

PERSONAL HOME SURVEILLANCE SYSTEM

YONIS ABDULQADER ESOUD GODGED ALWERFLLY

UNIVERSITY UTARA MALAYSIA

2009

PERSONAL HOME SURVEILLANCE SYSTEM

**A thesis submitted to college Arts & Sciences
in partial fulfilment of the requirement for the degree
Master of Science (Information Technology)
University of Utara Malaysia**

By

Yonis Abdulqader Esoud Godged

© Yonis Abdulqader, November, 2009. All rights reserved

PERMISSION TO USE

In presenting this thesis in partial fulfillment of the requirements for a Master of Science in IT degree from University Utara Malaysia, I agree that the University Library may make it freely available for inspection. I further agree that permission for copying of this thesis in any manner, in whole or in part, for scholarly purpose may be granted by my supervisor or, in their absence by the Academic Dean College of Arts and Sciences. It is understood that any copying or publication or use of this thesis or parts thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to University Utara Malaysia for any scholarly use which may be made of any material from my thesis.

Requests for permission to copy or to make other use of materials in this thesis, in whole or in part, should be addressed to

Dean (Academic) College of Art and Sciences

University Utara Malaysia

06010 UUM Sintok

Kedah Darul Aman.

ABSTRACT

A personal home surveillance system(PHSS) is a low cost web based security system that makes it possible for the users to monitor the events that is happening in their homes while they are away. This study has identified a means of developing a home surveillance system at that is not expensive, but at the same time has the necessary features that are needed to perform optimally. Necessary criteria were used to select the most important features of the surveillance system, and a system development method was adopted to develop the prototype of the system. The usability of the prototype was tested and evaluated using the USE usability test and the results were discussed.

ACKNOWLEDGEMENTS

“In The Name of Allah the Most Gracious and Most Merciful”

First and foremost, all praise to ALLAH (SWT), the Almighty, and the most gracious and most merciful, without whose divine guidance and blessing, I would not have been able to even begin, let alone complete, such a complex and confounding undertaking.

I would like to express my deepest appreciation to a number of people by giving up their valuable time and energy, and their precious thoughts and comments. I owe my heartfelt thanks to my supervisor Prof. Madya Abdul Nasir bin Zulkifli for his advice, knowledge and word of encouragement during this study. I feel much honoured to extend my thanks to my evaluator Mohd. Nizam bin Saad during defense for critical ideas and suggestions. I'll always be thankful to all, Terima kasih!

Special thanks to all my lecturers Dr. Nor Laily binti Hashim, Dr. Hazlina Bt Moh, Dr. Wan Rozaini Bt Sheik Osman, Dr. Norita Md Norwawi, Dr. Osman Bin Ghazali, Zhamri bin Che Ani and other UUM staff.

I must acknowledge the immeasurable contributions of my friends and colleagues who have shown great love and care during my study especially Taha, Ali, Moftah, Ackrm and Riaa, big Thank you!

I would also like to say a big thank you to my beloved family. I am indeed grateful to my parents who have always been there for me in life. May Allah reward your efforts! To my brothers and sister, you guys are great, I love you all.

DEDICATION

A very special dedication if this piece of myself to the two people who meant the most to me (my great father and my lovely mom). To my mom, who was so amazed at the way of my life turned out. To my father, who was my biggest cheerleader. Who, over the years, modeled compassion and caring of others. Who was always there with the advice when I needed it and sometimes I even took it? Who worked hard, to make sure me and support me, even when he may not agreed with the directions I took. I was richly blessed with the two of you in my life. Special thanks to my brothers and my sister, whom supporting and caring me all the time and never hide any efforts to encourage and consolidate my study.

