Using GIS for Safe Bicycle Routing in Morris County, New Jersey

Abstract

Through the course of the twentieth century, American has become increasingly dependent on the automobile, so much so that bicycling was referred to by some as the “forgotten mode of transportation.” Subsequently, in the past several years bicycle riding has regained some of its popularity due to new active lifestyle trends, fluctuations in gasoline prices, and environmental awareness. As a result of decades of urban sprawl and car-centric planning, bicycles are often not accommodated on roads shared with motorized vehicles. Standard computer navigation programs that are suitable for vehicles often yield dangerous routes for bicycles. Existing bicycle-specific routing programs are not specific to Morris County. They may carry incomplete datasets or have general algorithms that are not specifically suitable for the study area.

This research sought to create a GIS-based routing application that would route a bicyclist of any riding ability in the safest and most feasible way possible. The study first inventoried all bicycle facilities from a number of resources. Next, the road network was analyzed and classified to determine the degree of safe bicycle suitability of each road segment. Bicycle suitability factors have included road classes, zoning, traffic, and slope. The datasets were then combined and a cost analysis was performed to determine a score for each road segment in the resulting routing network. The cost also took into consideration a distance factor in order to avoid unreasonably long distances. ArcGIS
Network Analyst was configured to run the model so that when a user enters two or more points, the model yields turn-by-turn directions and a map. The results of the research were mixed. Although the model always yielded the safest routing option possible, the route was not necessarily perceived as safe for all bicyclists, especially young and novice riders. This is partly due to the nature of Morris County. In some cases, the only available routing option between two destinations is a busy thoroughfare with no available bicycle facilities. This issue can be used as a case in point when considering the accommodation of bicyclists in future circulation planning in Morris County. This model and the research should not be seen as final. It can be expanded upon with the availability of new and better data, it can be added to a website as an online tool, and it can be merged with other studies from neighboring counties to provide for regional seamless safe bicycle routing.