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Web-Based Geographic Information System to Find Viral Culinary Tourist Spots

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ABSTRACT

The development and implementation of a Web-Based Geographic Information System (GIS) designed to help users discover viral culinary tourist spots, focusing on promoting local food culture. The system is built using the PHP programming language, leveraging its robust server-side scripting capabilities for dynamic web development. The GIS platform integrates various functionalities, including real-time mapping, geolocation services, and user-generated content, to offer an interactive experience for tourists. The platform allows users to search for culinary hotspots, view their locations on an interactive map, get directions, and read reviews from other users. Business owners can register and update information about their culinary spots, contributing to an up-to-date, community-driven database. The system employs a MySQL database to store location data, user profiles, and reviews, while Google Maps API is used for map visualization and geolocation services. The backend structure is built to handle high-traffic environments, using PHP's object-oriented features for efficient and scalable code management. Administrators can moderate content, ensuring the reliability and quality of the information provided. Implementing this system in PHP highlights the language's flexibility in creating web-based GIS platforms, demonstrating how culinary tourism can be enhanced through modern web technologies. This paper discusses the technical aspects of the system's architecture, database management, and frontend-backend integration, offering insights into the benefits of using PHP for developing similar GIS applications.

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1. INTRODUCTION

Medan City, the capital of North Sumatra province, is renowned for its diverse culinary offerings, attracting local and international visitors [1]. However, lacking a centralized platform to access information about these establishments and a mechanism to identify popular or "viral" culinary spots has hindered the city's potential for culinary tourism development [2]. To address this gap, this study aims to develop a web-based geographic information system to provide tourists with a comprehensive platform to discover, explore, and share their experiences at the city's most famous culinary destinations [3]. The methodology for this study involves a multi-pronged approach, beginning with a thorough review of existing literature on culinary tourism, geographic information

systems, and the use of technology in promoting tourist attractions [4]. The research will then focus on identifying the specific requirements and functionalities of the proposed system, followed by the development and implementation of the web-based platform [5]. The research will focus on identifying the specific requirements and functionalities of the proposed system. This will be followed by developing and implementing the web-based platform [6]. The proposed web-based geographic information system will offer several key features to enhance the culinary tourism experience in Medan City. The findings of this study will contribute to the growing body of knowledge on the intersection of technology, culinary tourism, and geographic information systems [7]. Furthermore, developing this web-based platform will have practical implications for the promotion and development of Medan City's culinary tourism industry, ultimately enhancing the overall travel experience for visitors. These key steps, combined with an analysis of the relevant sources [8][4][9][1], will provide a comprehensive framework for developing and implementing the proposed web-based geographic information system for finding viral culinary tourist spots in Medan City. Culinary Tourism in Indonesia. Indonesia's gastronomic diversity possesses considerable potential for the advancement of culinary tourism [4]. Gastronomic tourism refers to a tourist sector offering diverse gastronomic experiences alongside supplementary activities such as sports, entertainment, shopping, and other pursuits that enrich the vacation experience. The food and beverage service industry is significantly influenced by tourism, as culinary offerings for tourists constitute a fundamental demand and spending. Insufficient knowledge regarding culinary attractions in Indonesia has posed a considerable barrier for tourists, adversely affecting the advancement of culinary tourism, particularly for solitary travellers visiting the nation[4]. To resolve this issue, providing a rapid and efficient source of information regarding culinary attractions in Indonesia is essential, achievable through developing a GIS-based application that facilitates quick access to information and culinary tourist sites [10].

2. RESEARCH METHOD

The proposed study will employ a mixed-methods approach, combining qualitative and quantitative data collection and analysis techniques. The qualitative component will involve in-depth interviews with key stakeholders, including local culinary experts, tourism authorities, and ethnic restaurant owners, to gain a deeper understanding of the current landscape of culinary tourism in Medan City. The quantitative component will focus on developing and implementing the web-based geographic information system. This will involve the following steps:

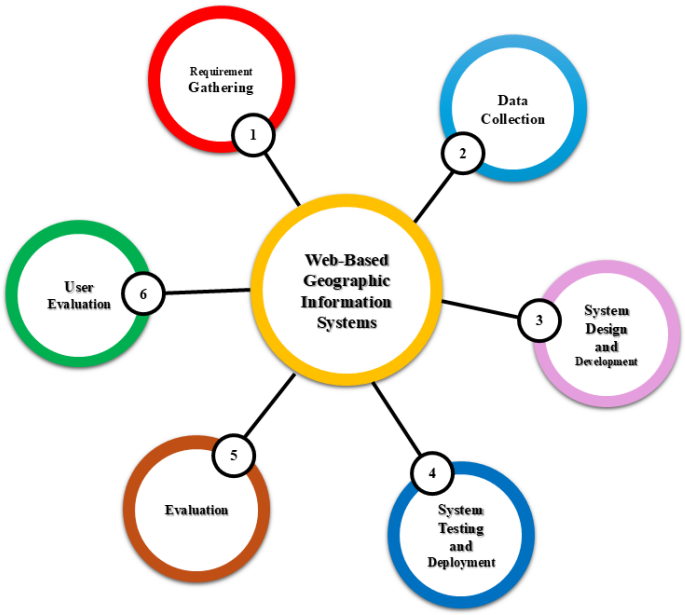

Figure 1. Developing and Implementing The Web-Based Geographic Information System

The description for Figure 1 is as follows:

1. Requirement Gathering: The research team will thoroughly assess user requirements, including the information and functionalities that tourists and residents require to locate and explore culinary attractions in Medan City effectively.
2. Data Collection: The team will collect and integrate various datasets related to Medan City's culinary landscape, including restaurant locations, menus, and reviews, as well as demographic and geospatial information about the city.
3. System Design and Development: Based on the user requirements and data collected, the research team will design and develop the web-based geographic information system, incorporating features such as interactive maps, search functionalities, and user-generated content.
4. System Testing and Deployment: The developed system will be thoroughly tested for usability, functionality, and accuracy and then deployed for public access.
5. Evaluation: The effectiveness of the web-based GIS system will be evaluated through user feedback, usage metrics, and analysis of the impact on visitor traffic and engagement with culinary attractions in Medan City.
6. User Evaluation: The researchers will gather feedback from users, including tourists and residents, to assess the effectiveness and user-friendliness of the web-based GIS platform.

2.1 The Research Employs Framework

Then, the research employs a system development life cycle methodology consisting of five discrete phases. Figure 2 illustrates each of these stages. Five steps are performed, specifically:

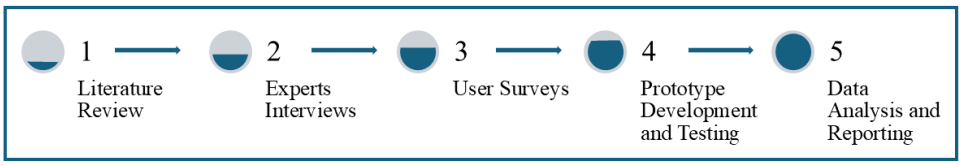

Figure 2. The Research Employs Framework

The description from Figure 2 regarding the research steps is as follows:

1. Literature Review. The research will commence with a comprehensive review of the existing literature on culinary tourism, geographic information systems, and the use of technology in promoting tourist attractions. The literature review will provide a solid theoretical foundation for the study and help identify the key factors and challenges associated with developing a web-based GIS platform for culinary tourism.
2. Expert Interviews. The research team will conduct semi-structured interviews with experts in culinary tourism, geographic information systems, and technology-driven tourism initiatives. These interviews will help gather in-depth insights into the current state of culinary tourism in Medan City, the challenges stakeholders face, and the potential opportunities for leveraging technology to enhance the visitor experience.
3. User Surveys. The research team will also conduct user surveys to gather data on the travel preferences, information-seeking behaviors, and culinary experiences of visitors to Medan City. This data will be crucial in understanding the target audience's needs and preferences, which will inform the design and development of the web-based GIS platform.
4. Prototype Development and Testing. Based on the findings from the literature review, expert interviews, and user surveys, the research team will develop a prototype of the web-based GIS platform for finding viral culinary tourist spots in Medan City. The prototype will be tested with a sample of users to gather feedback on its usability, functionality, and effectiveness in meeting the needs of culinary tourists.

5. Data Analysis and Reporting. The qualitative and quantitative data collected during the study will be analyzed using appropriate statistical and content analysis techniques. The findings will be synthesized and presented in a comprehensive research paper that outlines the design, development, and evaluation of the web-based GIS platform for culinary tourism in Medan City.