CONTENTS

PERMISSION TO USE	i
ABSTRACT	ii
ACKNOWLEDGEMENTS	iii
DEDICATION	iv
CONTENTS	v
LIST OF TABLES	viii
LIST OF FIGURES	ix
LIST OF ABBREVIATION	xi
CHAPTER ONE	1
INTRODUCTION	1
1.1 PROBLEM STATEMENT	3
1.2 RESEARCH QUESTION	3
1.3 OBJECTIVES	4
1.4 SCOPE OF STUDY	4
1.5 SIGNIFICANCE OF STUDY	4
1.6 ORGANIZATION OF THE REPORT	5
CHAPTER TWO	6
LITERATURE REVIEW	6
2.1 INTRODUCTION	6
2.2 LOW COST WEBCAM HOME SECURITY SYSTEM	6
2.3 TYPES OF SURVEILLANCE SECURITY SYSTEMS	7
2.3.1 THE CLOSED CIRCUIT TELEVISION (CCTV) SYSTEMS	8
2.3.2 WEB-CAM SURVEILANCE SECURITY SYSTEM	9
2.4 WEB INFORMATION SYSTEMS FOR SURVEILLANCE	11
2.5 TYPES OF WEB CAMERA	14
2.7 SUMMARY	15
CHAPTER THREE	16
METHODOLOGY	16
3.0 INTRODUCTION	16
3.1 THE SOFTWARE DESIGN METHODOLOGY	16
3.2 IDENTIFICATION OF THE PROBLEM AND NEED FOR THE STUDY	18
3.3 ANALYSIS AND THE DESIGN OF THE SYSTEM	18
3.3.1 SELECTION OPEN CRITERIA FOR -SOURCE SURVEILLANCE SOFTWARE	19
3.4 EQUIPMENTS FOR THE HOME SURVEILLANCE SYSTEM	21
3.4.1 THE WEB CAMERA	21
3.4.2 THE APPLICATION	22
3.4.3 SERVER	22

3.4.4	CLIENTS	22
3.4.5	CABLES	22
3.4.6	INTERNET MODEM.....	22
3.4.7	SWITCHES:	22
3.5	BUILDING THE SYSTEM.....	23
3.6	OBSERVATION AND EVALUATION.....	23
3.7	SUMMARY.....	23
CHAPTER 4	.....	24
THE DESIGN AND DEVELOPMENT OF THE PERSONAL SURVEILLANCE SYSTEM	.....	24
4.1	INTRODUCTION	24
4.2	SOFTWARE REQUIREMENT	24
4.3.	THE SURVEILLANCE SYSTEM OVERALL FLOW DIAGRAM	24
4.3.2	SEQUENCE DIAGRAMS:	47
4.3.3	CLASS DIAGRAMS OF PERSONAL HOME SURVEILLANCE SYSTEM:	53
4.4	PAGES FROM THE PROTOTYPE.....	54
4.4.1:	HOME PAGE LOGIN PAGE.....	54
4.4.2:	ADMIN LOGIN PAGE	54
4.4	COST IMPLICATIONS	62
4.5	IMPORTANT FEATURE OF THE PERSONAL HOME SURVEILLANCE SOFTWARE... 63	
4.5.1	LOW COST	63
4.5.2	WEB-BASED	64
4.6	SUMMARY.....	64
CHAPTER 5	.....	65
RESULTS AND DISCUSSIONS	.....	65
5.1	INTRODUCTION	65
5.2.	SYSTEM EVALUATION.....	65
5.2.1	USABILITY TEST ON THE PERSONAL HOME SURVEILLANCE SYSTEM PROTOTYPE.....	65
5.2.2	DATA ANALYSIS.....	66
5.3	SUMMARY.....	69
CHAPTER SIX	.....	70
CONCLUSION	.....	70
6.1	RESEARCH CONTRIBUTION.....	70
6.2	PROBLEMS AND LIMITATION	70
6.3	RECOMMENDATION AND FUTURE WORKS.....	71
REFERENCES	.....	72
APPENDIX	.....	Error! Bookmark not defined.

