

GROUP FORMATION USING SHORTEST PATH APPROACH

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GROUP FORMATION USING SHORTEST PATH APPROACH

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ABSTRACT

Group work is becoming more important in education. Working in groups give students the ability to share ideas, to enhance problem solving skills and to improve communication skills. Thus, group formation becomes a crucial issue in order to increase group capability. However in UUM, several colleges are located remotely and majority of the students do not own personal transport. These create constraints for group meetings and it will effect the group performance. Therefore, this paper proposes method for identifying groups using shortest path approach and we hope this approach is useful for lecturers who have a large class. We also believe that the approach can be integrated with other existing methods in group formation.

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CHAPTER 1

INTRODUCTION

Now a day, many organizations, especially in education institution are shifting away from individual work performed in hierarchical work structures and toward group operation. This project purposes to introduce the alternative guideline for increasing student group efficiency through the discussion on how to solve the problems of group formation which stated on time consuming and students' location in Universiti Utara Malaysia. Initially, an overview of this project includes a project's background, problem statement, objectives, scope, and significance are discussed in this chapter.

1.1 Background of the study

Group work is becoming more important in education. It is used to serve a variety of functions for organization. In academic institutions normally use the group structure as a place for students share and show their ability to manage and dissolve project problem, to enhance problem solving skills and to improve communication skills. Group formation is the starting point of all group development and performance (Anewalt, Polack-Wahl, Beidler, & Smarkusky, 2003). On the other aspect, group work could be seen as a good preparation for student to industry because most of the software industries have been developing software in teamwork(Brown & Dobbie,

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REFERENCES

- Adams, S.G. (2003). Building Successful Student Teams in the Engineering Classroom. *Journal of STEM Education*, 4(3) .Retrieved July 6, 2005, from <http://www.auburn.edu/research/litee/jstem/include/getdoc.php?id=51&article=21&mode=pdf>
- Anewalt, k., Polack-Wahl,J.A., Beidler, J.,& Smarkusky, D. L. (2003). Group Project Across The Curriculum. *Computing Sciences in Colleges* ,19(2), 232-237
- Bo-Linn, C. (2004).Students Learning Together: Collaborative or Cooperative Learning. *Illini Instructor Series*. Retrieved July 4, 2005, from <http://www.oir.uiuc.edu/Did/Resources/Illini%20Instructor/collaborative.htm>
- Brown, C.E., & Petrusha, R. (2004). *Access VBA Programming*. USA: McGraw-Hill
- Brown, J., & Dobble, G. (1999). Supporting And Evaluating Team Dynamics In Group Project. *Proceeding of 30th SIGCSE Technical Symposium On Computer Science Education*, 281-285.
- Carrano, F.M. and Savitch, W. (2003). *Data Structures and Abstractions with Java*. USA: Pearson Education.
- Dafoulas, G.A., & Macaulay, L.A. (2001). Facilitating Group Formation and Role Allocation in Software Engineering Groups. *ACS/IEEE International Conference on Computer Systems and Applications*, 352 - 359. Retrieved July 5, 2005, from IEEE Computer Society.
- Daniels, M., Faulkner, X., & Newman, I. (2002). Open Ended Group Projects, Motivating Students and Preparing them for the Real World .*IEEE*

- Proceedings of 15th Conference on Software Engineering Education and Training*, 115-126. Retrieved July 8, 2005, from IEEE Xplore.
- Deibel, K. (2000). Facilitating Group Discussions Through Learning Styles and Prior Student Knowledge. *ACM*. Retrieved July 6, 2005, from <http://www.cs.washington.edu/homes/deibel/papers/groupwork/groupwork.pdf>
- Fitzpatrick, E., Askin, R., & Goldberg, J. (2001). Using Student Conative Behaviors and Technical Skills to Form Effective Project Teams. *31st ASEE/IEEE Frontiers in Education Conference*. Retrieved July 4, 2005, from <http://fie.engrng.pitt.edu/fie2001/papers/1276.pdf>
- Foundation Coalition. (2002). Forming Student Engineering Teams. *The National Science Foundation*. Retrieved July 4, 2005, from <http://www.foundationcoalition.org/teams>
- Gottlieb, M.R. (2003). *Managing Group Process*. USA: Praeger Publishers.
- Haake, J. M., Haake, A., Schümmer, T., Bourimi, M., & Landgraf, B. (2004). End-User Controlled Group Formation and Access Rights Management in a Shared Workspace System. *Proceedings of the 2004 ACM conference on Computer supported cooperative work*, 6(3), 554-563. Retrieved July 5, 2005, from ACM Press.
- IML. (2004). Enhancing Experiences of Group Work: Unit 3 - Forming Effective Groups. Retrieved October 8, 2005, from <http://www.iml.uts.edu.au/learnteach/enhance/groupwork/unit3.html>
- Levi, D. *Group Dynamics for Team*. 2001. USA: Sage publication.
- Martin & Paredes. (2005). Using Learning Styles for Dynamic Group Formation in Adaptive Collaborative Hypermedia Systems. *International Conference on*

