香港浸會大學理學院
HKBU Faculty of Science

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**DEPARTMENT OF COMPUTER SCIENCE**

**MPhil Degree Oral Presentation**

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| MPhil Candidate: | Mr Jing DU |
| Supervisor: | Dr Jianliang XU |
| External Examiner: | Dr Hong-Va LEONG |
| Time: | 28 August 2007 (Tuesday)<br>10:00 am – 12:00 nn (35 mins presentation and 15 mins Q & A) |
| Venue: | T909, Cha Chi-Ming Science Tower, Ho Sin Hang Campus, HKBU |

# "Privacy Protection in Location-based Applications"


## Abstract

In location-based mobile applications, privacy protection is one of most important issues. In this thesis, two related problems are studied. One is how to realize privacy-preserving location-based data access in mobile environments; the other is how to protect privacy in publishing locations of moving objects.

In location-based services, users with location-aware mobile devices are able to query about their surroundings anywhere and at any time. To preserve location privacy, a typical approach is to cloak user locations with spatial regions based on user-specified privacy requirements and transform location-based queries to region-based queries. In this thesis, we identify and address three challenging issues for this location cloaking approach. Firstly, we study the optimal representation of cloak regions by proving that a circular region minimizes the expected result set size. Secondly, we develop an optimal mobility-aware location cloaking technique to resist trace analysis attacks. Two cloaking algorithms, namely MaxAccu_Cloak and MinComm_Cloak, are designed for different performance objectives. Thirdly, we develop an efficient polynomial algorithm for processing region-based queries. Two query processing modes, namely bulk and progressive, are proposed to return the query results all at once and incrementally, respectively. Experimental results show that the proposed mobility-aware cloaking algorithms significantly improve the cloaking quality without compromising query latency and communication cost.

Similarly, privacy protection is also a concern in applications of publishing locations of moving objects. k-anonymity has been studied to protect privacy by generalizing user locations. However, in practice, neither the location nor the user identity is sensitive enough to be anonymous. Rather, it is the association of the location with a sensitive event at this location that needs to be anonymous. Traditional k-anonymity algorithms are inefficient to solve this problem in terms of generalization cost. In this thesis, we propose a local recoding algorithm which is based on local enlargement, an innovative paradigm as opposed to conventional hierarchy- or partition-based generalization. Since locations are enlarged just enough to cover all events by k times, it allows the minimum cost of generalization. Through strong pruning techniques, our algorithm is shown to outperform partition-based algorithms by several orders of magnitude and run within a reasonable time.


***** ALL INTERESTED ARE WELCOME*****