LIST OF TABLES

Table 3.1: Rating of the software according to the selected criterion/features	19
Table 4.1: The table showing the cost of developing the system.....	63
Table 5.1 Reliability Statistics.....	66
Table 5.2 Descriptive Statistics	68

LIST OF FIGURES

Figure 3.1: System development Research method	17
Figure 4.1: Main Use Case Diagram	25
Figure 4.2: Login.....	26
Figure 4.3: View Picture.....	28
Figure 4.4: Generate Report	29
Figure 4.5: Manage Pictures	31
Figure 4.6: Admin View Reports.....	33
Figure 4.7: Configure System	35
Figure 4.8: Manage Operation.....	36
Figure 4.9: Alert	38
Figure 4.10: Display Picture.....	40
Figure 4.11: Send Images	42
Figure 4.12: Take Picture.....	43
Figure 4.13: Logout.....	45
Figure 4.14: Login Sequence Diagram	47
Figure 4.15: Generate Report Sequence diagram.....	47
Figure 4.16: User View Picture Sequence Diagram.....	48
Figure 4.17: Manage Login Sequence Diagram	48
Figure 4.18: Manage picture Sequence Diagram.....	49
Figure 4.19: Manage Configuration Sequence Diagram	49
Figure 4.20: View reports Sequence Diagram.....	50
Figure 4.21: Manage Operation Sequence Diagram.....	50
Figure 4.22: Take Images Sequence Diagram	51
Figure 4.23: Display Images Sequence diagram.....	51
Figure 4.24: Generate Alert Sequence diagram.....	52
Figure 4.25: The Personal surveillance System Class diagram	53
Figure 4.26: Home pages of Personal Home Surveillance System (PHSS)	54
Figure 4.27: Admin login Page	54
Figure 4.28: Administrator main page.....	55
Figure 4.29: Administrator's page to Add User's profile.....	55
Figure 4.30: An Administrator page to edit users account	56
Figure 4.31: An Administrator image viewing page.....	56

Figure 4.32: Administrator’s Delete image page.....	57
Figure 4.33: Administrator’s View reports list page	57
Figure 4.34: Administrator’s View full report page	58
Figure 4.35: User login page	58
Figure 4.36: User main page	59
Figure 4.37: User image viewing page.....	59
Figure 4.38:User update profile page.....	60
Figure 4.39: View User profile page	60
Figure 4.40: User Generate report page	61
Figure 4.41: Image at 2 meter distance from the web camera of the system.....	61
Figure 4.42: An Image at 5 meter distance from the web camera of the system.....	62
Figure 4.43 : An Image at 7 meter distance from the web camera of the system.....	62
USEFULNESS.....	66
EASE OF USE.....	67
EASE OF LEARNING	67

LIST OF ABBREVIATION

Personal Home Surveillance System	PHSS
Java Server Pages	JSP
Video surveillance system and closed circuit television	CCTV
Home security system on an intelligent network	HSSIN.
Local Area Network	LAN
Community Antenna Television	CATV
Frequently lost objects	FLO
Internet Service Providers	ISP
Hypertext Transfer Protocol	HTTP
Hyper Text Mark up Language	HTML
Wireless sensor networks	WSN
Open service gateway initiative	OSG
Home security system on an intelligent network	HSSIN.
Transmission Control Protocol Internet Protocol	TCP/IP.
File Transfer Protocol	FTP
Unified Modelling Language	UML
Alternative flow	A
Exceptional Flow	E

CHAPTER ONE

INTRODUCTION

The home video surveillance system is a system that makes it possible for house owners and the security agents to combat crime. Homemade video surveillance is a system that is made to display different sections of the house. In a place where an intruder visits a home leaving threats and doing various vicious activities, the home made video surveillance assist in making a facial recognition of the person for the law enforcement to apprehend. Therefore the security system is made for the convenience and safety of the occupants of a building (Zhao &Ye, 2007). In the early 80's till late 90's, security systems were restricted to the business office environment, government houses, banks, financial institutes, jewellery stores, museums, art galleries and the houses of the rich and affluence. This is because these are the places that are regarded as places that needs high security, also the high cost of the equipments used and the need for highly skilled security professionals for installing the security system makes it more difficult to extend to other areas.

