Management of Moving Objects in a Cluster of Workstations

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Abstract : With the proliferation and widespread use of mobile devices and satellite based sensors, there has been increased interest in storing and managing large amount of spatio-temporal information in the form of data streams generated by moving objects such as vehicles in road networks. Efficient management of such streams is a challenging goal due to high update rate and the need for fast computations and large storage space. Moreover, it has been recognized that centralized and monolithic index structures are not enough to process queries related with the present, past and the future position of the moving objects. In this paper, we propose new approach designed to address the above challenges. Our method not only facilitates fast query and update response times but also accommodates large trajectory data sets via networked storage manager based on a Cluster of Workstations. It is the combination of SETI-tree and TPR-tree, the SETI like index is used for indexing the past trajectories except the front line structure, and the moving objects' current position, velocity are indexed via the TPR-tree. Considering the large update operations on TPR-tree of large population, a hash index considering cache sensitivity is also introduced. It works with the TPR*-tree party, leading a bottom-up update of the tree. The performance analysis proves that our proposed method can handle most of the query efficiently and provides a uniform solution for the trajectory query, time-slice query, internal query and moving query.