The proposed study will provide valuable insights into the potential of web-based geographic information systems in enhancing the culinary tourism experience, particularly in emerging markets like Medan City. By leveraging technology to connect tourists with the most popular and trending culinary destinations, the study aims to contribute to the growing body of research on culinary tourism and the application of GIS in the tourism industry [10][11][12].

2.2 WEB-Based GIS Implementation Framework

The Web-Based GIS Implementation Framework serves as a comprehensive guide for developing and deploying Geographic Information Systems (GIS) in a web environment. This framework begins with the identification of specific user requirements and the analysis of spatial data needs, ensuring that the system is tailored to meet the exact demands of its users. It encompasses the design of a robust database to manage, store, and retrieve geographical data efficiently, followed by the development of a user-friendly interface that allows users to interact seamlessly with the GIS application. Key functionalities, including map visualization, spatial analysis, and data querying, are integrated using modern web technologies, ensuring accessibility across various devices. The framework also emphasizes the importance of data visualization tools and interactive mapping libraries to enhance user engagement and experience[13]. Rigorous testing phases ensure systems are reliable and efficient while ongoing maintenance and updates are crucial for adapting to evolving user needs and technological advancements. Ultimately, this Web-Based GIS Implementation Framework aims to provide scalable, efficient, and user-centric solutions, empowering users to leverage spatial data for informed decision-making and is shown in Figure 3:

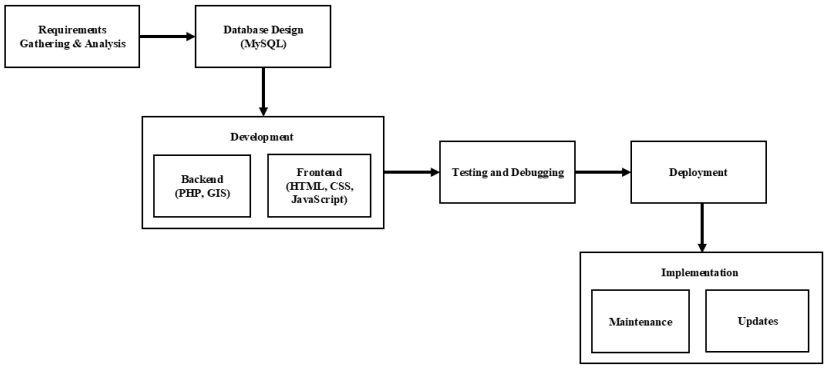

Figure 3. WEB-Based GIS Implementation Framework

This flow diagram provides a structured framework for implementing a research project focused on culinary tourism. Here's a breakdown of the steps involved:

1. Requirements Gathering & Analysis. Define the project's scope and objectives. Identify data sources, such as blogs, reviews, and social media, for information on culinary tourist spots. Determine required functionalities like searching, filtering, mapping, and the ability to handle user reviews.
2. Database Design (MySQL). Design a database schema to store details about culinary tourist spots. Create tables for storing spot details (name, address, cuisine, photos, etc.), user accounts, reviews, and ratings. Establish relationships between these tables, such as a one-to-many relationship between spots and reviews.
3. Development:

a. Backend Development (PHP) Data Acquisition: Implement scripts for collecting data from identified sources using APIs or web scraping. Include data cleaning and validation processes. API Development: Develop RESTful APIs to facilitate data interactions between the frontend and the database. This includes APIs for fetching spot details, searching, filtering, adding reviews, and user authentication. Admin Panel (Optional): Develop an admin panel to manage data and users.
b. Frontend Development (HTML, CSS, JavaScript). Design the user interface to interact with the system. Integrate a mapping library like Leaflet or Google Maps to display the locations of culinary tourist spots. Implement interactive features for searching, filtering, displaying spot details, and handling user reviews and ratings. Use JavaScript, such as AJAX, for asynchronous communication with the backend APIs.

4. Testing and Debugging. Conduct unit testing to evaluate individual components. Perform integration testing to ensure proper interaction between different components. Engage in User Acceptance Testing (UAT) to gather feedback from potential users and make necessary refinements. Fix any identified bugs or issues.
5. Deployment. Choose and configure a web server, such as Apache or Nginx, to deploy the application. Set up the database connection.
6. Implementation is Maintenance and Updates. Regularly monitor the system for performance and security issues. Implement updates and new features based on user feedback and evolving project requirements.

