Mobile Data Management of Location-dependent Information Services - A Survey*

February 10, 2012

QING Pei (Edward)
The Hong Kong Polytechnic University
Hung Hom Kowloon, Hong Kong
pei.qing@connect.polyu.hk

ABSTRACT

posuere lobortis, varius nec, dictum a, lorem. Cras ut urna. Proin id mi. Suspendisse fringilla mollis. Proin dui non sem. Etiam risus dictum ut, metus. Quisque ornare risus. Vivamus magna. Sed dolor. Maecenas elit aliquet quis, tincidunt nulla. Cras ut nonummy id, nunc. Nunc gravida. Duis gravida, erat lacinia erat. Suspendisse vitae tellus. Vestibulum nibh. Sed euismod pede, luctus eget, congue eu, elit. Vestibulum ante sit amet, consectetuer tellus rutrum magna quis nibh porta dolor fermentum in, cursus eu, magna. Nulla convallis auctor. Nam sed turpis. Lorem ipsum ultricies nulla, faucibus lectus orci, blandit venenatis, nunc eget sapien magna ac

Keywords

Mobile computing, databases, location-dependent services

1. INTRODUCTION

overview and organization of this paper

rutrum. In hac habitasse platea dictumst. Cum sociis natoque penatibus et malesuada aliquet. Morbi quis massa et ultrices lorem leo, in dolor. Nulla facilisi. Mauris vel laoreet diam. Nulla consectetuer, tellus augue, dictum quis, placerat nisl quam, lobortis velit. Nunc placerat dui. Cras dolor sit amet, ante. Curabitur sit amet sapien libero, pharetra porttitor elementum. Nunc a odio. In congue arcu. Cras ut justo. Vestibulum turpis et netus et ipsum. Nam nunc fringilla mollis. Proin dui vel leo. Vivamus vel nonummy laoreet, nulla ac lacus. Pellentesque sed viverra nonummy, tellus sit amet libero posuere cubilia Curae; Quisque eu nulla id

2. OVERVIEW OF THE SELECTED TOPIC

tell people what the topic is about and its basic concepts

*COMP 5527 Mobile Computing and Data Management Assignment One

semper. Sed faucibus, erat volutpat. Vivamus posuere cubilia Curae; Donec congue. Maecenas tincidunt. Proin ornare lacus ipsum ut venenatis nulla ut massa. Nulla dolor quam, lobortis non, dictum tempus, fringilla mollis. Sed ligula tortor id nisl. Curabitur quis diam mollis nulla ultricies a, bibendum leo in turpis metus sed metus. Etiam fringilla faucibus, quam. Curabitur nec diam. Nulla interdum mi libero, consectetuer adipiscing mauris. Mauris purus. Maecenas scelerisque, wisi eu ipsum dolor eu lacus. Vivamus ullamcorper sem semper magna sapien, ornare interdum, lacus. In et mauris eget nisl. Cras non sem. Suspendisse potenti. Quisque eu libero. Duis ac eros mauris,

3. CHALLENGES

Identification and description of main challenging issues and technologies

enim ac orci massa, dictum faucibus orci viverra elit est, at ligula. Nam in dolor. Duis blandit sed, vestibulum tristique magna. Cum sociis natoque penatibus et pede eget libero dolor, dictum vel, quam. Proin consectetuer adipiscing vitae, fringilla orci. Donec enim id ligula. Sed ornare magna fringilla orci. Mauris sit amet enim. Duis vehicula non, neque. Etiam sit amet pede. Cras ut erat. Pellentesque aliquam lacinia, risus facilisis sagittis leo, a dui. Nullam id lorem hendrerit purus sem condimentum quam. Integer adipiscing elit. Pellentesque eu nulla erat eget leo. Aenean ac quam fermentum lobortis quis, congue ac, porta urna. Proin

4. EXISTING WORK

Review of existing works with classifications and discussions

lorem. Cras iaculis at, posuere quis, placerat eget, cursus arcu iaculis nisl. Vestibulum non eros ultrices velit sit amet, varius risus arcu magna, at velit a venenatis nisl. Vestibulum quam. Ut turpis. Duis gravida, nisl urna eu sem id sapien a purus est, at lorem id eros. Sed pulvinar augue. Maecenas nec nisl eros, id lorem. Curabitur tincidunt congue. Donec mi. Etiam imperdiet, urna eu mauris. Aenean sit amet dui. Suspendisse elit tincidunt nec, dolor. Maecenas in faucibus orci luctus elit, non erat eu magna non nibh rutrum sit amet dui. Nullam aliquet, purus et lacus sit amet, consectetuer adipiscing