A low cost personal home surveillance system is an application that assists users by displaying the events that is happening in their homes while they are away. The systems have the ability sending alerts to the users irrespective of the distance. The entry of the new millennium brought about a lot of ingenious innovations and thus many open source applications has been developed and made for public use. These have made the cost of

The contents of
the thesis is for
internal user
only

REFERENCES

- Baharom , A.H. and Habibullah, M, S. (2009). Crime and Income Inequality: The Case of Malaysia. *Journal of Politics and Law Vol2.No 1 March, 2009*
- Bellazzi, R., Montani S,Riva A, and Stefanelli M. (2001). Web-based telemedicine systems for home-care: technical issues and experiences. *A journal of Computer Methods and Programs in Biomedicine Vol.64 pp. 175–187.*
- Coulouris, G.F and Dollimore T. (2005). *Distributed Systems Concepts and Design 3rd Edition Kindberg, Addison-Wesley.*
- Cucchiara, R.(2005).Multimedia Surveillance Systems. In proceeding at the VSSN conference, November 11, 2005, Singapore.
- Chassiakos, A.P. and Sakellariopoulos, S.P. (2008). A web-based system for managing construction information. *A journal of Advances in Engineering Software Vol .9 pp 865–876.* Retrieved from WWW.ELSEVIER.COM/LOCATE/ADVENGSOFT.
- Detmold,H.,Dick,A.,Falkner,K, Munro, D. S., Hengel, Anton van den and Morrison, R. (2006). Scalable Surveillance Software Architecture .Proceedings of the IEEE International Conference on Video and Signal Based Surveillance. Retrieved from ACM library on 22/09/2009.
- Hagiwara,K., Chigira',Y.,Yoshiura,N. &Fujii',Y (2004). Proposal for a world wide home security system using PC-cameras : the e-Vigilante Network Project. In proceeding at the SICE Annual Conference in Sapporo, August 44,2004, Hokkaido Institute of 'Fecnology, Japan
- Johnson, J. (2006). The Advantages of Digital Video Surveillance. Retrieved from <http://ezinearticles.com/?The-Advantages-Of-Digital-Video-Surveillance&id=157371>
- Kidd,Cory D., Orr,R., Abowd,G.D.,Atkeson,C.G., Essa,I.A., MacIntyre,B Mynatt,E., Starner,T.E and Newstetter, W.(1999). The Aware Home: A Living Laboratory for Ubiquitous Computing Research. A paper in CoBuild'99, LNCS 1670, pp. 191-198, 1999 Springer-Verlag Berlin Heidelberg 1999.

- Koay,S.Y,Ramli,A.R.,Lew,Y.P.,Prakash,V and Ali R.(2002). A Motion Region Estimation For Web Camera Application. A paper presented at the student conference on research and development, Shah Alam Malaysia.
- Koutsiaa,A., Semertzidisa,T.,Dimitropoulosa,K.,Grammalidisa,N and Georgouleasb,K.(2008) Automated Visual Traffic Monitoring And Surveillance Through A Network Of Distributed Units. The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences. Vol. XXXVII. Part B3b. Beijing 2008
- Lam, K-Y and Chiu, C. K. H.(2004). Adaptive Visual Object Surveillance with Continuously Moving Panning Camera. In proceeding at the VSSN conference, New York, USA.
- Liang,N.S.,Fu, L.C and Wu,C.L "An integrated, flexible, and Internet-based control architecture for home automation system in the Internet era. Proceedings ICRA '02. IEEE International Conference on Robotics and Automation, Vol. 2, pp. 1101 -1106, 2002
- Liebau,N.C., Heckmann, O., Hubbertz,I. and Steinmetz,R (2005). A Peer-to-Peer Webcam Network .A paper presented at GI-Proceedings.61-19.Germany.
- Lund, A.M. (2001) Measuring Usability with the USE Questionnaire. STC Usability SIG Newsletter. Retrieved from WWW.HCIBIB.ORG on 22/09/2009.
- Maeda, F, Asada, A., Kuramoto, K., Kurashige, Y., Nanri, M., Kawashima, Y., Imai, R. and Hantani K. (2007). Development of diver detection and sensor integration for wharf surveillance software. A paper presented at Underwater Technology And Workshop On Scientific Use Of Submarine Cables And Related Technologies, 2007symposium. Retrieved from IEEE library pg 133-141.
- Moeslund,T and Granum E. (2001). A survey of computer vision based human motion capture.Computer vision and Image understanding. Vol. 81.No 3,pp.231-268,March 2001.