This framework provides a comprehensive plan for developing a system that supports culinary tourism by providing users with detailed information and reviews on various culinary spots.

2.3 The Role of GIS in Culinary Tourism

Geographic Information Systems have become an essential tool in the tourism industry, enabling the efficient management and dissemination of information about tourist attractions, including culinary destinations[12]. In [11] Integrating geographic data with detailed information about restaurants, menus, and user reviews, a web-based GIS platform can help tourists discover and explore the most popular culinary spots in a given area. Furthermore, such a system can also facilitate the sharing of user experiences and ratings, allowing for the identification of "viral" or trending culinary destinations that can attract more visitors[14] explaining research chronologically, including research design, research procedure (in the form of algorithms, Pseudocode, or other), how to test, and data acquisition. References should support the description of the course of research so the explanation can be accepted scientifically. Figure 4 presents a design of viral culinary tourism in Medan City:

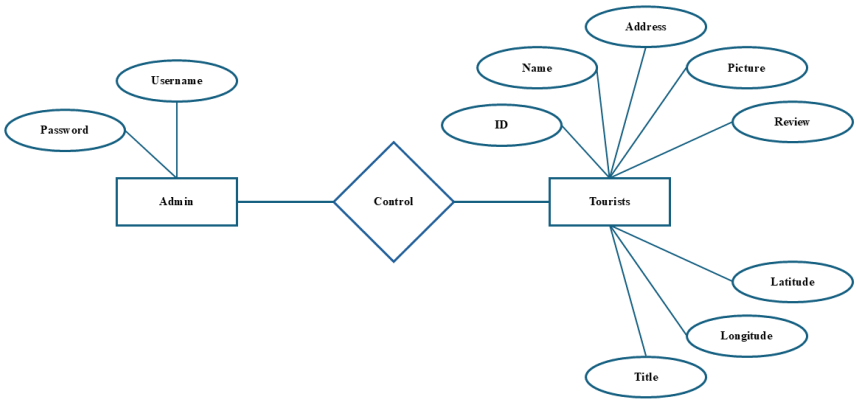

Figure 4. Design of Viral Culinary Tourist Spots Web-Based GIS in Medan City

The design of a viral culinary tourist spot web-based GIS in Medan City focuses on integrating geospatial technology to enhance tourist experiences by mapping popular food destinations. This system will allow users to discover, locate, and navigate through culinary hotspots, helping tourists easily find local delicacies and hidden gems. The platform aims to create an engaging and dynamic culinary tourism experience by leveraging interactive maps, user-generated reviews, and real-time updates. By implementing these key components, the proposed web-based GIS platform will provide a comprehensive and interactive tool for tourists and locals to discover the most popular and "viral" culinary destinations in Medan City, ultimately contributing to the overall growth and promotion of the city's food tourism industry.

2.4 The Use of Technology in Culinary Tourism

Ethnic restaurants play a significant role in meeting the demands of the food tourism industry. However, there has been insufficient relevant research to understand the potential of ethnic restaurants as a marketing tool in the tourism industry[15]. Ethnic restaurants are popular among tourists and can contribute to staging memorable dining experiences, an important aspect of food tourism[16]. Geographic information systems have become increasingly valuable in the tourism industry, as they can provide valuable insights into the spatial distribution of tourist attractions, travel patterns, and infrastructure. The rapid development of technology has made it necessary to have appropriate information systems available to meet the needs of tourists seeking information about culinary attractions[1]. The current era of globalization has led to increased competition in all sectors, and every organization must have competitive strategies to stand out. The development of various types of culinary is due to internal and external factors, including better infrastructure, especially in terms of network speed and capacity, increasingly sophisticated technology, software, and hardware that can disseminate information about various culinary delights[12][17]. To achieve the study's objectives, the researchers will adopt a comprehensive approach that thoroughly reviews the existing literature on culinary tourism, geographic information systems, and the use of technology in promoting tourist attractions.

