

Acknowledgement

I am taking this opportunity to express my gratitude to my Supervisor Dr.Alaa Alden Awouda who supported me throughout the course of this Electronic Engineering project. I am thankful for his aspiring guidance, invaluable constructive criticism and friendly advice during the project work. I am sincerely grateful to Dr.Daffalla A'lam Elhuda for sharing their truthful and illuminating views on a number of issues related to the project. I express my warm thanks to Eng.Safwat Magdi and Eng. Ahmed Khalaf Allah for their support and guidance .I would also like to thank my friends Mr.Mohannd Awad and Mr.Isam Abdelgadir who provided me with the facilities being required and conducive conditions for my project.

Abstract

The system is developed for home use by patients that are not in a critical condition but need to be periodically monitored by clinician or family. In any critical condition sending a message regarding the health status of the patient to the doctor and family, using GSM system while sending the same status to using wireless technique (ASK) , Thus can to avoid human errors and also can easily save many lives by providing them quick service. In this project blood pressure, Temperature and heart beat are estimated by using sensors designed in the developed system give accurate readings so it can be said that the developed system less expensive and accurate. The Design can be effectively used as communication medium in conjunction with GSM system and wireless technique (ASK).encouraging result has been obtained and several recommendation is been suggested for future work .

المستخلص

تم تطوير النظام للاستخدام في المنزل لمراقبة المريض للحالة الحرجة وبذلك يحتاج لمراقبة دورية من قبل الطبيب والعائلة . يتم إرسال رسالة عن الحالة الصحية الحرجة للمريض إلى الطبيب و العائلة ، من خلال رقم الهاتف بواسطة ال SMS وايضا إرسال الرسالة لجهاز الكمبيوتر بواسطة ال (ASK) إلى الطبيب داخل المستشفى ، وبذلك يمكن تفادي الأخطاء البشرية ، و انقاذ العديد من الأرواح عن طريق تزويدهم خدمة سريعة . هذا البحث يستخدم حساسات (ضغط الدم - درجة الحرارة -ضربات القلب) مصممة في نظام متطور تعطي قراءات دقيقة وبأقل تكلفة . التصميم يستخدم نظام اتصال فعال للربط وهو ال GSM مع تقنية لاسلكية (ASK).تم الحصول على نتيجة مشجعة واقتراح عدة توصيات للعمل في المستقبل .

Table of contents

الاستهلال	I
الإهداء.....	II
Acknowledgement.....	III
Abstract.....	IV
Abstract in Arabic.....	V
Table of content	VI
List of Tables.....	VIII
List of Figures.....	IX
List of abbreviations.....	X
List of Symbols	XI
Chapter One: Introduction	
1.1 Preface.....	1
1.2 Problem statement.....	2
1.3 Proposed solution.....	2
1.4 Objective.....	2
1.5 Scope.....	3
1.6 Methodology.....	3
1.7 Chapter organization.....	3
Chapter Two: Literature review	
2.1 Related Work.....	5
2.2 Heart Beat.....	7
2.2.1 Principle of Heartbeat Sensor.....	8
2.2.2 Types of photoplethysmography	9

2.2.3	Practical heart beat sensor	10
2.3	Blood pressure sensor.....	10
2.3.1	Mean Arterial Pressure	11
2.3.2	Interpretation of mean arterial pressure.....	12
2.4	Temperature sensor -The LM35.....	14
2.5	Microcontroller.....	15
2.5.1	Digital Input Output Port.....	18
2.5.2	Analog to Digital Conversion (ADC).....	19
2.5.3	Timers.....	20
2.6	LCD (Liquid Crystal Display) 16x2.....	21
2.7	Serial Communication (RS-232).....	22
2.7.1	Serial Data Transmission.....	22
2.8	GSM Technique.....	23
2.9	Amplitude-Shift Keying (ASK) Modulation.....	25
2.9.1	RF Module (Transmitter & Receiver).....	26
Chapter Three: System design		
3.1	Overview.....	28
3.2	System block diagram.....	28
3.3	Temperature measurement of the patient.....	29
3.4	Measuring heart rate.....	30
3.5	Measurement the blood pressure of the patient.....	32
3.6	Blood Pressure Sensor circuit.....	33
3.7	The main unit in the circuit.....	34
3.8	Graphical user interface.....	35
3.9	Flow Chart.....	36
Chapter Four: Implementation and Simulation results		
4.1	Simulation and the results of the heart rate.....	39