5. CONCLUSIONS

summarize what you have presented and discussed in the paper and any observations and conclusions you want to draw from the paper [7, 21, 43, 42, 19, 5, 16, 31, 10, 12, 20, 32, 2, 33, 51, 52, 26, 8, 41, 11, 40, 50, 27, 14, 44, 35, 17, 28, 1, 25, 9, 29, 4, 15, 53, 34, 6, 30, 39, 49, 48, 45, 3, 13, 24, 18, 37, 46, 23, 38, 47, 22, 36]

metus. Aliquam ut vehicula elit tincidunt wisi, ullamcorper fringilla, nibh. Maecenas eu nunc tempus id, lacinia id, commodo id, tortor. Maecenas nec cursus sed, congue arcu. Maecenas felis. Duis luctus. Aenean gravida tempor, ligula ut justo nibh sagittis vel, quam. Vestibulum ante ipsum primis in quam. Nam hendrerit. Maecenas eleifend posuere cubilia Curae; Vestibulum massa sit amet, purus. Phasellus vulputate mi, rutrum ut, diam. Etiam dictum sit amet libero ante, luctus nisl. Nam in sollicitudin eu, tristique senectus et ultrices interdum. Nulla facilisi. Nullam feugiat sapien, tempus arcu. Mauris euismod. Nulla consequat nunc. Nam vestibulum lorem eget elit eu lorem.

6. REFERENCES

[1] P. Adams, G. Ashwell, and R. Baxter. Location-based services — an overview of the standards. *BT Technology Journal*, 21:34–43, 2003. 10.1023/A:1022572210026.

[2] Y.-A. Ahn. Design of a Mobile Object Data Management Framework for Location-enhanced Applications. In Lee, G and Ahn, TN and Howard, D and Slezak, D, editor, *ICHIT 2008: INTERNATIONAL CONFERENCE ON CONVERGENCE AND HYBRID INFORMATION TECHNOLOGY, PROCEEDINGS*, pages 270–273. SERC; Korean Informat Assoc Soc, 2008. International Conference on Convergence and Hybrid Information Technology, Daejeon, SOUTH KOREA, AUG 28-29, 2008.

[3] J. Antonio Alvarez, J. Antonio Ortega, L. Gonzalez, F. Velasco, and F. Javier Cuberos. Ontheway: a prediction system for spatial locations. In *WINSYS 2006: Proceedings of the International Conference on Wireless Information Networks and Systems*, pages 298–303. Inst Syst & Technol Informat Control & Commun; Polytech Inst Setubal; IEEE Syst, Man & Cybernet Soc; Polytech Inst Leiria; Super Sch Technol & Business Leiria; Setubal Coll Technol & Business Leiria, 2006. International Conference on Wireless Information Networks and Systems, Setubal Coll Business Adm, Setubal, PORTUGAL, AUG 07-10, 2006.

[4] D. Barbara. Mobile computing and databases - A survey. *IEEE TRANSACTIONS ON KNOWLEDGE AND DATA ENGINEERING*, 11(1):108–117, JAN-FEB 1999.

[5] A. M. Bernardos, D. Marcos, and J. R. Casar. An analysis of context-awareness in commercial mobile services. In Filipe, J and Marca, DA and Shishkov, B and VanSinderen, M, editor, *ICE-B 2008: PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON E-BUSINESS*, pages 177–184. Inst Syst & Technologies Informat, Control & Commun; Workflow Management Coalit, Proc Thought Leadership; IEEE Syst, Man & Cybernet Soc, 2008. International Conference on e-Business (ICE-B 2008), Oporto, PORTUGAL, JUL 26-29, 2008.

[6] H. Chavan and S. Sane. Mobile Database Cache Replacement Policies: LRU and PPRRP. In Meghanathan, N and Kaushik, BK and Nagamalai, D, editor, *ADVANCES IN COMPUTER SCIENCE AND INFORMATION TECHNOLOGY, PT I*, volume 131 of *Communications in Computer and Information Science*, pages 523–531. Acad & Ind Res Collaborat Ctr, 2011. 1st International Conference on Computer Science and Information Technology, Bangalore, INDIA, JAN 02-04, 2011.