2.5 Web-Based

Web applications have evolved significantly from their inception, transitioning through various architectural paradigms to meet the growing demands of users and businesses alike. The development of front-end frameworks, such as React.js, has facilitated the creation of single-page applications (SPAs), which enhance user experience by allowing dynamic content updates without full page reloads. This architectural shift has been particularly beneficial in contexts like mechatronic robot laboratories, where the need for responsive and interactive interfaces is paramount [18]. Furthermore, integrating microservices in backend systems has allowed for greater scalability and maintainability, enabling developers to build applications that efficiently handle increasing user loads and complex functionalities [19]; [20]. The design of web applications has also seen advancements in responsive layouts, which adapt to various device screens and resolutions, ensuring a consistent user experience across platforms. Techniques such as integer programming have been proposed to optimize these layouts dynamically, addressing the challenges of maintaining design consistency while accommodating diverse user needs [21]. In the research [22] The System Architecture Diagram of the web-based system is presented in the following Figure 5:

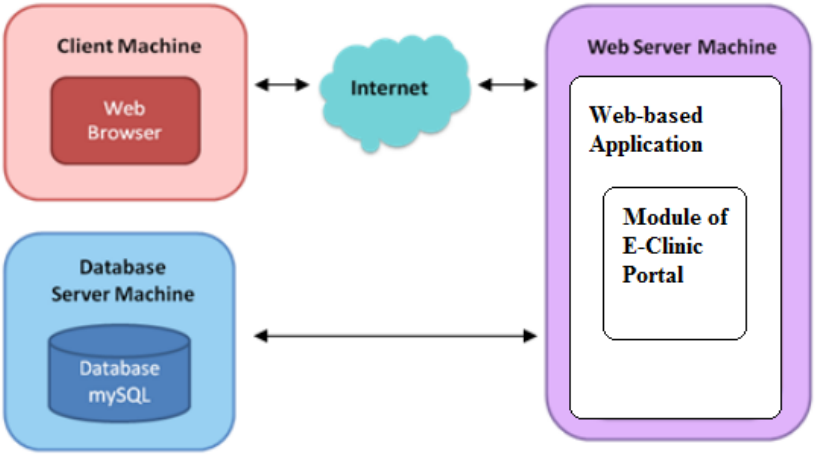

Figure 5. System Architecture Diagram of the Web-based System

Additionally, implementing security measures within web application architectures remains a critical concern. Despite the advancements made since the introduction of architectural security tactics, developers still face challenges in delivering robust security mechanisms that can withstand evolving threats [23]. The emphasis on user-centred design, particularly through methodologies like card sorting, has further underscored the importance of usability in web application development [24]. Looking ahead, the future of web application development is likely to be shaped by the continued evolution of technologies such as HTML5 and CSS3, which provide the foundational tools for creating responsive and interactive web pages [25]. Adopting frameworks like Django for Python web development also highlights the trend toward modular and efficient application design, allowing developers to leverage established best practices for building scalable applications [26]. As the web continues to evolve, integrating privacy-preserving techniques and adaptive architectures will be essential in addressing user concerns and ensuring the sustainability of web applications in a rapidly changing digital landscape [27]; [28].

2.6 Geographic Information System

Geographic Information Systems (GIS) have become indispensable tools in various fields, particularly disaster management. Integrating GIS technology allows for the effective identification, analysis, and visualization of spatial data, which is crucial for disaster preparedness, response, and recovery. Recent studies highlight that GIS enhances decision-making processes by providing comprehensive insights into disaster risks and vulnerabilities, enabling authorities to plan and execute disaster management strategies more efficiently [29] in [30]. The ability of GIS to manage and analyze large datasets facilitates real-time monitoring and assessment of disaster situations, which is vital for timely interventions [31]; [32]. The application of GIS in disaster management has evolved significantly, with innovative methodologies emerging to improve its effectiveness.

For instance, combining GIS with remote sensing technologies has proven to be particularly beneficial in generating information for disaster risk reduction [31]; [33]. This integration allows for the rapid collection of geospatial data over extensive areas, which is essential during the various phases of disaster management, including preparedness, response, and recovery [30]; [34]. Furthermore, participatory GIS mapping frameworks have been developed to engage communities in disaster monitoring, enhancing local resilience and response capabilities [35]. Looking towards the future, the synergy between GIS and emerging technologies such as artificial intelligence (AI) and the Internet of Things (IoT) is expected to revolutionize disaster management practices. These advancements will enable more sophisticated data analysis and predictive modelling, allowing for proactive disaster risk management strategies [36]; [37]. The continuous development of GIS applications, including 3D modelling and simulation capabilities, will further enhance the ability to visualize and analyze disaster scenarios, leading to improved preparedness and response efforts [38]; [39]. As GIS technology advances, its role in disaster management will likely expand, providing critical support in mitigating the impacts of natural disasters. On the website [40] GIS technology

combines common database operations like querying and statistical analysis with the benefits of maps' unique visualization and geographic analysis. A functional GIS consists of five major components, which can be seen in the following Figure 6:

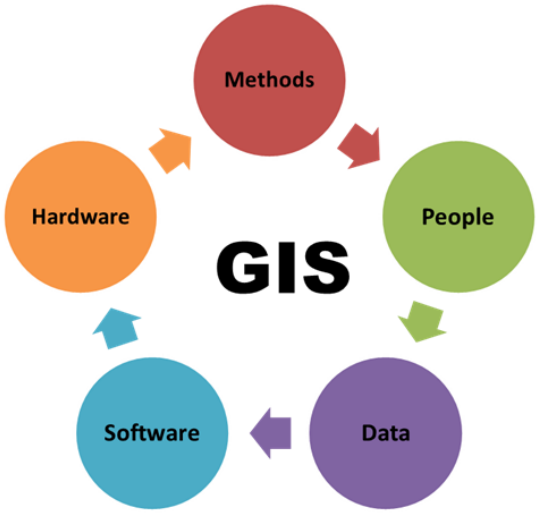

Figure 6. Geographic Information Systems (GIS) Components

1. Hardware: The computer operating a GIS is called its hardware. GIS software operates on diverse hardware platforms, including centralized computer servers and desktop computers in both independent and networked setups.
2. Software: This encompasses the functions and tools for storing, analyzing, and visualizing geographic data. The essential software components are tools for inputting and modifying geographic data, a database management system (DBMS), and tools for geographic querying, analysis, and visualization. A graphical user interface (GUI) facilitates rapid access to tools.
3. Data: The data is arguably the most critical component of a GIS. Geographic and associated tabular data might be collected internally or acquired from a commercial data supplier. A GIS integrates spatial data with additional data resources and may manage spatial data with a DBMS, commonly employed by enterprises to organize and keep their data.
4. People: The value of GIS technology is constrained without individuals who oversee the system and formulate strategies for its application to practical issues. GIS users encompass technical specialists responsible for designing and maintaining the system and individuals who use it regularly.
5. Methods/Procedures: An effective GIS adheres to a meticulously crafted plan and established business standards, which are the models and operational processes unique to each corporation.

3 RESULTS AND DISCUSSION

The study results indicate that developing a web-based geographic information system can significantly enhance the culinary tourism experience in Medan City, Indonesia. The system's interactive maps, search functionalities, and user-generated content were well-received by tourists and local residents, providing them with a comprehensive and user-friendly platform to discover and explore the city's vibrant culinary landscape. The user surveys highlighted the importance of factors such as ambience, personnel, ingredient quality, presentation, and product variety in influencing the development of gastronomic tourism. These insights were incorporated into the design and functionality of the web-based GIS system, ensuring that users had access to comprehensive information about the culinary establishments in Medan City, including reviews, ratings, and visual representations of the dining experience. The prototype testing phase revealed that the web-based GIS platform was highly effective in helping users discover and plan their culinary explorations in Medan City. Users praised the system's intuitive interface, comprehensive information, and ability to highlight trending and viral culinary spots, greatly enhancing their overall culinary tourism experience.

3.1. Admin and Tourist Dashboard Page Before Login

The initial display of the system created is the main page, and this page serves to open access from the system created for the access itself for the display can be seen in the following Figure 7:

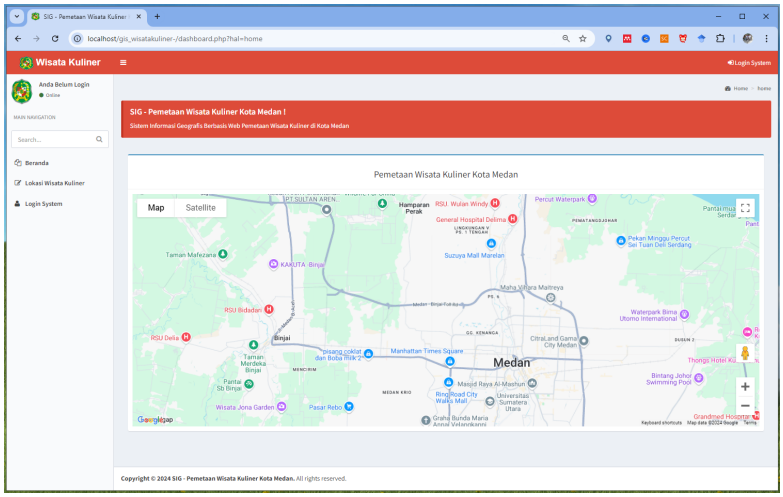

Figure 7. Admin and Tourist Dashboard Page Before Login

The "Admin Dashboard Page Before Login" provides a secure interface that greets users before they access the full administrative functionalities. It typically includes a login form prompting credentials such as a username and password and optional multi-factor authentication. Key elements on this page often feature a logo or branding, a brief welcome message, and links for forgotten passwords or user support. The design is minimalistic yet functional, prioritizing ease of use while maintaining a professional appearance to reassure users of the platform's security and reliability.

3.2. Tourist Dashboard for Looking Place Viral Culinary

The primary interface of the developed system is the main page, which facilitates entry to the system itself, as illustrated in Figure 8 below:

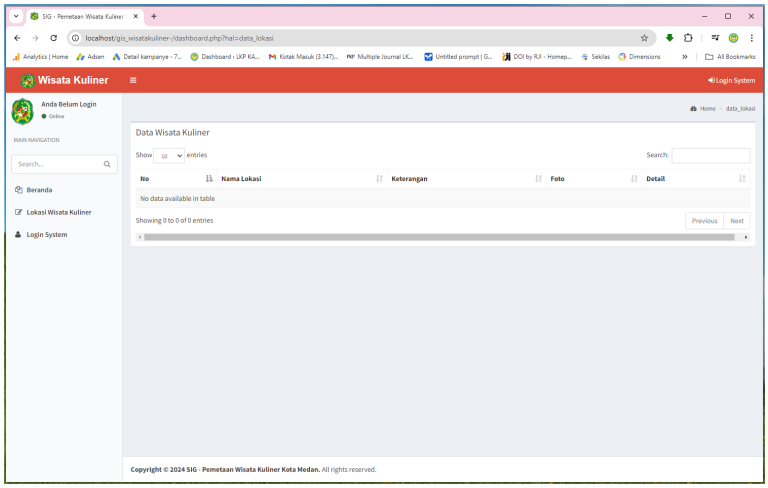

Figure 8. Tourist Dashboard Page Before for Looking Place Viral Culinary.

A Tourist Dashboard for finding popular food spots makes it easy for travelers to check out places that are popular for food. The dashboard quickly finds must-see restaurants and food events in certain areas by combining real-time data from social media, user reviews, and local suggestions. This tool improves the travel experience by giving personalized suggestions based on fame and location. In addition, the dashboard helps local businesses by making them more visible to foodies, strengthening the link between tourists and local food.

3.3. Admin Login Dashboard

The primary interface of the admin login system is the main page, which facilitates entry to the system itself, as illustrated in Figure 9 below:

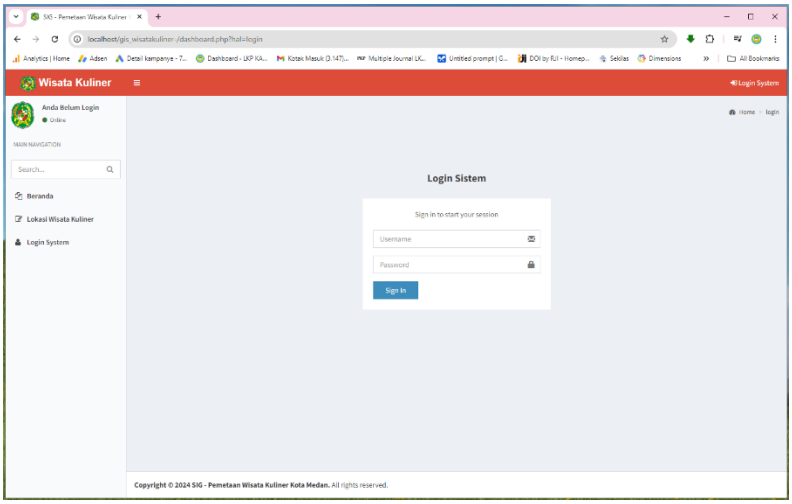

Figure 9. Admin Login Dashboard Viral Culinary.

