words:
Clinical engineering, asset management, medical equipment monitoring.

Summary:
In industry, keeping the production line running in good conditions, is an objective of the maintenance department in a factory. This is crucial to avoid both of the equipment failure and the production loss. The same concept can be applied to maintain the proper operation of the medical equipment in a hospital. To achieve such a requirement the hospital should organize a predictive maintenance program that anticipates any operation fault and gives the necessary warning to take the proper maintenance action. This goal will guarantee the safe operation process of the equipment together with the reduction of the maintenance cost. Getting the accurate information about the equipment performance at the right time is necessary to detect any fault occurrence. In this work, the Electrical Signature Analysis (ESA) is applied to identify the medical equipment-operating modes. ESA is also applied for fault detection during the equipment performance. A noninvasive data acquisition system was built to record the electric current consumption of the equipment. Based on the recorded data, the operating modes are identified and its performance is evaluated. The developed system is installed and tested to monitor several types of medical equipment. This monitoring technique was able to detect modes of operation, faults or degradation of its performance. ESA provides quantitative measurements of the equipment effective usability. Such measurements give indications about the equipment availability. Promising results were obtained from testing several equipment.

Disclaimer

1 hereby decline that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

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Signature:

Dedication

My heartfelt thanks go to all of my family members and especially my friends Dr. Zaid Abduh Hassan, Eng. Hossam Senior, my daughter Ola, and my wife whose sacrifice, support, loves; caring inspired me to overcome all the difficulties throughout my academic life. This dissertation process would not be successful without having their patience, love, and dedication.

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