TOBB ETÜ

University of Economics & Technology

Proposal

QUAD-CORE

Ebrar Sude Doğan
Erdem Baran
Kayrahan Toprak Tosun
Tuna Kodal

Topic

1. Project Title

GUIDE (**G**uided **U**ser **I**tinerary & **D**estination **E**xplorer): A Personalized Tour Recommendation and Guidance System

2. Problem Definition & Objectives

- **Problem Definition:** Travelers often struggle to design personalized and efficient travel routes that align with their preferences and time constraints. Existing travel recommendation platforms generally provide static lists of popular destinations or fixed tour packages without dynamically adapting to user context, such as travel mode, available time, or specific themes of interests (e.g., cultural, culinary, or scenic tours). Furthermore, during the trip, most applications fail to provide contextual and informative guidance once a traveler reaches a point of interest. As a result; users, frequently switch between multiple sources of information — navigation apps, travel blogs, and guidebooks — leading to fragmented experiences. These fragmented experiences not only lessen the overall quality of the journey but also reduce the traveler's engagement and fulfillment throughout the trip.

  Therefore, there is a need for an intelligent, "context-aware" system that can generate optimized routes based on user preferences and constraints, and deliver integrated and multilingual guidance about visited locations in real time.

- **Objectives:** The main goal of the GUIDE project is to develop a context-aware, personalized travel guidance system that generates customized routes and delivers real-time audio guidance in multiple languages throughout the trip.

  - To provide enhanced traveler experience and engagement.
  - To develop a personalized route planning system that considers user preferences.
  - To identify and recommend points of interests based on user preferences.
  - To provide contextual and multilingual information (Turkish, English, German) as an audio for each point of interests through images, text and text-to-speech (TTS) features.
  - To design an interactive and user-friendly interface in order to ease user-application interaction.
  - To ensure modularity and scalability for future integration of enhanced features such as interactive guidance, weather-based adjustment, price-optimized planning etc.
  - To include time- and distance-aware trip planning that uses predefined visiting durations for each destination to organize routes under user-specified time constraints.
  - To compute optimized daily travel routes using a pre-defined static road graph of Türkiye and shortest-path algorithms.

Ultimately, the project aims to enhance travelers' experiences by providing a unified platform that replaces multiple fragmented travel tools with one intelligent, adaptive and easy-to-use system.

3. Scope

The GUIDE system has two main components: route planning and guidance services. It is designed to support travelers throughout their journeys by integrating trip organization and on-site assistance within a single platform, combining intelligent route creation with informative guidance during visits.

The functional scope of the GUIDE system includes personalized route planning based on user preferences, point-of-interest recommendations within the selected region, and guidance through textual and multilingual (Turkish, English, German) audio information during visits. The system also enables users to exclude previously visited or unwanted locations and automatically generates optimized routes based on user selections. Additionally, the system will utilize a static graph representation of Türkiye's road network stored in the database to calculate efficient travel routes through shortest-path computation. After the computation, user can see their travel path on map.

Some advanced features are excluded from the current scope of the GUIDE project. These include real-time weather, crowd data integration or social media connectivity. In addition, real-time route adjustments are not included in this phase but may be considered for future works. Additional language support (beyond Turkish, English, and German) are also considered out of scope for the current phase but may be planned for future releases.

The technical scope of the GUIDE project involves integrating location-based data services, such as OpenStreetMap, with AI-driven route generation and text-to-speech (TTS) technologies. The system will be implemented as a web-based platform supported by backend and frontend components. The system is designed to support up to 1000 users and generate personalized routes within an average of five seconds. The platform will integrate text-to-speech (TTS) and Wikipedia data retrieval APIs for multilingual information presentation, while the interface itself will remain English-only. GPS-based location tracking is excluded from the current project scope.

4. User Profile

The target users of the GUIDE system are individuals who enjoy exploring new places, with basic technology (smartphone and web apps) usage habits and seek a more personalized and informative travel experience.

