UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF WIRELESS NURSE CALL SYSTEM WITH AUTOMATED FALL DETECTOR USING WI-FI

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Computer Engineering Technology (Computer Systems) with Honours.

by

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I hereby, declared this report entitled DEVELOPMENT OF WIRELESS NURSE CALL SYSTEM WITH AUTOMATED FALL DETECTOR USING WI-FI is the results of my own research except as cited in references.

Signature: ……

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Date:

APPROVAL

This report is submitted to the Faculty of Electrical and Electronics Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Computer Engineering Technology (Computer Systems) with Honours. The member of the supervisory is as follow:

Signature: …….

Supervisor : SHAMSUL FAKHAR BIN ABD GANI

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Co-supervisor: AIMAN ZAKWAN BIN JIDIN

ABSTRAK

Sistem Panggilan Jururawat adalah pertahanan garis pertama untuk pesakit yang berada di bawah unit rawatan perubatan. Walau bagaimanapun, masalah yang ada dengan sistem panggilan jururawat tradisional adalah sistem kabel dan sistem pengesanan kejatuhan tradisional kebanyakannya pasif. Sekiranya pesakit jatuh dan tidak sedarkan diri, dia tidak akan dapat meminta bantuan. Oleh itu, sebuah sistem telah dibangunkan untuk menangani masalah ini dengan menggunakan Wi-Fi sebagai protokol tanpa wayar untuk peranti Butang Panggilan Jururawat untuk berkomunikasi dengan server Stesen Jururawat. Tambahan pula, sebuah tri-paksi pecutan telah ditambahkan di dalam butang Panggilan Jururawat untuk mengesan kejatuhan yang berdasarkan atas nilai ambang. Jika nilai yang dikesan melebihi nilai ambang, isyarat kejatuhan akan dihantar ke Stesen Jururawat dan dipaparkan pada Paparan LED Dot Matrix. Peranti Paparan LED Dot Matrix ini akan memaparkan ID pesakit dan status (sama ada jatuh atau panggilan). Di samping itu, pangkalan data telah dicipta untuk menyimpan sejarah dan status terkini. Data-data ini boleh dilihat di laman web di Komputer Perawat Jururawat. Tambahan pula, julat sistem ini berdasarkan kekuatan isyarat Wi-Fi. Ini telah diuji di dalaman dan di luaran dengan menggunakan hotspot mudah alih. Hasilnya menunjukkan bahawa isyarat luaran lebih kuat daripada dalaman kerana hotspot mudah alih bergantung kepada rangkaian selular dan ambang batas yang dicadangkan ialah 16.

ABSTRACT

Nurse Call System is the first line of defense for patients who are under medical care unit. However, the existing problems with the traditional nurse call systems are the systems are hard-wired and the traditional fall detection systems are mostly passive. If a patient fell to unconscious mind, he or she will not able to call for help. Therefore, a system is developed to tackle these problems by using Wi-Fi as the wireless protocol for the Nurse Call Button devices to communicate with the Nurse Station servers. Moreover, an accelerometer is embedded inside of the Nurse Call button to detect falls based on the threshold value. If the value detected exceeds the threshold, the fall signal will be sent to Nurse Station and displayed on the LED Dot Matrix Display. This LED Dot Matrix Display device displays the respective patient ID and the status (either fall or call). In addition, a database is created to store the history and the updated status. These can be viewed on the webpage in Nurse Station Computers. The range of the system is based on the strength of Wi-Fi signal. This system has been tested indoors and outdoors using a mobile hotspot. The result shows that the outdoor signal is stronger than indoor due to mobile hotspot relies on cellular network and the ideal falling threshold is 16.

DEDICATION

To My Parents

Thank you for showering me with your continuous love and devotion. It will always be remembered and kept in my heart.

To My Supervisor and Lecturer

Thank you for all the knowledge and support. Your patience, support and words of encouragement gave me enormous strength throughout the whole project.

To My Senior

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Thank you for offering guidance and directions when I am at lost.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF SYMBOLS

b	-	byte
GHz	-	Gigahertz
k	-	kilo
m	-	metre
MHz	-	Megahertz
mm	-	millimetre
s	-	second
$\boldsymbol{\pi}$	-	pi value

LIST OF ABBREVIATIONS

AP	Access Point
API	Application Programming Interface
BCG	Ballistocardiogram
BPNN	Backpropagated Neural Network
DBMS	Database Management System
ECG	Electrocardiography
FFD	Full Function Device
FTDI	Future Technology Devices International
Gen.	Generation
HTML	Hypertext Markup Language
I^2C	Inter-Integrated Circuit
ICSP	In-circuit Serial Programming
IEEE	Institute of Electrical and Electronics Engineers
IP	Internet Protocol
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LR-WPANS	Low-Rate Wireless Personal Area Network
MB/s	MegaByte per second
MEMS	Micro-Eletro-Mechanical Systems
PHP	Hypertext Preprocessor
PIR	Passive Infrared

PWM	Pulse Width Modulation
RC4	Rivest Cipher 4
RFD	Reduced Function Device
SQL	Structured Query Language
TUG	Timed Up and Go
USB	Universal Serial Bus
UWB	Ultra Wide Band
VoIP	Voice over Internet Protocol
WEP	Wired Equivalent Privacy
Wi-Fi	Wireless Fidelity
WLAN	Wireless Local Area Network
XAMPP	Cross-Platform (X), Apache (A), MySQL (M), PHP (P), Perl (P)