IPHONE APP : LECTURER'S ROOM FINDER, UUM-CAS

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iPhone App : Lecturer's Room Finder, UUM-CAS

A project submitted to Dean of Research and Postgraduate Studies Office in partial Fulfillment of the requirement for the degree Master of Science (Information Technology) Universiti Utara Malaysia

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ABSTRACT

The Information Technology building at the College of Arts and Sciences, Universiti Utara Malaysia has a complex design. The numbering of the lecturers' rooms is very confusing and finding the required room is very difficult and taking a long time not just for students but also for lecturers. The purpose of this study is to develop a mobile indoor navigation prototype for lecturers' room search based on iPhone. This report discusses about indoor navigation and the development of the prototype based on iPhone. This study utilized the research methodology in Information System (IS) which was adapted from Vaishnavi and Kuechler (2007). The use of mobile indoor navigation prototype could help students to find the required room faster while saving energy and increasing productivity. The mobile indoor navigation prototype was developed using web tools such as PHP, HTML5, CSS, JavaScript and SQLite as database. The prototype can be used as an alternative way in finding lecturers' room at IT building. The results from the evaluation indicated that mobile indoor navigation application for searching lecturers' room at IT building, College of Arts and Sciences, Universiti Utara Malaysia based on iPhone devices has achieved all the objectives. The users agreed in terms of Perceived Usefulness and Perceived Ease of Use towards the use of the prototype.

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LIST OF ABBREVIATIONS

GPS	Global Position System
GIS	Geographic Information System
RFID	Radio-Frequency Identification
UI	User Interface
SDK	Software Development Kit
IT	Information Technology
UUM	Universiti Utara Malaysia

CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter provides an overview of the entire study. The first sub-topic describes the background of the study that lead to the implementation of the whole research. This is followed by problem statement, research questions, objectives, scope of the study, significance of the study and research organization. The last sub-topic provides the way this research is summarized.

1.1 Background of the Study

Currently most navigation systems are designed to support outdoor navigation. However, when reaching a destination by using outdoor navigation, a walker need to enter a building, and indoor navigation is required for a large and complex building. According to Huang et. al. (2009), people tend to lose orientation a lot easier within buildings than outdoors. While outdoor navigation has good data supported in the network, that is not true for indoor navigation (Werner & Kessel, 2010).

The contents of the thesis is for internal user only

REFERENCES

- Akiyama, T., Teranishi, Y., Okamura, S., & Shimojo, S. (2010). An Approach for Filtering Inaccurate Access Point Observation Report in WiFi Positioning System. In the 2010 International Conference on P2P, Parallel, Grid, Cloud and Internet Computing (3PGCIC), November 4-6, 2010, 517-520.
- Ali, N. & Mansoor, H. (2010). Cross Platform Mobile Application Development Framework. Retrieved May 1, 2011, from http://ieeepkhi.org/studentseminar/ doc/cross%20Platform%20Mobile%20Application%20Development%20Framew ork.pdf
- Allen, S., Graupera, V., & Lundrigan, L. (2010). Pro Smartphone Cross-Platform Development: iPhone, Blackberry, Windows Mobile and Android Development and Distribution. USA:Apress.
- Apers, C., & Paterson, D. (2010). Beginning iPhone and iPad Web Apps: Scripting with HTML5, CSS3, and JavaScript. USA:Apress.
- Barney, L. S. (2009). *Developing Hybrid Application for the iPhone*. Boston: Pearson Education Inc.
- Bellman, R. (1958). On a routing problem. *Quarterly of Applied Mathematics* 16, 87-90.
- Ching, W., The, R.J., Li, B., & Rizos, C. (2010). Uniwide WiFi based positioning system. In the 2010 IEEE International Symposium on Technology and Society (ISTAS), June 7-9, 2010, 180-189.
- Cruz, O., Ramos, E., & Ramirez, M. (2011). 3D indoor location and navigation system based on Bluetooth. In the 21st International Conference on Electrical Communications and Computers, CONIELECOMP, 2011, February 28-March 2, 2011. 271-277.
- Dijkstra, E.W. (1959). A note on two problems in connexion with graphs. *Numerische Mathematik*, 1, 269-271.
- Evennou, F. & Marx, F. (2006). Advanced Integration of WiFi and Inertial Navigation Systems for Indoor Mobile Positioning. EURASIP Journal on Applied Signal Processing Volume 2006. Retrieved April 30, 2011, from http://www.hindawi.com/journals/asp/2006/086706/abs/ doi:10.1155/ASP/2006/86706
- Floyd, R.W. (1962). Algorithm 97: Shortest Path. Communications of the ACM, 5(6), 345.