4.1.1 Microcontroller and amplifier.....	41
4.2 Temperature measurement outputs.....	43
4.3 Blood pressure measurement outputs.....	44
Chapter Five: Conclusion& Recommendations	
5.1 Conclusion	50
5.2 Recommendations.....	51
References.....	52
Appendix A-D	54-63

List of Tables

Table 2-1: Pin Description 16x2 LCD	21
Table 2-2: GSM overall efficiency.....	25
Table 2-3: Pin Description RF Transmitter	27
Table 2-4: Pin Description RF Receiver.....	27

List of Figures

Figure 2-1: Heart beat sensor	8
Figure 2-2: Heart beat output signal	9
Figure 2-3: Practical Heartbeat Sensors.....	10
Figure 2-4: Normal blood pressure fluctuations in the aorta	12
Figure 2- 5: Temperature (LM35) sensor.....	14
Figure 2-6: Pin Configurations AT Mega 16 Microcontroller.....	17
Figure 2-7: Analog to Digital Conversion.....	19
Figure 2-8: Pin Diagram 16x2 LCD.....	21
Figure 2-9: Data Transmission.....	23
Figure 2-10: RS-232C Pin Numbers.....	23
Figure 2-11: ASK signal and the message.....	25
Figure 2-12: RF Module (Transmitter & Receiver).....	26
Figure 3-1: Block Diagram of System.....	28
Figure 3-2: Lm35 measurement.....	29
Figure 3-3: Circuit measuring heart rate.....	31
Figure3-4: Clock generators inside to Microcontroller.....	32
Figure 3-5: Blood Pressure Sensor circuit.....	33
Figure 3-6: The main unit in the circuit.....	35
Figure 3-7: Graphical user interface.....	35
Figure 3-8 Flow Chart.....	38
Figure 4-1: Simulation and the results of the heart rate (179.9).....	39
Figure 4-2: Simulation and the results of heart rate (60).....	40
Figure 4-3: Simulation and the results of heart rate (120).....	41
Figure 4-4: Micro and amplifier.....	41
Figure 4-5: Operational amplifier output and input signal	42

Figure 4-6: Operational amplifier to signal square	42
Figure 4-7: Operational amplifier frequency of 1 Hz.....	43
Figure 4-8: Temperature outputs up normal	43
Figure 4-9: Temperature outputs normal	44
Figure 4-10: Blood pressure outputs (89.7)	44
Figure 4-11: Blood pressure outputs (189.9).....	45
Figure 4-12: Blood pressure outputs (max & min volt).....	46
Figure 4-13: Blood pressure outputs (into Micro Amp).....	46
Figure 4-14: Blood pressure outputs (SMS).....	47
Figure 4-15 Blood pressure outputs (GUI).....	47
Figure (4-16): GUI Display for Heart rate, Blood pressure and Temperature.....	48
Figure (4-17): GUI for heart beat reading.....	48
Figure (4-18): Patient Data Result.....	49

List of abbreviations

ADC	:	Analog to Digital Converter
ASK	:	Amplitude-Shift Keying
BPM	:	Beat per minute
EEPROM	:	Electrically erasable programmable read only memory
GSM	:	Global System Mobile
GUI	:	Graphical user interface
ICU	:	Intensive care unit
IR	:	Infrared
LCD	:	Liquid Crystal Display
LED	:	Light-emitting diode
LDR	:	Light detected resistor
MAP	:	Mean Arterial Pressure
PWM	:	Pulse-width modulation
SMS	:	Short Message Service
SRAM	:	Static random-access memory
TD	:	Transmit data
USART	:	Universal Synchronous/Asynchronous Receiver/Transmitter

List of Symbols

BPM	:	Beats per minute
C	:	Capacitor
C°	:	Centigrade
F	:	Frequency
Hz	:	Hertz
KHz	:	Kilohertz
MmHg	:	Millimeters of mercury
MHz	:	Megahertz
μF	:	Microfarad
P	:	Pressure
R	:	Resistance
Sec	:	Second
V	:	voltage