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# A Time-constrained Network Voronoi Construction and Accessibility Analysis in Location-based Service Technology

W. Yu and T. Ai
School of Resource and Environment Sciences, Wuhan University, Wuhan 430072, China

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Abstract. Accessibility analysis usually requires special models of spatial location analysis based on some geometric constructions, such as Voronoi diagram (abbreviated to VD). There are many achievements in classic Voronoi model research, however suffering from the following limitations for location-based services (LBS) applications. (1) It is difficult to objectively reflect the actual service areas of facilities by using traditional planar VDs, because human activities in LBS are usually constrained only to the network portion of the planar space. (2) Although some researchers have adopted network distance to construct VDs, their approaches are used in a static environment, where unrealistic measures of shortest path distance based on assumptions about constant travel speeds through the network were often used. (3) Due to the computational complexity of the shortest-path distance calculating, previous researches tend to be very time consuming, especially for large datasets and if multiple runs are required. To solve the above problems, a novel algorithm is developed in this paper. We apply network-based quadrat system and 1-D sequential expansion to find the corresponding subnetwork for each focus. The idea is inspired by the natural phenomenon that water flow extends along certain linear channels until meets others or arrives at the end of route. In order to accommodate the changes in traffic conditions, the length of network-quadrat is set upon the traffic condition of the corresponding street. The method has the advantage over Dijkstra ' s algorithm in that the time cost is avoided, and replaced with a linear time operation.