

## الاية

(اقْرَأْ بِاسْمِ رَبِّكَ الَّذِي خَلَقَ \* خَلَقَ الْإِنْسَانَ مِنْ عَلَقٍ \* اقْرَأْ وَرَبُّكَ الْأَكْرَمُ \*  
الَّذِي عَلَّمَ بِالْقَلَمِ \* عَلَّمَ الْإِنْسَانَ مَا لَمْ يَعْلَمْ)

## *DEDICATION*

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*This thesis is dedicated to my parents  
for their endless support  
and encouragement.  
And also for brothers, sisters, teachers and friends.*

## ***ACKNOWLEDGEMENT***

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*First and foremost, I would like to thank to my supervisor of this project, Dr. Ala Eldin Awouda for the valuable guidance and advice. Besides ,I would like to thank the authority of Sudan University of Science &Technology College of Graduated Studies for providing us with a good environment and facilities to complete this project . Finally, an honorable mention goes to my family and friends for their understandings and supports on me in completing this project. Without helps of the particular that mentioned above, I would face many difficulties while doing this*

## **ABSTRACT**

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The main objective of this research is to develop a mechatronics based system, which will depend on many type of sensors such as water level, pressure and touch to make full automatic control in a real-time basis. This system offers more flexibility and more accurate .the designed system can solve many problem that may occur when using manual dam control system such as overflow of water , high pressure on the gate .

The proposed system consists of a set of sensors to check the status of the DAM. an 8-bit microcontroller (ATMEGA16) is used to determine the best control action to fill full the performance requirements. The water level sensor and the pressure sensors is used feedback the status to the microcontroller. Based on this feedback from sensors , the dam water flow can be controlled through the gates by using motors. Two powerful simulation tool is used to simulate the proposed design. The first one is BASCOM which is used for program writing , compiling and simulating. The second one is proteus ISIS professional which is used to build the interactive component models to allow the simulation of complete micro-controller based designs.

The result obtained from the simulation tool is used to enhance the system performance and improve the proposed control system mechanism .Prototype hardware circuit is built and the program that written using BASCOM is loaded to microcontroller to simulate real time DAM control system .

## المستخلص

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الغرض الاساسي من هذا البحث هو تطوير نظام ميانكي الالكتروني يعتمد علي عدة انواع من الحساسات مثل : حساس تحديد مستو الماء ,حساس الضغط و حساس اللمس وذلك لتكوين نظام الي للتحكم في عمل خزان حيث يتيح مرونة و دقة اكثر ذلك اذا ما قورن بالنظام اليدوي للتحكم في الخزان.هذا النظام سيحل العديد من من المشاكل الناجمة من استخدام النظام اليدوي مثل : فيضان مياه الخزان,الضغط العالي علي ابواب الخزان وتنظيم تدفق المياه.

النظام المقترح يتكون من عدة حساسات و متحكمة دقيقة لاتخاذ افضل القرارات التي تحقق الاداء المطلوب للمحافظة علي التدفق المناسب و حماية الخزان وذلك بالاعتماد علي التغذية العكسية الصادرة من المحساسات الي المتحكمة الدقيقة حيث يمكن التحكم في تدفق مياه الخزان من خلال التحكم بابواب الخزان من خلال التحكم في المحركات (موتورات) التي تتحكم في فتح و اغلاق الابواب. ولتنفيذ هذا المشروع تم استخدام اثنين من اقوي ادوات المحاكاة التي تستخدم في تطوير مثل هذه الانظمة اولا تم استخدام اداة (باسكوم) لكتابة وتجميع البرنامج ثم محاكاته و الاداة الثانية هي (بروتوس) الذي يتيح تصميم نماذج تفاعلية تسمح بمحاكاة معظم انظمت المتحكمات الدقيقة.

النتيجة التي تم التحصل عليها باستخدام ادوات المحاكاه المذكورة استخدمت لزيادة و تحسين فعالية النظام المقترح. بعد تنفيذ المحاكاة و التأكد من صحة النظام تم بناء نموذج مصغر من العتاد ثم تحميل البرنامج الذي تمت كتابته بواسطة (الباسكوم) الي المتحكمة الدقيقة و ذلك لمحاكاة النظام.

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## **LIST OF ABBREVIATIONS**

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AC	Alternating current
ALU	arithmetic and logic unit
ASIC	Application Specific Integrated Circuit
CPU	central processing unit
CMOS	Complementary Metal Oxide Semiconductor
CAN	controller area network
CISC	complex instruction set computer
DC	Direct Current
ESC	electronic stability control
HVAC	heating, ventilation, and air conditioning
HL	high level
IDE	Integrated Development Environment
LED	light-emitting diode
LCD	liquid crystal display
LL	low level
ML	middle level
MCU	moisture cure urethane
MEMS	Micro-Electro-Mechanical Systems
OV	overflow
PCB	printed circuit board

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PA	pressure in gate A
PB	pressure in gate B
PC	pressure in gate C
ROM	read only memory
RAM	random access memory
RISC	Reduced instruction set computing

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