

Dedication

This project is lovingly dedicated to our respective parents who have been our constant source of inspiration. They have given us the drive and discipline to tackle any task with enthusiasm and determination. Without their love and support this project would not have been made possible.

ACKNOWLEDGEMENT

I would like to acknowledge the contributions of the following group and individuals to the development of this project:

- Sudan university.

- I am also heartily thankful to our teacher, Dr. /ABD ELRASOUL whose encouragement, guidance and support from the initial to the final level enabled us to develop an understanding of the subject.

- To our truly great friend Don who has made available his support in a number of ways.

- Lastly, I offer our regards and blessings to all of those who supported me in any respect during the completion of the project.

Abstract

Monitoring the Water Level Remotely Using GSM is the title of this project. This project was designed to give an accurate Nile water level gauging and early flood warning where the water level of a certain place is monitored remotely. The water level data was then sent to data center monitoring station via SMS. At the monitoring station, the warning will be given once the water level has achieved at different level.

By implementing one of the GSM technologies which is SMS, the system could be used by anyone, anywhere at any time to monitor whatever you want on-time remotely.

This project enlightens the people how advance technologies are especially in communication that every single motion of everything can be monitored through GSM technologies. It proves no boundary to communicate between two different devices at two different places at the same time.

There are many other technologies available to communicate with the water level monitoring system such as satellite technologies. However, compared to satellite monitoring, GSM technologies has better advantages by sending SMS to multiple recipients which is faster (more spontaneous), cheaper and more popular way. Therefore, crops, properties and live stocks can be saved in time.

This project is a hopeful device for precision agriculture. By forming wireless sensor network we can make good monitoring system in the Agricultural projects. This project proposed idea about monitoring the water level gauging without man power.

تجريد

أسندَ جي إس إم وحدة طرفية بعيدة مِن مستوى الماء هي اساس فكرة هذا المشروع. هذا المشروع صمّم لإعطاء قياساً دقيقاً لمستوى ماء النيل مع تحذير الفيضان المبكر حيث أن يقوم بتحديد مستوى مياه نهر النيل عن بعد وارسالها في شكل بيانات لمركز المراقبة الدائم عن طريق رسالة قصيرة الى الهاتف الجوال، التحذير سيعطي مرّة واحدة في حالة بلوغ مستوى الماء الى اعلى مستوى ويمكن ان تسبب خطورة على البشر.

بتطبيق أحد تقنيات جي إس إم التي هي إس إم إس، النظام يُمكن أن يكون مستعمل من قبل أي واحد في أي مكان وأي وقت للمراقبة مهما تَريدُ في الوقت المناسب عن بُعد، فهو يمكن أي شخص من معرفة مستوى المياه .

هذا المشروع يدل على ان هناك تقدم واضح في التقنيات خصوصاً في الإتصال التي أصبحت تعرف كلّ حركة يمكن ان يخطاها الانسان وتراقبه من خلال عدة تقنيات وفي هذا المشروع نأخذ ال جي إس إم كمثال . واثبتت ايضا انه ليس هنالك أي حواجز او عوائق يمكن ان تعيق الاتصال بين شخصين في مكانين مختلفين في نفس الوقت.

هناك العديد من التقنيات الأخرى المتوفرة للإتصال بنظام مراقبة مستوى الماء مثل تقنيات القمر الصناعي والانترنت والعديد من وسائل الاتصال واذا قمنا بمقارنة القمر الصناعي و تقنيات جي إس إم فلووجدنا ان الاخير لها فوائد أفضل بإرسال إس إم إس إلى المستلمين المتعددين التي هي أسرع (أكثر تلقائية)، وطريق شعبي أرخص وأكثر انتشارا وملكية ويمكن توفرها في أي وقت. هذا المشروع أداة متفائلة للزراعة الدقيقة بتشكيل شبكة محسّس اللاسلكي الذي من خلاله يُمكن أن نجعل نظام مراقبة جيد في المشاريع الزراعية. إقترح هذا المشروع فكرة حول مراقبة مستوى الماء بدون قوّة رجل.