- Gallagher, T.J., Binghao, Li., Dempster, A.G., & Rizos, C. (2010). A sector-based campus-wide indoor positioning system. In the 2010 International Conference on Indoor Positioning and Indoor Navigation (IPIN), Zurich, Switzerland, September 15-17, 2010.
- Gartner G. (2007). Smart Environments and LBS to support pedestrian navigation. In Proceedings of the 9th International Conference on GeoComputation, National Centre for Geocomputation, National University of Ireland, Maynooth, September 3-5, 2007.
- Gressmann, B., Klimek, H., & Turau, V. (2010). Towards ubiquitous indoor location based services and indoor navigation. In *Proceeding of 7th Workshop on Positioning Navigation and Communication, WPNC 2010*, March 11-12, 2010. 107-112.
- Hart, P. E., Nilsson, N. J., & Raphael, B. (1968). A Formal Basis for the Heuristic Determination of Minimum Cost Paths. *IEEE Transactions on Systems Science and Cybernetics SSC4*, 4(2), 100–107.
- Im, J., Choi, D., Shin, K., Kim, S., & Sohn, J. (2010). Location based hybrid application using Wi-Fi zone. In the 2010 International Conference on Information and Communication Technology Convergence (ICTC), November 17-19, 2010, 321-322.
- Inoue, Y., Ikeda, T., Yamamoto, K., Yamashita, T., Sashima, A., & Kurumatani, K. (2008). Usability study of indoor mobile navigation system in commercial facilities. In *Proceedings of the 10th international conference on Ubiquitous computing, UbiComp '08,* Seoul, South Korea, September 21 - 24, 2008. 15-20.
- Johnson, D.B. (1977). Efficient algorithms for shortest paths in sparse networks. Journal of the ACM, 24 (1), 1-13.
- Jørgensen, A.P., Collard, M., & Koch, C. (2010). Prototyping iPhone Apps: Realistic Experiences on the Device. In Proceedings of the 6th Nordic Conference on Human-Computer Interaction: Extending Boundaries, NordiCHI '10, Reykjavik, Iceland, 687-690.
- Lashkari, A.H., Parhizkar, B., & Ngan, M.N.A. (2010). WIFI-Based Indoor Positioning System. In the 2010 Second International Conference on Computer and Network Technology (ICCNT), April 23-25, 2010, 76-78.
- Medford, J., Ray, S., Ratchev, E., Retelle, A., & Agrawal, A. (2010, November 18). Personal Indoor Navigator. [Video file]. Retrieves from http://www.youtube.com/watch?v=jlEoq5syaM8