- Web Engineering (ICWE 2004)*. Retrieved July 9, 2005, from <http://www.ii.uam.es/~rcarro/AHCW04/MartinParedes.pdf>
- Mohd Zabidin, H., Mohamed Ali, S., Zhamri, C. A. , & Azizi, A. A. (2005) Student Group Formation And Role Distribution Using Team Software Process (TSP) Approach ., *Proceeding of 1st International Symposium on E-Learning*, Kota Kinabalu, Sabah.
- Muehlenbrock, M. (2004). *Learning group formation based on learner profile and context*. Retrieved June 25, 2005, from <http://www.cs.kuleuven.ac.be/~hmdb/ProlearnIClass/papers/Muehlenbrock.pdf>
- Redmond, M. A. (2001).A Computer Program to Aid Assignment of Student Project Groups. *Proceedings of the thirty-second SIGCSE technical symposium on Computer Science Education*, 134-138. Retrieved July 6, 2005, from ACM Press.
- Rourke, L., & Anderson, T. (2002). Using peer teams to lead online discussions. *Journal of Interactive Media in Education*. Retrieved October 1, 2005, from <http://www-jime.open.ac.uk/2002/1/rourke-anderson-02-1.pdf>
- Rutherford, R.H. (2001).Using Personality Inventories to Help Form Teams for Software Engineering Class Projects. *Proceedings of the 6th annual conference on Innovation and technology in Computer Science Education*. Retrieved July 5, 2005, from ACM Press.
- Scott, T., J., Tichenor, L., H., Bisland, R., B. , & Cross, J., H.(1994) Team Dynamic In Student Programming Projects, *Proceeding of 25th SIGCSE Symposium On Computer Science Education*, 111-115. Retrieved July 5, 2005, from ACM Press.

- Tu, Y., & Tu, Y. (2004). Achieving an Effective and Successful IS Group Project. *Proc ISECON*. Retrieved July 5, 2005, from <http://isedj.org/isecon/2004/3263/ISECON.2004.Tu.pdf>
- Valente, T. W., Hoffman, B. R., Ritt-Olson, A., Lichtman, K., & Johnson, C. A. (2003). Effects of a Social-Network Method for Group Assignment Strategies on Peer-Led Tobacco Prevention Programs in Schools. *American Journal of Public Health*, 93(11), 1837-1843. Retrieved July 6, 2005, from <http://www-hsc.usc.edu/~tvalente/Publications/Valente%20et%20AJPH%202003.pdf>
- Waldura, R. (2005). Dijkstra's Shortest Path Algorithm in Java. Retrieved July 6, 2005, from <http://renaud.waldura.com/doc/java/dijkstra/>
- Weiss, M. A. (2002). *Data Structures and Problem Solving Using Java*, USA: Addison Wesley.
- Wikipedia. (2005). Microsoft Access. Retrieved July 15, 2005, from http://en.wikipedia.org/wiki/MS_Access
- Yalamanchi, G. D., & Ravi, S. (2003). Project Group Assignment System. *Proceedings of Student Research Day, CSIS*. Retrieved July 9, 2005, from <http://www.csis.pace.edu/~ctappert/srd2003/paper07.pdf>
- yWorks GmbH. (2005). Analyzing Graphs. Retrieved October 9, 2005, from <http://www.yworks.com/products/yfiles/doc/developers-guide/analysis.html>