MOBILE COMPUTING

DATA ON THE ROAD IN INTELLIGENT TRANSPORTATION SYSTEMS

TABLE OF CONTENTS

ABSTRACT:

Advances in wireless technology and mobile computing have provided a major impetus towards development of mobile Ad-hoc Network. This networks are selforganizing networks comprised of wireless nodes that co – operate in order to dynamically establish communication. In this paper we propose an opportunisticapproach to resource (parking slot, taxi-cab customer, etc.) dissemination, in which anobject propagates the resources it carries to encountered objects, and obtains newresources in exchange. For example , an object finds out about available parking spacesfrom other objects. These spaces may either have been vacated by these encountered objects or these objects have obtained this information from other previously encountered ones. Thus the parking space information transitively spreads out across objects .Similarly, information about an accident or a taxi cab customer is propagated transitively.The approach can also be used in dissemination of resources among pedestrians. The target of the design is to connect different moving devices together, wirelessly in an small geographical area.

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INTRODUCTION

Consider an urban area with hundreds of thousands of vehicles.Drivers and passengers in these vehicles are interested in information relevant to their trip.For eg, a driver would like his/her vehicle to continuously display on a map at any time, the available parking spaces around the current location of the vehicle.Or, the driver may be interested in the traffic conditions one mile ahead.such information is important for drivers to optimize their travel, to alieviate traffic congestions,or to avoid wasteful driving.the challenge in processing queries in this highly mobile environment with an acceptable delay,overhead and accuracy.In this paper we explore a new paradigm that is based on peer to peer communication in mobile computing.

Mobile Computing is a technology that allows transmission of data, via a computer, without having to be connected to a fixed physical link.**P2P computing can be simply defined as the sharing of computer resources and services by direct exchange. The peer computer can respond to request from other peers. The p2p computing model offers a number of compelling advantages to individual users and large organizations. P2p can be use3d to distribute data and in addition the p2p infrastructure allows direct access and shared spaces and this can enable remote maintanance capability.**

1. THE SYSTEM MODEL:

The system consists of fixed stations and moving objects. Each station senses resources and continuously announces them by wireless broadcast. Each announcement message, contains the home and the create-time of the resource. An object is capable of detecting the objects that are within its transmission range. We say that two objects encounter each other when their distance is smaller than the transmission rang. If two moving objects travel within the transmission range for a period of time, after the initial exchange only newly arrived resources are exchanged.

1.1EXAMPLES:

In the parking slots example, a sensor in a parking slot monitors the slot, and, while unoccupied, announces its availability to the neighboring vehicles.

In the car accident example, the event may be announced by the sensor that deploys the air-bag.

2. RESOURCES AND THEIR RELEVANCE:

Resources may be spatial, temporal, or spatio-temporal . Spatio – temporal resources generalize the spatial and the temporal resources. A spatio – temporal resource, or a resource for short, is a piece of information about an event(e.g. the availability of a parking space, or a car accident, the speed of a vehicle at a particular time – point, the availability of a taxi-cab customer at a particular location). The event is specific to a certain location that is referred to as the home of the resource.Each resource has a time duration for which it is valid. This duration is referred to as the valid duration. For example, the valid duration of the resource regarding the availability of a parking space is the time period since the space becomes available until it is occupied.We use the following function to compute the relevance of compute the relevance of resource R:

$$F(R) = \alpha.t - \beta.d \quad (\alpha, \beta > 0)$$

Where d is the distance form the home location of R. α and β are constants that represent the decay factors of time and distance respectively. The bigger the ratio $\alpha\beta$, the more the relevance is sensitive to time than to distance; conversely, the relevance is more sensitive to distance than to time.

3. DISSEMINATION ALGORITHMS:

In this section we describe two possible opportunistic resource dissemination algorithms.

3.1.OPPORTUNISTIC RESOURCE DISSEMINATION:

The resources in memory are ranked according to their relevance. If the number of received resources exceeds the allocated memory,less relevant resources must be shed from memory to accommodate more relevant ones. We assume that a moving object has a fixed amount of memory allocated to each application (e.g the user allocates 10 entries for relevant parking slots. In other words, the user wants only 10 parking slots to be saved and displayed)

Two types of operations may be performed at a moving object O. The first type is resource acquisition, which is performed when O is within the coverage area of a station while the station is announcing a resource R. Upon reception of R, if O's memory space is not full, R is saved in memory. If the memory is full, O computes the relevance of R based on the age of R and on the distance between the current location of O and the home of R.O also recomputes the relevance for each stored resource. If the relevance of R is higher than that of any stored resource, the least relevant one is purged, and then R is saved otherwise R is discarded.

The second type of operations is resource exchange, which is performed when O encounters a new object O',it neither O nor O' is in the middle of data exchange with a third vehicle, the resource exchange is performed between A and B as follws.O and O' first exchange their resources. Upon receiving new resources, moving object O computes the relevance for each received resource and re-evaluates the relevance of its own resources. If all the resources do not fit in the memory space of O, the least relevant ones are purged. In either resource acquisition or resource exchange, when O receives a resource R, if O has a resource R in its memory such that R and R have the same home and the create-time of R is greater than that of R' then R' is replaced by R.