Content

Contents	Page
Dedication.....	I
Acknowledgement.....	II
Abstract in English	III
Abstract inArabic	IV
Contents.....	V
List of figures.....	VIII
List of tables.....	IX
Abbreviations.....	X
Chapter one : Introduction	
1.1 Background.....	1
1.2 problem Statements.....	4
1.3 Objective.....	6
1.4 Methodology.....	7
1.5 Research Outline.....	11
Chapter two : The Nile River in Sudan	
2.1 Introduction.....	13
2.2 The Nile source.....	14
2.3.1 In Sudan	14
2.3.2 Atbara River.....	16
2.3.3 Blue Nile.....	16
2.3.4 White Nile	17

2..3.5	Bahr el Ghazal and Sobat River.....	18
2.4	The Nile Basin.....	18
2.4.1	Rivers and discharges.....	20
2.4.2	Irrigation potential and water requirements.....	25
Chapter Three:Project Development		
3.1	Introduction.....	32
3.2	Water detection Unit.....	34
3.3	GSM Technology.....	36
3.3.1	Base Station subsystem.....	38
3.3.2	GSM carrier frequencies.....	39
3.3.3	Subscriber Identity Module (SIM).....	40
3.3.4	SIM lock	41
3.3.5	GSM service security	41
Chapter Four Hardware Components		
4.1	Introduction	45
4.2	The microcontroller.....	45
4.3	ATmega16.....	46
4.3.1	Pin Diagram.....	47
4.3.2	Pin Description.....	48
4.4	GSM Modem.....	49
4.4.1	Functions.....	49
4.4.2	Configuration of the base.....	50
4.4.3	How can I start the base.....	51
4.4.4	How can I setup the alarm phone numberand SMS?.....	52
4.4.5	How can I test the base alarm out?.....	54

4.4.6	How Can I control the base.....	55
4.4.7	How Can I use controllers.....	58
4.4.8	How can I add more detectors?.....	59
4.4.9	How Can I cancel the lost detectors?.....	60
Chapter Five: Hardware Architecture		
5.1	Introduction.....	64
5.2	Important factors in the hardware development.....	65
5.2.1	Time.....	65
5.2.2	Cost.....	65
5.2.3	Plan.....	66
5.3	Circuit component.....	67
5.4	Circuit design.....	69
5.5	Circuit operation.....	70
5.6	Flow Chart.....	71
Chapter six: Results and Discussion		
6.1	Results.....	74
6.2	DESCUTION.....	75
Chapter seven: Conclusion And Recommendations		
7.1	Conclusion	78
7.2	Recommendations	79
	References.....	81

List of figures

Figure1.1 Exterior of the Nilometer on Roda Island.	2
Figure 1.2. Interior of the Nilometer (Photographed by Bill Hocker).....	2
Figure 1.3. The Nilometer on Elephantine Island.....	3
Figure 1.4. The Nilometer on Roda Island.....	3
Figure 1.5 Real-world interpretation of the readings from the Nilometer	4
Figure 1.6 existing way for gauging.....	5
Figure 1.7: Interactions of Components.....	8
Figure 1.8 RWLM Block Diagram.....	9
Figure 1.9: Water level monitoring network.....	10
Figure 3.1: Flow Chart for Project Development.....	33
Figure 3.2 Water level detectors.....	35
Figure 3.3the link for GSM unit and water detecting unit	37
Figure 4.1 :ATmega16 pin diagram.....	47
Figure 4.2: GSM Modem.....	49
Figure 4.3 :GSM modem from the rear.....	51
Figure 4.4: The remote controller.....	58
Figure 4.5: The monitor lamp.....	61
Figure 5.1 electronic design of the system.....	69
Figure 5.2 Flow Chart.....	72

List of Tables

List of tables	Page
Table 3.1: Nile basin: areas and rainfall by country.....	19
Table 3.2: Average annual discharges at different locations in the Sudd region	22
Table 3.3: Variations in discharges at different locations on the Nile.....	24
Table 3.4: Water resources, irrigation potential and areas under irrigation	27
Table 3.5: Irrigated land use in Sudan.....	28
Table 3.6: Estimated water balance of Sudan in 1995 and 2015.....	29
Table 4.1: AT mega pin description.....	48
Table 4.2 GSM modem command list.....	56

Abbreviations

Ad: Anno Domini

AH: anno hegirae

RWLM: Remote Water Level measurement

MOIWR: ministry of irrigation and water resources

GSM: Global System for Mobile

SMS: short message service

ETSI: European Telecommunications Standards Institute

1G: first generation

2G: second generation

GPRS : General Packet Radio Services

EDGE : Enhanced Data rates for GSM Evolution or EGPRS

HSUPA: High-Speed Uplink Packet Access

HSDPA: High-Speed Downlink Packet Access

MHz: mega hertz

UMTS: Universal Mobile Telecommunication System

TDMA: Time division multiple access

LPC: linear predictive coding

EFR: Enhanced Full Rate

AMR: Automatic Message Registering

SIM: Subscriber Identity Module SIM

USIM L: Universal Subscriber Identity Module

FPGA: Field Programmable Gate Arrays

SIM : Subscriber Identity Module

DC: Direct Current

TTL: Transistor–transistor logic

CMOS: Complementary Metal Oxide Semiconductor

PMOS: positive Metal Oxide Semiconductor

NMOS: negative Metal Oxide Semiconductor

IC: integrated circuit