Sudan University of Science and Technology

College Of Graduate Studies

Design of a Programmable Number Locks system

تصميم نظام قفل رقمي قابل للبرمجة

A Thesis Submitted in Partial Fulfillment for Requirements of the Degree of M.Sc. in Electrical Engineering (Control)

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بسم الله الرحمن الرحيم

قال الله تعالى:

﴿ اقرأ باسمِ ربِّكَ الَّذي خلَق* خلَقَ الإنسانَ من علَق* اقرأ وربُّكَ الأكرم*الَّذي علَّمَ بالقلَم*علَّم الإنسانَ ما لم يعلم ﴾

صدق الله العظيم

سورة العلق- الايات (١-٥)

Dedication

To my parents who supported me to complete this project. To my teachers who gave me their precious time, and shared their wide knowledge with me. To all my friends and colleagues.

Acknowledgment

I would like to take this opportunity to thank my thesis supervisor, Dr. **Awadalla Taifour**, for his guidance and patience. I would like to thank the staff of Electrical Department. I extend my gratitude to my parents for supporting my endeavors and encouraging me.

ABSTRACT

The digital lock is an extremely safe form of keyless security. It has a number of positive qualities to offer in comparison to a lock which uses a key. With no key to lose, this worry is removed and it will reduce the chances of being locked out. If the users think someone has found out the pin number then it can simply be changed without the need to replace the locks.

The main objective of this thesis is to design and implementation a high security lock system that can be used to lock up to nine devices at the same time. The access to such devices can be restricted to particular users only. The proposed system is very user friendly. This system is a combination of software and hardware at its best.

The system is fully controlled by the Atmega32 microcontroller. The system uses the internal RAM of the microcontroller to store the code. The system has a Keypad which the password can be entered through it and LCD to display the device number and the code password that is entered by the user. The system is highly secured since the code can be changed every time the user locks it. The performances of the system are simulated by using ISIS professional and the microcontroller programmed using BASCOM AVR.

مستخلص

القفل الرقمي هو شكل من اشكال التأمين بدون مفتاح. ولديه عدد من الصفات الايجابية مقارنة مع انظمة القفل الاخري التي تستخدم المفتاح. استخدام القفل الرقمي يوفر للمستخدم حماية فائقه، كما يزيل قلق المستخدم الدائم من فقدان المفتاح. إذا كان المستخدم يعتقد أن شخصا ما قد اكتشف رقمه السري فإنه يمكن ببساطة أن يغيره من دون الحاجة لاستبدال القفل.

والهدف الرئيسي من هذا البحث هو تصميم وتنفيذ نظام قفل عالي الامان يمكن استخدامه لقفل تسعة أجهزة في نفس الوقت. ويمكن تقييد الوصول إلى هذه الأجهزة لمستخدمين معينين فقط. النظام المقترح سهل الاستخدام . ما يميزهذا النظام هو أنه دمج لمجموعة من البرامج مع الأجهزة.

يتم التحكم في النظام بالكامل من قبل متحكم صغري ATMEGA 32. يستخدم النظام ذاكرة الوصول العشوائي للمتحكم الصغري من أجل حفظ الرمز السري. يستخدم النظام لوحة مفاتيح تستخدم لإدخال كلمة المرور، كما يستخدم عارضة رقمية من نوع البلؤر السائل لعرض رقم الجهاز وكلمة السر التي يتم إدخالها من قبل المستخدم. النظام بدرجة امان عالية ، نظرا لأن كلمة السر يمكن ان تتغير في كل مرة يستخدم فيها النظام. تمت عملية المحاكاة لاداء النظام باستخدام ISIS professional وتم برمجة المتحكم الصغري باستخدام لغة BASCOM AVR.

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LIST OF ABBREVIATIONS

ATM	Automated teller machine
CIA	Central Intelligence Agency
CRT	Cathode ray tube
DSP	Digital signal processor
FBI	Federal Bureau of Investigation
I\O	Input\Output
LCD	Liquid crystal display
LCS	Liquid crystals
LED	Light-emitting diode
NASA	National Aeronautics and Space Administration
OTP	One-time programmable
RAM	Random-access memory
RFID	Radio-frequency identification
ROM	Read-only memory

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