

# Nearest Neighbor for Inter-Building Environment

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## Abstract

Nearest neighbor is one of the most common spatial database queries. The query has been implemented in outdoor space to find the nearest object of interests from query location. While nearest neighbor queries are commonly used in outdoor, it is hard to be implemented in indoor space due to lack of geo-positioning system that can be used in indoor space. Moreover, the network structure and the objects of interest types in indoor environment make nearest neighbor query difficult to implemented straight away in indoor environment. This paper adapts nearest neighbor in indoor space for inter-building environment without geo-positioning and discover the shortest path to nearest object. Our experiment show that nearest neighbor could be adapted in indoor spaces by using road network in indoor and implement routing algorithm for routing to the nearest object.

**Keyword :** Nearest neighbor, indoor space.

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## 1. Introduction

### Overview

Spatial database is designed to store and process data with spatial data types such as points, line or area containing the Geographical Information System (GIS) [16]. Spatial database have data objects and queries are assumed to be static that make nearest neighbor get considerable attention in the spatial database [18]. Nearest neighbor is one of spatial queries widely used in spatial databases [7][19][20] and in spatial databases most of the work has focused on Nearest neighbor (NN) query that retrieves the ( $k \geq 1$ ) data point(s) closest to a query location  $q$  and depend on the location (the coordinates) of the query [17][4]. This query has been implemented in outdoor space to find the nearest object of interests from query location.

Implementation of nearest neighbor query in outdoor routing is to find the closest object from a query location such as navigation systems, surrounding objects[14]. Implementation of nearest neighbor in outdoor space, positioning units enable the users to report their positions that usually used navigation system like Global Position System (GPS) that provide reliable outdoor location information. Unfortunately, the characteristic of line-of-sight transmission causes that the GPS is not workable for in-building location-based services [12][11][13]. It has an inherent problem of accurately determining the location of objects located inside buildings. Different approaches have been proposed and tested for their effectiveness and utilities in order to achieve the ability to locate objects with in buildings. In addition, outdoor space typically used an Euclidean space or a spatial network for the measurement, where as indoor space is related to the notion of cellular space [6].



**Figure 1.** Geo-Positioning system implementation in outdoor