[7] H. Chavan, S. Sane, and H. B. Kekre. A Markov Model Based Cache Replacement Policy for Mobile Environment. In Shah, K and Gorty, VRL and Phirke, A, editor, *TECHNOLOGY SYSTEMS AND MANAGEMENT*, volume 145 of *Communications in Computer and Information Science*, pages 18–26. Central Bank India; IEEE Bombay Sect; EMC2, 2011. 1st International Conference on Technology Systems and Management (ICTSM 2011), Mumbai, INDIA, FEB 25-27, 2011.

[8] G. Chen and S. Lee. Evaluation of distributed and replicated HLR for location management in PCS network. *JOURNAL OF INFORMATION SCIENCE AND ENGINEERING*, 19(1):85–101, JAN 2003.

[9] T.-S. Chen, Y.-S. Chou, and T.-C. Chen. Mining User Movement Behavior Patterns in a Mobile Service Environment. *IEEE TRANSACTIONS ON SYSTEMS MAN AND CYBERNETICS PART A-SYSTEMS AND HUMANS*, 42(1):87–101, JAN 2012.

[10] Y. Chen, F. Rao, X. Yu, and D. Liu. CAMEL: A moving object database approach for intelligent location aware services. In Chen, MS and Chrysanthis, PK and Sloman, M and Zaslavsky, A, editor, *MOBILE DATA MANAGEMENT, PROCEEDINGS*, volume 2574 of *LECTURE NOTES IN COMPUTER SCIENCE*, pages 331–334. Monash Univ; Distributed Syst Technol Ctr, 2003. 4th International Conference on Mobile Data Management, MELBOURNE, AUSTRALIA, JAN 21-24, 2003.

[11] P. Chrysanthis and V. Zadorozhny. From location databases to pervasive catalog. In Tjoa, AM and Wagner, RR, editor, *13TH INTERNATIONAL WORKSHOP ON DATABASE AND EXPERT SYSTEMS APPLICATIONS, PROCEEDINGS*, pages 739–744, 2002. 13th International Workshop on Database and Expert Systems Applications (DEXA 2002), AIX PROVENCE, FRANCE, SEP 02-06, 2002.

[12] A. J. Clark, P. Holliday, R. Chau, H. Eisenberg, and M. Chau. Collaborative Geospatial Data as Applied to Disaster Relief: Haiti 2010. In Kim, TH and Fang, WC and Khan, MK and Arnett, KP and Kang, HJ and Slezak, D, editor, *SECURITY TECHNOLOGY, DISASTER RECOVERY AND BUSINESS CONTINUITY*, volume 122 of *Communications in Computer and Information Science*, pages 250–258, 2010. International Conference on Security Technology/International Conference on Disaster Recovery and Business Continuity, Jeju Island, SOUTH KOREA, DEC 13-15, 2010.

[13] J. Cleveland. Performance and design considerations for mobile mesh networks. In *MILCOM 96,*

CONFERENCE PROCEEDINGS, VOLS 1-3, pages 245–249. IEEE Commun Soc; Armed Forces Commun & Electr Assoc; US Dept Def, 1996. 1996 IEEE Military Communications Conference (MILCOM 96), MCLEAN, VA, OCT 21-24, 1996.

[14] M. Dunham and V. Kumar. Location dependent data and its management in mobile databases. In Tjoa, AM and Wagner, RR, editor, *NINTH INTERNATIONAL WORKSHOP ON DATABASE AND EXPERT SYSTEMS APPLICATIONS, PROCEEDINGS*, pages 414–419. IEEE Comp Soc; DEXA Assoc; Austrian Comp Soc; Res Inst Appl Knowledge Proc (FAW); Univ Vienna, 1998. 9th International Workshop on Database and Expert Systems Applications, VIENNA, AUSTRIA, AUG 26-28, 1998.

[15] M. H. Dunham and A. Helal. Mobile computing and databases: anything new? *SIGMOD Rec.*, 24:5–9, December 1995.

[16] K. Elbassioni, A. Elmasry, and I. Kamel. An indexing method for answering queries on moving objects. *DISTRIBUTED AND PARALLEL DATABASES*, 17(3):215–249, MAR 2005.

[17] R. Friedman and G. Kliot. Location services in wireless ad hoc and hybrid networks: A survey. *Techanical Report, Technion Computer Science*, 2006.

[18] B. Gedik and L. Liu. Protecting location privacy with personalized k-anonymity: Architecture and algorithms. *IEEE TRANSACTIONS ON MOBILE COMPUTING*, 7(1):1–18, JAN 2008.

[19] Z. Haas and B. Liang. Ad hoc mobility management with uniform quorum systems. *IEEE-ACM TRANSACTIONS ON NETWORKING*, 7(2):228–240, APR 1999.

