

INTISARI

Kota Surakarta memiliki tingkat aktivitas pendidikan yang tinggi, ditunjukkan oleh jumlah sekolah dan perguruan tinggi yang terus mengalami peningkatan. Transportasi publik seperti Batik Solo Trans (BST) diharapkan mampu mendukung mobilitas pelajar secara efektif. Dalam konteks tersebut, aksesibilitas menjadi aspek penting untuk meningkatkan efektivitas pelayanan sistem BST. Meskipun demikian, sebaran halte BST belum merata, dan informasi mengenai keterjangkauan halte terhadap prasarana pendidikan bagi pejalan kaki belum tersedia. Kondisi ini berdampak pada rendahnya jumlah pengguna BST di kalangan pelajar dan mahasiswa. Penelitian ini bertujuan untuk mengevaluasi dan memvisualisasikan sebaran halte bus BST terhadap prasarana pendidikan, serta memberikan rekomendasi untuk meningkatkan layanan BST. Analisis dilakukan untuk mengetahui pola distribusi halte, menghitung keterjangkauan sekolah dan perguruan tinggi dari halte BST dengan berjalan kaki, serta merancang alternatif jalur baru untuk meningkatkan layanan sistem BST.

Penelitian menggunakan data sebaran halte bus BST dengan metode *Nearest Neighbour Analysis* (NNA) untuk mengetahui pola sebaran halte bus. Kemudian analisis *service area* berbasis algoritma *A-Star* dilakukan terhadap data halte bus BST untuk mengetahui keterjangkauan halte terhadap prasarana pendidikan. Analisis *service area* mempertimbangkan jaringan jalan dan hambatan di lapangan. Kriteria keterjangkauan ditentukan berdasarkan waktu tempuh lima menit berjalan kaki dari halte, yang dianggap sebagai jarak yang masih wajar ditempuh oleh pejalan kaki. Analisis tersebut dilakukan untuk mengetahui jumlah prasarana pendidikan terjangkau halte bus BST dan area prasarana pendidikan yang belum terlayani BST. Oleh karena itu, dibuat rekomendasi pengembangan layanan BST berdasarkan *service area* prasarana pendidikan yang belum terjangkau. Langkah rekomendasi dapat berupa penambahan halte baru atau jalur baru dengan mempertimbangkan jalur yang sudah ada. Berdasarkan interseksi *service area* pendidikan belum terjangkau dan jalur operasional, rekomendasi dibuat melalui perencanaan alternatif jalur BST baru.

Hasil penelitian menunjukkan bahwa sebaran halte BST bersifat mengelompok, dengan konsentrasi tertinggi di wilayah pusat kota. Sebanyak 397 halte dianalisis sebagai titik asal dalam pemodelan *service area*, yang menghasilkan temuan bahwa 243 prasarana pendidikan dapat dijangkau dalam waktu lima menit berjalan kaki. Sisanya, 184 prasarana pendidikan atau sekitar 43% prasarana belum terlayani secara optimal. Rekomendasi peningkatan pelayanan BST berupa alternatif jalur BST baru. Dirancang sebanyak 2 jalur alternatif dengan jalur rekomendasi 1 sepanjang 13,95 km dan jalur rekomendasi 2 sepanjang 7,17 km. Jalur rekomendasi 1 berpotensi melayani 49 prasarana pendidikan, sementara jalur rekomendasi 2 berpotensi melayani 26 prasarana pendidikan yang sebelumnya tidak terlayani. Seluruh hasil penelitian ini disajikan dalam bentuk peta berbasis web ke dalam *dashboard* sistem informasi bus BST dan prasarana pendidikan. Dengan demikian informasi distribusi halte, keterjangkauan prasarana pendidikan, serta rekomendasi jalur baru dapat diakses dengan mudah oleh masyarakat maupun pemangku kepentingan.

Kata kunci: halte bus, prasarana pendidikan, aksesibilitas, *A-Star*, *service area*.

ABSTRACT

Surakarta City has a high level of educational activity, as indicated by the continuous increase in the number of schools and higher education institutions. Public transportation such as Batik Solo Trans (BST) is expected to effectively support student mobility. In this context, accessibility is a crucial aspect for enhancing the effectiveness of the BST system. However, the distribution of bus stops has not yet covered the entire area of Surakarta City. Furthermore, information regarding the accessibility of bus stops to educational facilities for pedestrians is currently unavailable. This situation has resulted in a low number of Batik Solo Trans (BST) users, particularly among students and university attendees. This study aims to evaluate and visualize the distribution of BST bus stops in relation to educational facilities, as well as to provide recommendations for improving BST services. The analysis was conducted to identify the spatial distribution of bus stops, measure the accessibility of schools and universities from BST bus stops within walking distance, and design alternative routes to improve the BST system.

The study utilized BST bus stop distribution data analyzed using the Nearest Neighbour Analysis (NNA) method to determine spatial distribution patterns. Subsequently, a service area analysis based on the A-Star algorithm was applied to the BST bus stop and educational facility data to assess accessibility. The service area analysis considered the road network and physical barriers. Accessibility was defined by a five-minute walking distance from a bus stop, which is regarded as a reasonable threshold for pedestrians. This analysis was conducted to determine the number of educational facilities reachable from BST bus stops and to identify those that remain underserved. Accordingly, recommendations for the development of BST services were formulated based on the service areas of educational facilities not yet covered. These recommendations include the addition of new bus stops or the introduction of new routes, taking into account the existing operational network. Based on the intersection of underserved educational facilities and current operational routes, alternative BST route plans were proposed.

The results indicate that the distribution of BST bus stops is clustered, with the highest concentration located in the city center. A total of 397 bus stops were analyzed as origin points in the service area modeling, which revealed that 243 educational facilities could be reached within a five-minute walking distance. However, 184 educational facilities, or approximately 43%, remain underserved. To address this issue, two alternative BST routes were designed: the first route extends 13.95 km and has the potential to serve 49 additional educational facilities, while the second route extends 7.17 km and could serve 26 educational facilities previously not covered. The overall results of this study are presented through a web-based map integrated into a dashboard system of BST and educational facilities. Thus, information regarding bus stop distribution, educational facility accessibility, and proposed new routes can be accessed easily by the public and relevant stakeholders.

Keywords: bus stop, educational facilities, accessibility, A-Star, service area.