5. Anticipated Challenges & Constraints

- **Technical hurdles**
  - The route generation process may face time complexity issues, especially when multiple user preferences and destinations are involved.
  - The system may not be able to detect temporary road closures, maintenance, or other real-time changes in map and data.

  - Achieving high accuracy in providing personalized recommendations for each user may be challenging due to limited personal data.
  - Minor pronunciation errors may occur in text-to-speech (TTS) outputs, especially for Turkish language content.
  - Ensuring synchronization between the static road graph data and real-world changes (e.g., new or closed roads) may present long-term maintenance challenges.

- **Time/resources limits**
  - The system is not planned to be deployed on advanced hardware, so it may not support a large number of concurrent users or heavy performance loads. Performance optimization will be required to maintain the target average response time of five seconds under typical load conditions.
  - With a four-member team, covering different technical areas may require additional learning effort and some stages take longer than expected.
  - Since the project is open to many possible feature additions, new ideas introduced during development may cause scheduling and scope management challenges.
  - Pre-processing and maintaining a static road network graph may require significant storage and optimization effort, particularly as the dataset grows.

- **Ethical or regulatory considerations**
  - Handling user location and preference data must comply with KVKK/GDPR privacy regulations.
  - Multilingual content should consider cultural differences and avoid inappropriate expressions for the target culture.
  - Data from map and content providers must be used in accordance with their licensing terms.
  - Information about points of interest should remain free from bias or misleading details.

6. Data Sources

- **UNESCO World Heritage Listings, Türkiye Tourism Encyclopedia, and Wikipedia APIs:** These sources are planned to be used to obtain a comprehensive list of historical and cultural sites in Türkiye and to collect short descriptive information about them. Wikipedia APIs will be used to collect text in three languages (Turkish, English, and German) for each point of interest, which will also serve as input for text-to-speech generation. They are expected to provide structured and reliable data for generating informative content and supporting tour recommendations[1, 2, 3, 4].

- **OpenStreetMap (OSM) and Open Source Routing Machine (OSRM):** OSM is planned to be used as the main source of Türkiye's road and transportation network, while OSRM will be used to perform shortest-path calculations on this data. Together, they will enable accurate and flexible routing, distance, and travel time estimations for personalized route planning[5].

- **Flickr and Pixabay:** These image platforms are planned to be used to gather high-quality photographs of historical and cultural sites, aiming to enhance the system's user interface and overall user experience through visually rich content[6, 7].
- **ElevenLabs:** The ElevenLabs API is planned to be integrated to generate multilingual audio explanation from the collected descriptive texts using its text-to-speech (TTS) feature. This will increase accessibility and create a more innovative and interactive experience for users[8][1].

References

[1] UNESCO. UNESCO National Commission of Türkiye. Accessed: 2025-10-03. URL: https://www.unesco.org.tr/Pages/125/122/UNESCO-D%C3%BCnya-Miras%C4%B1-Listesi.

[2] Türkiye Tourism Encyclopedia. Türkiye Tourism Encyclopedia. Accessed: 2025-10-03. URL: https://turkiyeturizmansiklopedisi.com.

[3] MediaWiki. MediaWiki REST API. Accessed: 2025-10-03. URL: https://www.mediawiki.org/wiki/API:REST_API.

[4] MediaWiki. MediaWiki Geosearch API. Accessed: 2025-10-03. URL: https://www.mediawiki.org/wiki/API:Geosearch.

[5] OpenStreetMap contributors. OpenStreetMap. Accessed: 2025-10-03. URL: https://www.openstreetmap.org.

[6] Flickr. Flickr Photo Sharing Platform. Accessed: 2025-10-03. URL: https://www.flickr.com.

[7] Pixabay. Pixabay Free Images. Accessed: 2025-10-03. URL: https://pixabay.com.

[8] ElevenLabs. ElevenLabs AI Voice Platform. Accessed: 2025-10-03. URL: https://elevenlabs.io.

[1] Data will be accessed via APIs. If access or licensing issues arise, alternative data sources will be explored.