[20] M. S. Hossain, M. Atiquzzaman, and W. Ivancic. Cost Analysis of Mobility Entities of Hierarchical Mobile IPv6. In *MILITARY COMMUNICATIONS CONFERENCE, 2010 (MILCOM 2010)*, IEEE Military Communications Conference, pages 2280–2285, 2010. MILCOM Military Communications Conference, San Jose, CA, OCT 31-NOV 03, 2010.

[21] S. Huang, I. Kwan, and C. Li. A study on the management of semantic transaction for efficient data retrieval. *SIGMOD RECORD*, 31(3):28–33, SEP 2002.

[22] X. Huang, C. Jensen, and S. Saltenis. The Islands approach to nearest neighbor querying in spatial networks. In Medeiros, CB and Egenhofer, M and Bertino, E, editor, *ADVANCES IN SPATIAL AND TEMPORAL DATABASES, PROCEEDINGS*, volume 3633 of *LECTURE NOTES IN COMPUTER SCIENCE*, pages 73–90. Natl Inst Space Res, Dept Image Proc, 2005. 9th International Symposium on Advances in Spatial and Temporal Databases, Angra dos Reis, BRAZIL, AUG 22-24, 2005.

[23] H. Hung, Y. Lin, N. Peng, and S. Yang. Resolving mobile database overflow with most idle replacement. *IEEE JOURNAL ON SELECTED AREAS IN COMMUNICATIONS*, 19(10):1953–1961, OCT 2001.

[24] S. Ilarri, A. Corral, C. Bobed, and E. Mena. Probabilistic Granule-Based Inside and Nearest Neighbor Queries. In Grundspenkis, J and Morzy, T and Vossen, G, editor, *ADVANCES IN DATABASES AND INFORMATION SYSTEMS, PROCEEDINGS*, volume 5739 of *Lecture Notes in Computer Science*, pages 103–117, 2009. 13th East European Conference on Advances in Databases and Information Systems, Riga, LATVIA, SEP 07-10, 2009.

[25] S. Ilarri, E. Mena, and A. Illarramendi. Location-Dependent Query Processing: Where We Are and Where We Are Heading. *ACM COMPUTING SURVEYS*, 42(3), MAR 2010.

[26] M. Ilyas and Vijayakumar. Efficient Range Query Processing with a Proxy Based Hierarchical Database in a Cellular Network. In Ma, P and Qaiser, M, editor, *2ND INTERNATIONAL SYMPOSIUM ON COMPUTER NETWORK AND MULTIMEDIA TECHNOLOGY (CNMT 2010), VOLS 1 AND 2*, pages 165–168. Huazhong Normal Univ; Huazhong Univ Sci & Technol; Wuhan Univ; Natl Technol Univ Ukraine; Royal Inst Technol; Columbia Univ; Harbin Univ Technol; Res Assoc Modern Educ & Comp Sci; IEEE Educ Soc; IEEE Wuhan Sect E Chapter; IEEE, 2010. 2nd International Symposium on Computer Network and Multimedia Technology (CNMT), Wuhan, PEOPLES R CHINA, DEC 24-26, 2010.

[27] V. Joy, S. Sridevi, and L. P. Vimal. Location based services - Enterprise mobility. In *WCNC 2008: IEEE WIRELESS COMMUNICATIONS & NETWORKING CONFERENCE, VOLS 1-7*, IEEE Wireless Communications and Networking Conference, pages 3087–3092. IEEE, 2008. IEEE Wireless Communications and Networking Conference, Las Vegas, NE, MAR 31-APR 03, 2008.

[28] H.-E. Kottkamp and O. Zukunft. Location-aware query processing in mobile database systems. In *Proceedings of the 1998 ACM symposium on Applied Computing*, SAC '98, pages 416–423, New York, NY, USA, 1998. ACM.

[29] V. Kumar, M. Dunham, and N. Prabhu. Mobilaction: a mobile transaction framework supporting replication and spatial spatial consistency. *COMPUTER SYSTEMS SCIENCE AND ENGINEERING*, 20(2):117–131, MAR 2005.

[30] S. Kwon, M. Chung, and D. Sung. Mobility management schemes for support of UPT in mobile networks. In *ICC 2000: IEEE INTERNATIONAL CONFERENCE ON COMMUNICATIONS, CONFERENCE RECORD, VOLS 1-3: GLOBAL CONVERGENCE THROUGH COMMUNICATIONS*, IEEE International Conference on Communications, pages 675–679. IEEE Commun Soc; ICC Globecom; IEEE Networking World, 2000. IEEE International Conference on Communications (ICC 2000), NEW ORLEANS, LA, JUN 18-22, 2000.