Nunes, J. C. and Delgado, J. C. M. (2000). An Internet application for home automation. A paper Electrotechnical Conference, 2000. MELECON 10th Mediterranean, Vol: 1, pp. 298 - 301, 2000.

Nunmaker, J.F JR.,Purdin, T.D.M. (2001). Systems development in Information systems Research. Journal of Information Systems winter 2000-2001 Vol 7. No3pp. 89-106.

Septor, K.(2004) Creating A Video Device Application. Student Poster Abstract. A paper at the Consortium for Computing Sciences in Colleges. Advisor: Dr. Dale Skrien. Colby College

KJSEPTOR@COLBY.EDU

Sidhu, A.S. (2005). The rise of crime in Malaysia: An academic and Statistical analysis. Journal of the Kuala Lumpur Royal Malaysian Police College. No 4,2005. Retrieved from WWW.MPK.RMP.GOV.MY/JURNAL/2005/RISEOFCRIME.PDF on 22Aug 2009.

Takabayashi, K.,Fujita,N., Nomura,Y., Amada, Y., Osaki,T., Sugahara, K. and Konishi, R.(2002). Construction of the home security system using the Internet technology. PROCEEDINGS OF THE 41ST SICE ANNUAL CONFERENCE, retrieved from IEEE library Vol: 1, pg 461- 465 vol.1

Tsai,S.M., Yang,P.C., Wu, S.S. and Sun, S.S.(1998) A Service Of Home Security System On Intelligent Network .A journal of IEEE Transactions on Consumer Electronics, Vol. 44, No. 4, NOVEMBER 1998

Tseng Yu-Chee, You-Chiun Wang, Kai-Yang Cheng, Yao-Yu Hsieh.(2005). "iMouse: An Integrated Mobile Surveillance and Wireless Sensor System. In Proceedings at MSWiM'05, October 10–13, 2005, Montreal, Quebec, Canada.

Tseng Yu-Chee, You-Chiun Wang, Kai-Yang Cheng, Yao-Yu Hsieh.(2007). "iMouse: An Integrated Mobile Surveillance and Wireless Sensor System," IEEE Computer magazine, vol. 40, no. 6, pp. 60-66, June 2007, doi:10.1109/MC.2007.211

- Verkest, D., Kunkel,J., Schirrmeister,F. (2000). System Level Design Using C++. Proceedings of design, Automation and Test in Europe conference, Paris France,pp. 74-81.March 2000.
- Verkest, D., Desmet D.,Avasare,P.,Coene, P.,Decneut, S.,Hendrickx, F.,Marescaux,T.,Mignolet,J-Y and Pasko, R. (2001). Design of a Secure,Intelligent and Reconfigurable WebCam Using a C Based System Design Flow. Proceeding at the Signals, Systems and Computers Conference.
- Volner, R. (2001).Home security system and CATV. A paper at the IEEE 35th International Carnahan Conference on Security Technology Volume , Issue , Oct 2001 Page(s):293 - 30
- Wu,B.F., Peng, H.Y. and Chen.C.J. (2006) A Practical Home Security System via Mobile Phones. Proceedings of the 5th WSEAS International Conference on Telecommunications and Informatics, Istanbul, Turkey, May 27-29, 2006 (pp299-304)
- Yoshiura,N,Fujii, Y. and Naoya Ohta.(2005).Using the Security Camera System Based on Individually Maintained Computers for Homeland Security: The e-JIKEI Network Project. A paper at IMTC 2005 – Instrumentation and Measurement Technology Conference, Ottawa, Canada, 17-19 May 2005.
- Zhao, Y. and Ye, Z.(2007). A Low Cost GSM/GPRS Based Wireless Home Security System. A paper in IEEE Transactions on Consumer Electronics, Vol. 54, No. 2, MAY 2008.