- Millonig, A., & Schechtner, K. (2005). Devloping landmark-based pedestrian navigation systems. In Proceedings of the 8th International IEEE Conference on Intelligent Transportation Systems, Arsenal Res, Vienna, Austria, September 13-16, 2005. 197-198.
- Montague, K. (2010). Accessible indoor navigation. In Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility, ASSET'10, Orlando, Florida, USA, October 25-27, 2010. 305-306.
- Morales, F., & Toledano, M. (2009). Web-apps for the iPhone in Higher Education. Applications for the Degree in Actuarial Science. In proceedings Research, Reflections and Innovations in Integrating ICT in Education, m-ICTE2009, April 22-24, 2009. 1049-1053.
- Puikkonen, A., Sarjanoja, A., Haveri, M., Huhtala, J., & Häkkilä, J. (2009). Towards designing better maps for indoor navigation: experiences from a case study. In the Proceedings of the 8th International Conference on Mobile and Ubiquitous Multimedia, MUM'09, Cambridge, UK, November 22-25, 2009.
- Riehle, T. H., Lichter, P., & Giudice, N. A. (2008). An indoor navigation system to support the visually impaired. In 30th Annual International Conference of the IEEE on Engineering in Medicine and Biology Society, 2008. EMBS 2008, Vancouver, British Columbia, Canada, August 20-25, 2008. 4435-4438.
- Rodrigues, J.P.C., Oliveira, M., & Vaidya, B. (2010). New Trends on Ubiquitous Mobile Multimedia Application. EURASIP Journal on Wireless Communications and Networking Volume 2010. Retrieved April 30, 2011, from http://www.hindawi.com/journals/wcn/2010/689517 doi:10.1155/2010/689517.
- Ruppel, P., Gschwandtner, F., Schindhelm, C.K., & Linnhoff-Popien, C. (2009). Indoor Navigation on Distributed Stationary Display Systems. In 33rd Annual IEEE International Computer Software and Applications Conference, 2009. COMPSAC '09, July 20-24, 2009. 37-44.
- Sanchez, J.G., & Echeagaray, M.E.C. (2010). Iphone Application Development. In the Proceedings of the ACM international conference companion on Object oriented programming systems languages and applications companion, SPLASH'10. 321-322.
- Serra, A., Carboni, D., & Morotto, V. (2010). Indoor pedestrian navigation system using a modern smartphone. In Proceedings of the 12th international conference on Human computer interaction with mobile devices and services, MobileHCI '10, Lisboa, Portugal, September 7-10, 2010. 397-398.
- Shin, B.J., Lee, K.W., Choi, S.H., Kim, J.Y., Lee, W.J., & Kim,H.S. (2010). Indoor WiFi positioning system for Android-based smartphone. In the 2010 International Conference on Information and Communication Technology Convergence (ICTC), November 17-19, 2010, 319-320.

- Stark, J. (2010). Building iPhone Apps with HTML, CSS, and JavaScript: Making App Store Apps Without Objective-C or Cocoa. USA:O'Reilly Media.
- Takeda, H., Veerkamp, P., Tomiyama, T., & Yoshikawam, H. (1990). Modeling Design Processes. AI Magazine 11(4), 38-48.
- Vaishnavi, V. & Kuechler, W. (2007). Design Science Research Methods and Patterns: Innovating Information and Communication Technology. New York: Auerbach.
- Vaupel, T., Seitz, J., Kiefer, F., Haimerl, S., & Thielecke, J. (2010). Wi-Fi positioning: System considerations and device calibration. In the 2010 International Conference on Indoor Positioning and Indoor Navigation (IPIN), Zurich, Switzerland, September 15-17, 2010.
- Wagner, R. (2008). Professional iPhone and iPod Touch Programming: Building Applications for Mobile Safari. Indiana: Wiley Publishing.
- Want, R. (2010). iPhone: Smarter Than the Average Phone. *Pervasive Computing*, *IEEE*, 9(3), 6-9.
- Wu, H., Marshall, A., & Yu, W. (2007). Path Planning and Following Algorithms in an Indoor Navigation Model for Visually Impaired. In Second International Conference on Internet Monitoring and Protection (ICIMP 2007), 1-5 July 2007. 38-44.
- Yan, W. (2004). Mobile map service with scalable vector graphics. In the Proceedings 2004 IEEE International Geoscience and Remote Sensing Symposium, 2004, IGARSS '04, Anchorage, Alaska, USA, September 20-24, 2004, 2967-2970.