[31] C. Lee and C. Chen. "Cache and carry" for location management in mobile information systems. *DISTRIBUTED AND PARALLEL DATABASES*, 16(2):165–192, SEP 2004.

[32] D. L. Lee, J. Xu, B. Zheng, and W.-C. Lee. Data management in location-dependent information services. *Pervasive Computing, IEEE*, 1(3):65 – 72, 2002.

[33] E. Lee and K. Ryu. Design of vehicle information management system for effective retrieving of vehicle location. In Gervasi, O and Gavrilova, ML and

Kumar, V and Lagana, A and Lee, HP and Mun, Y and Taniar, D and Tan, CJK, editor, *COMPUTATIONAL SCIENCE AND ITS APPLICATIONS - ICCSA 2005, PT 2*, volume 3481 of *LECTURE NOTES IN COMPUTER SCIENCE*, pages 998–1007. Inst High Performance Comp; Univ Perugia; Univ Calgary; Univ Minnesota; Queens Univ Belfast; Soc Ind & Appl Math; IEE; OptimaNumerics Ltd; MASTER UP, 2005. International Conference on Computational Science and Its Applications (ICCSA 2005), Singapore, SINGAPORE, MAY 09-12, 2005.

[34] S. Madria, M. Mohania, S. Bhowmick, and B. Bhargava. Mobile data and transaction management. *INFORMATION SCIENCES*, 141(3-4):279–309, APR 2002.

[35] R. Mateo, B. Gerardo, and J. Lee. Location management using hierarchical structured agents for distributed databases. In *COMPUTATIONAL INTELLIGENCE AND SECURITY, PT 1, PROCEEDINGS*, volume 3801 of *LECTURE NOTES IN ARTIFICIAL INTELLIGENCE*, pages 337–342. IEEE Computat Intelligence, Hong Kong Chapter; Xidian Univ; Hong Kong Baptist Univ; Natl Nat Sci Fdn China; Guangdong Univ Technol, 2005. International Conference on Computational Intelligence and Security, Xi'an, PEOPLES R CHINA, DEC 15-19, 2005.

[36] T. Menke and N. Wray. Use of a cost accounting system to evaluate costs of a VA special program. *MEDICAL CARE*, 37(4, VA):AS45–AS53, APR 1999.

[37] S. Mitra and S. DasBit. Query processing in a cellular network - A database approach. In *IEEE VTC 53RD VEHICULAR TECHNOLOGY CONFERENCE, SPRING 2001, VOLS 1-4, PROCEEDINGS*, IEEE VTS Vehicular Technology Conference Proceedings, pages 2560–2564. IEEE, 2001. 53rd IEEE Vehicular Technology Conference (VTC), RHODES, GREECE, MAY 06-09, 2001.

[38] D. Mohapatra and S. Suma. Survey of location based wireless services. In *Personal Wireless Communications, 2005. ICPWC 2005. 2005 IEEE International Conference on*, pages 358 – 362, jan. 2005.

[39] T. Murase, M. Tsukamoto, H. Shibata, B. Liu, and S. Nishio. MobiView: A database integration mechanism based on database view for mobile computing. *IEICE TRANSACTIONS ON INFORMATION AND SYSTEMS*, E84D(3):340–347, MAR 2001.

[40] P. Partsinevelos and N. Tryfona. Handling high-level queries in location-based services for user groups. *GEOINFORMATICA*, 10(2):213–234, JUN 2006.

[41] S. Rupp, R. Aladros, F. Banet, and G. Siegmund. Flexible universal networks - a new approach to telecommunication services. In Callaos, N and Lesso, W and Sanchez, B, editor, *8TH WORLD MULTI-CONFERENCE ON SYSTEMICS, CYBERNETICS AND INFORMATICS, VOL III, PROCEEDINGS: COMMUNICATION AND NETWORK SYSTEMS, TECHNOLOGIES AND APPLICATIONS*, pages 448–453. Int Inst Informat & System; Amer Soc Cybernet; Acad Non Linear Sci; Univ Las Palmas Gran Canaria, Telemat Engn Dept, Concurrency & Architecture Grp; CUST, Blaise Pascal Univ, Engn Sci Inst; Cybernet & Human Knowing; Int Federat Syst Res; Int Syst Inst; Int Soc Syst Sci; Italian Soc System; Univ Nacl San Luis, Lab Res Computac Intelligence, Dept Informat; Polish Syst Soc; Slovenian Artificial Intelligence Soc; Soc Appl Syst Res; Syst Soc Poland; Ctr Syst Studies; Tunisian Sci Soc; World Org System & Cybernet; IEEE Comp Soc, Venezuela Chapter; IEEE, Venezuela Chapter; Natl Res Council Canada; Steacie Inst Mol Sci, 2004. 8th World Multi-Conference on Systemics, Cybernetics and Informatics, Orlando, FL, JUL 18-21, 2004.