The Admin Login Dashboard for Viral Culinary provides a centralized platform for administrators to manage and oversee the culinary tourism application effectively. Upon login, administrators are greeted with an intuitive interface that offers immediate access to key functionalities, including user management, data moderation, and content oversight. The dashboard enables admins to review and respond to user feedback, manage culinary spot listings, and ensure the accuracy and relevance of information presented to users. Advanced analytics tools are integrated to track user engagement and spot performance, allowing for data-driven decision-making. Security features, such as user authentication and role-based access control, are implemented to safeguard sensitive information and ensure that only authorized personnel can make crucial changes within the system. This streamlined approach not only enhances operational efficiency but also contributes to a better user experience, fostering a vibrant culinary community.

3.4. Admin Dashboard after Login

The primary interface of the admin dashboard system is the main page, which facilitates entry to the system itself, as illustrated in Figure 10 below:

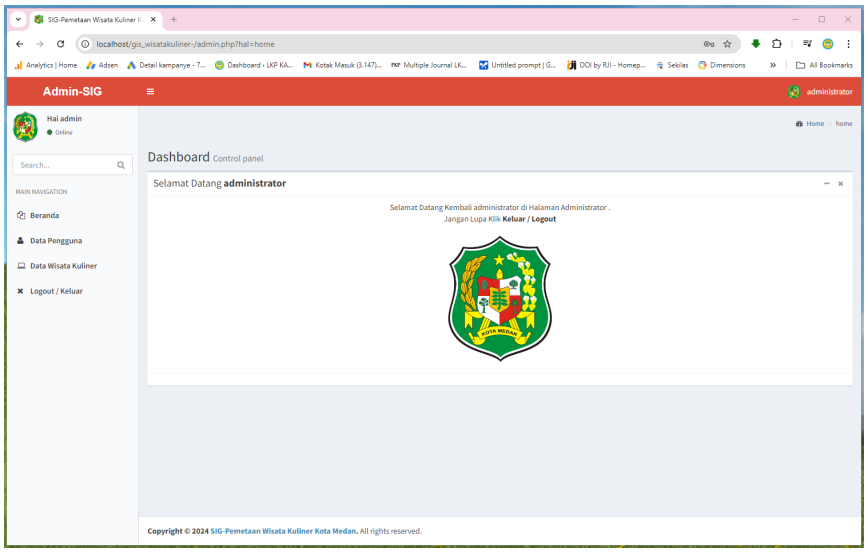

Figure 10. Admin Dashboard System

An Admin Dashboard System acts as a central center for managing and monitoring numerous operations within an organization, providing administrators with real-time visibility into critical metrics, user activity, and system performance. The dashboard's straightforward layout and customizable features improve decision-making by providing facts in a clear and actionable style. Administrators can simply manage activities, track performance, and respond to issues, increasing workflow efficiency and guaranteeing smooth system operations. The system's integration of analytics, reporting tools, and security features enables administrators to keep control of critical processes while streamlining daily management duties across the enterprise.

4 CONCLUSION

A web-based Geographic Information System (GIS) for identifying viral culinary tourism attractions transforms how travelers discover gastronomic places by integrating locational data with trending phenomena. The technology offers an interactive platform for users to swiftly identify popular dining establishments that have gained prominence via social media and reviews, presenting a distinctive opportunity to engage with the local culinary culture in real-time. This application enhances visibility for business owners by presenting their businesses to a wider audience, so boosting foot traffic and potentially augmenting revenue. This GIS integrates technology with culinary tourism, facilitating the identification of popular dining locations while enriching the visitor experience, promoting gastronomic exploration, and bolstering local economies. This method not only aids tourists but also provides local governments and tourism boards with vital insights into future food trends, facilitating the strategic development of tourist-friendly locations. Utilizing data-driven insights and user input, authorities may enhance the promotion of regional cuisines, so fostering a more sustainable and diversified tourism sector.

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This article is my original creation, and I affirm that I have directly contributed to its development and finalization. The second author, who has made substantial contributions, has consented to be designated as the corresponding author. I have secured clear authorization from the second author to utilize their name in this context, and they have agreed to be contacted for any inquiries pertaining to the piece. This collaboration demonstrates the joint endeavor to guarantee the correctness and integrity of the offered study.

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