3.2. OPPORTUNISTIC RESOURCE DISSEMINATION WITH INVALIDATION (ORDI)

With ORD, a resource in an object's memory may become invalid before it is purged out. This invalid resource introduces wrong information for decision making. For example, the resource may indicate an available parking space that is actually already occupied, or it may indicate a cab request that is already satisfied. Time may be wasted if the driver uses this resource to make decisions. In order to reduce the invalid resources, we developed Opportunistic Resource Dissemination with Invalidation (ORDI).

ORDI works as follows. At each station, whenever the valid duration of a resource R ends, the station starts to announce an invalidation message for R until the beginning of the announcement of the next resoure. The invalidation message contains the following three data items:

i) **$T_{invalid}$ (R) the time when R becomes invalid (which is also the time when the invalidation message is created)**

ii) **T_{create} (R) the create-time of R**

iii) **H(R) the home of R. the invalidation message is a special resource. Its home is H(R) and its create-time is T invalid (R), and it uses the same relevance function as a regular resource. We will refer to the invalidation message as the invalidating resource of R, and refer to R as a regular resource. The invaliding resource is acquired and exchanged similarly to a regular resource. The only difference is a follows. When an invalidating resource (T invalid(R), T create(R), H(R) is received by an object, the object uses T create (R) and H(R) to search R in its memory. If R is found, then it is replaced by the invalidating resource.**

4. QUERYING:

Consider queries that find all the resources within a particular geographic region R. for example, find all the available parking spaces within certain campus, or find all the cab requests within five blocks of an area. When a moving object receives such a query from the user, it sends the query to all the objects that may have information about resources located inside the queried area. It then computes the answer to the query from the answers that it receives.

Consider problem (i). Observe that information about the resources in the region R may travel beyond the region. Thus, the query destination area P, i.e. the region to which the query is propagated, may be larger than the queried region R. Consider the following approach to determine the query destination area. Suppose that from the analysis of data dissemination, we know that the maximum distance to which a resource is propagated is bounded by some constant B. Assume that R is a polygonal area, and D denotes a disk with radius b. Then P is {R interior of R the Points which are in the "Sweep" of D when its center moves along the edges of P} .

Now consider problem (ii), i.e. how the query is disseminated to all the objects in the destination area. One distinguishes among several situations, depending on what each moving object knows about the future motion plans of other objects in the system. One situation is that each object knows the trajectories of each other object. The trajectories can be known by the objects exchanging their trajectories, and trajectories of neighboring vehicles they are aware of, as resources. Another situation is that objects do not know the future expected trajectories of other objects; and there can be intermediate situations where some trajectories are known but some are not. In each one of these situations the propagation mechanism is different.

Finally, to propagate the answer back to the query originator there can be several strategies. First, each moving object can send to the query originator, O, the resources of R it is aware of in turn, O consolidates the results (e.g. eliminates duplicates). Second possibility is that a leader is elected in the region p; the leader collects and consolidates the answers of the responding vehicles, before delivering them to O.

5. NETWORKING:

Traditional MANET routing protocols are not suited to the high mobility environment of vehicular networks. For deployment in vehicular networks, topology- based routing protocols would require a large number of routing states and incur large routing overheads for updating topology changes. For example, a vehicle would query which locations ahead have average speed below a specific threshold, rather than the average speed of a particular vehicle.

6. PRIVACY AND SECURITY

Important privacy concerns arise when a vehicle has to provide itslocation or future trajectory. In our case, this situation occurs when a vehicle generates a query and needs to specify where the answer needs to be returned. Anonymization techniques can be used to address this problem.

Security issues arise in the economic model to prevent cheating,to prevent vehicle from generating fictitious resources.

7.THE FUTURE:

With the rapid technological advancements in mobile computing the future of data on the road in intelligent transportation systems looks increasingly exciting. This scary concept of a world full of inanimate zombies sitting, locked to their mobile stations, accessing every sphere of their lives via the computer screen becomes ever more real as technology, especially in the field of mobile data communications, rapidly improves as shown below Using the mobile data communication technologies discussed, this

mobility may be pushed to extreme.

8. BENEFITS:

- **improving the data collection process**
- **improving data accuracy**
- **reducing paperwork**
- **enforcing collection of more completed information**
- **facilitating collection of more useful information**
- **elimination redundant data entry**
- **reducing administrative costs**
- **reducing billing errors**
- **reducing data backlog**
- **improving information flow**
- **allowing faster adaptation to changing business conditions**
- **increasing responsiveness and customer satisfaction**

9.CONCLUSION:

In this paper we devised a model for dissemination of spatio-temporal resources in an infrastructure-less environment, in which the database is distributed among the moving objects. The moving objects also serve as routers of queries and answers. We discussed two possible resource dissemination algorithms which differ in their treatment of invalidation messages.The future of Mobile Computing is very promising indeed, although technology may go too far, causing detriment to society.

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