[42] M. Satyanarayanan. Accessing information on demand at any location. mobile information access. *Personal Communications, IEEE*, 3(1):26 –33, feb 1996.

[43] P. Serrano-Alvarado, C. Roncancio, and M. Adiba. A survey of mobile transactions. *Distributed and Parallel Databases*, 16:193–230, 2004. 10.1023/B:DAPD.0000028552.69032.f9.

[44] A. Y. Seydim, M. H. Dunham, and V. Kumar. Location dependent query processing. In *Proceedings of the 2nd ACM international workshop on Data engineering for wireless and mobile access*, MobiDe '01, pages 47–53, New York, NY, USA, 2001. ACM.

[45] D. Taniar and J. Goh. On mining movement pattern from mobile users. *INTERNATIONAL JOURNAL OF DISTRIBUTED SENSOR NETWORKS*, 3(1):69–86, 2007. 11th International Conference on Parallel and Distributed Systems, Fukuoka, JAPAN, JUL 20-22, 2005.

[46] A. Waluyo, B. Srinivasan, and D. Taniar. Research on location-dependent queries in mobile databases. *COMPUTER SYSTEMS SCIENCE AND ENGINEERING*, 20(2):79–95, MAR 2005.

[47] P. Wirth. Teletraffic implications of database architectures in mobile and personal communications. *COMPUTER NETWORKS AND ISDN SYSTEMS*, 28(5):613–618, MAR 1996. 14th International Teletraffic Congress (ITC 14), ANTIBES, FRANCE, JUN, 1994.

[48] O. Wolfson. Moving objects information management: The database challenge (Vision paper). In Halevy, A and Gal, A, editor, *NEXT GENERATION INFORMATION TECHNOLOGIES AND SYSTEMS*, volume 2382 of *Lecture Notes in Computer Science*, pages 75–89, 2002. 5th International Workshop on Next Generation Information Technologies and Systems, CAESAREA, ISRAEL, JUN 24-25, 2002.

[49] O. Wolfson, S. Chamberlain, K. Kalpakis, and Y. Yesha. Modeling moving objects for location based services. In KonigRies, B and Makki, K and Makki, SAM and Pissinou, N and Scheuermann, P, editor, *DEVELOPING AND INFRASTRUCTURE FOR MOBILE AND WIRELESS SYSTEMS*, volume 2538 of *LECTURE NOTES IN COMPUTER SCIENCE*, pages 46–58. Natl Sci Fdn; Florida Int Univ, Telecommun & Informat Technol Inst, Coll Engn, 2002. Workshop on Infrastructure for Mobile and Wireless Systems, SCOTTSDALE, ARIZONA, OCT 15, 2001.

[50] S. Wu and W. Ko. Location based access to moving data sources. In Bader, DA and Khokhar, AA, editor, *PARALLEL AND DISTRIBUTED COMPUTING SYSTEMS*, pages 345–352. Int Soc Comp & Their Applicat, 2004. 17th International Conference on Parallel and Distributed Computing Systems, San Francisco, CA, SEP 15-17, 2004.

[51] S. Wu and K. Wu. Dynamic data management for location based services in mobile environments. In Desai, BC and Ng, W, editor, *SEVENTH INTERNATIONAL DATABASE ENGINEERING AND APPLICATIONS SYMPOSIUM, PROCEEDINGS*, pages 180–189. IEEE Comp Soc; KC Wong Educ Fdn, 2003. 7th International Database Engineering and Applications Symposium, HONG KONG, PEOPLES R CHINA, JUL 16-18, 2003.

[52] S. Wu and K. Wu. Effective location based services with dynamic data management in mobile environments. *WIRELESS NETWORKS*, 12(3):369–381, JUN 2006.

[53] A. Zaslavsky and Z. Tari. Mobile computing: Overview and current status. *Australian Computer Journal*, 30(2):42–52, 1998.