

ABSTRAK

Pelaksanaan ibadah haji melibatkan banyak jemaah dalam area terbatas, sehingga jemaah dapat mengalami kesulitan menemukan petugas haji terdekat. Penelitian ini bertujuan mengimplementasikan Haversine Formula untuk menghitung dan mengurutkan petugas haji terdekat berdasarkan koordinat jemaah dan petugas serta mengembangkan aplikasi mobile yang menampilkan lokasi petugas dan rute menuju petugas yang dipilih. Aplikasi dikembangkan menggunakan Flutter, *Firebase Realtime Database*, GPS, *Mapbox Maps SDK*, dan *Mapbox Directions API*. Koordinat *latitude* dan *longitude* diperoleh dari perangkat jemaah dan petugas. Haversine Formula digunakan untuk menghitung jarak awal dan mengurutkan petugas, sedangkan *Mapbox Directions API* digunakan untuk menghasilkan rute berjalan kaki setelah petugas dipilih. Pengujian meliputi pengujian *black-box*, perhitungan manual Haversine, perbandingan jarak Haversine dengan jarak rute Mapbox, serta pengujian kompatibilitas pada Android dan iOS. Pada pengujian terhadap sepuluh lokasi petugas, petugas di Souq Al-Khalil menempati urutan pertama dengan jarak Haversine 0,542 km. Jarak rute Mapbox pada seluruh lokasi lebih besar daripada jarak Haversine dengan selisih 0,220–0,800 km karena dihitung berdasarkan jaringan jalur berjalan kaki. Seluruh 21 skenario pengujian *black-box* menghasilkan keluaran yang sesuai dengan hasil yang diharapkan pada lingkungan Android dan iOS yang diuji. Hasil tersebut menunjukkan bahwa aplikasi dapat menghitung dan mengurutkan petugas haji terdekat, menampilkan lokasi pada peta, serta menyediakan rute menuju petugas yang dipilih.

Kata Kunci: aplikasi mobile, Haversine Formula, lokasi terdekat, *Mapbox Directions API*, *Mapbox Maps SDK*

ABSTRACT

The Hajj pilgrimage involves a large number of pilgrims within limited areas, which may make it difficult for them to locate the nearest Hajj officer. This study aimed to implement the Haversine Formula to calculate and rank the nearest Hajj officers based on the coordinates of pilgrims and officers and to develop a mobile application that displays officer locations and routes to selected officers. The application was developed using Flutter, Firebase Realtime Database, GPS, Mapbox Maps SDK, and Mapbox Directions API. Latitude and longitude coordinates were obtained from the devices of pilgrims and officers. The Haversine Formula was used to calculate initial distances and rank the officers, while Mapbox Directions API was used to generate walking routes after an officer was selected. Testing included black-box testing, manual Haversine calculations, a comparison between Haversine distances and Mapbox route distances, and compatibility testing on Android and iOS. In a test involving ten officer locations, the officer at Souq Al-Khalil ranked first with a Haversine distance of 0.542 km. Mapbox route distances were greater than Haversine distances at all locations, with differences ranging from 0.220 to 0.800 km because they were calculated using the walking-route network. All 21 black-box test scenarios produced the expected outputs in the tested Android and iOS environments. These results show that the application can calculate and rank the nearest Hajj officers, display their locations on a map, and provide routes to selected officers.

Keywords: *Haversine Formula, Mapbox Directions API, Mapbox Maps SDK, mobile application, nearest location*