HistoMind : AI-Powered Historical Place navigator

TMP – 378

Project Proposal Report

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DECLARATION

I declare that this is my own work, and this proposal does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or Institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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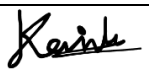
Ranasinghe P.R.K.U	IT20259266	

The above candidates are carrying out research for the undergraduate Dissertation under my supervision.

Signature of the supervisor
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Date

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(Dr. Samantha Rajapaksha)

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Abstract

The COVID-19 outbreak has had a negative effect on Sri Lanka's tourism economy by significantly reducing the number of tourists who visit its iconic historical sites. We suggest an innovative approach to give HistoMind, an AI-powered historical place navigator that provides tourists with an immersive and engaging experience, in order to grow this industry and attract more visitors.

The HistoMind platform is made up of four sub-components: a smart location-based recommendation mechanism with a route planner, an AI-based chatbot to help native speakers communicate, image processing to identify historical locations, and a mechanism to create 3D models of historical locations. These elements come together to offer visitors to Sri Lanka a thorough and exciting experience.

The application makes recommendations for nearby historical sites to tourists using machine learning, and it also makes use of 3D modeling and image processing to provide an immersive and engaging experience. The suggested AI-based chatbot for tourism allows users to communicate in their native language by speaking or typing, which makes it easier for tourists who may not be native speakers of their own language to understand and use.

The HistoMind platform's overall goal is to encourage tourists to learn about and explore the country's rich history and culture by presenting it in an interesting and user-friendly manner. By enhancing Sri Lanka's tourist attractions, we hope to draw more visitors to the nation and promote the tourism sector there, which will contribute to the economy.

Keywords : AI-based chatbot, NLP, Machine Learning, Multilingual chatbot

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List of abbreviations

Abbreviation	Description
NLP	Natural Language Processing
API	Application Programming Interface
TTS	Text-to-Speech
STT	Speech-to-Text
NLU	Natural Language Understanding
AI	Artificial Intelligence
LSTM	Long Short-Term Memory
SVM	Support Vector Machines

1. INTRODUCTION

1.1 Background & Literature survey

Sri Lanka has a history that ranges more than 2500 years and is home to many historical sites and cultural landmarks. The country's tourism sector depends greatly on the attraction of these historical locations, and a significant number of tourists come particularly to experience and learn about the nation's rich cultural history. Even so, considering its great potential, the sector has recently encountered difficulties, such as a significant decrease in tourist visits brought on by the COVID-19 pandemic. [1] [2]

The research proposes developing HistoMind, an AI-powered historical place navigator, to assist with these issues and grow the tourism sector. With the support of this cutting-edge mobile software, tourists will be able to explore Sri Lanka's historical places in a thorough and immersive manner, improving the overall tourist experience. HistoMind combines several key features, such as a location-based recommendation system, an AI-based chatbot for smart conversation, image processing for identifying historical locations, and 3D modeling for animating historical landmarks.

In order to support tourists in efficiently planning and navigating their routes, the location-based recommendation system uses machine learning to offer them individualized recommendations on nearby historical places. The AI-based chatbot makes it easier for native speakers to communicate intelligently and provides text and voice responses in the user's native language, boosting accessibility for tourists who may not be fluent in English or the local language (English, Tamil, German). By using computer vision for identifying historical landmarks with high accuracy, the image processing mechanism uses image analysis to provide insightful information about the historical value of different locations. The 3D modeling element, finally, enables visitors to virtually explore historical sites and comprehend their value on a deeper level.

HistoMind has the potential of attracting more visitors to Sri Lanka's historical sites and developing the tourism sector, thereby boosting the local economy. By providing a more engaging, customized and immersive experience for tourists, HistoMind can help the country's economy grow.

Clarizia et al. [3] developed a chatbot that can comprehend conversational context in order to share information with tourists about cultural heritage places. They recognized the value of cultural heritage and the potential advantages of incorporating modern technologies to enhance the user experience, which is a similar focus to our work. To give users the information they need, the chatbot takes advantage of context and pattern recognition methods.

A chatbot was created by ACHUTHAN.s [4] that can understand user questions on health-related issues (whether they are voice or text-based) and respond appropriately. Users can ask dosage-related medical queries using voice input and receive spoken responses via the Google API in part

to the chatbot's integration with the latter for text-to-speech and speech-to-text conversions. Using natural language processing (NLP), this strategy makes computer-to-computer communication possible.

A chatbot developed by Navod. G [5] makes it simple to communicate and retrieve information. By recognizing speech and text inputs as user messages and responding to them accordingly, the user interface makes communication with the client, enabling them to request information about Sri Lankan archaeological sites in any format. The user's query is subsequently processed by the natural language processing (NLP) module. NLP is a rather complicated method that includes automatically understanding human speech. Rasa NLU and Rasa Core, an open-source NLP framework, are utilized to construct the NLP module. The chatbot uses Mongo DB to store historical location information in a database for knowledge.

The development of a chatbot that can understand user queries and provide suitable responses using speech recognition, speech synthesis, and natural language processing is described in this research study. A customized dataset, Support Vector Classifier, and Gridsearch for parameter optimization are used to train the chatbot. The Python SpeechRecognition module is used for speech recognition, and the Pyttsx3 library is used for text-to-speech conversion. In order to give an application a human touch and help the user feel understood, natural language processing is necessary. The chatbot makes use of NLU to figure out the user's intent and input entities. Overall, this chatbot employs a number of strategies for understanding customer questions and replying to them in a more human-like manner. [6]

A conversational bot called HealthAssistantBot (HAB) was created to assist patients with routine healthcare tasks. [7] The Profiler, Symptom Checker, Knowledge Base, and Recommender System modules make up the architecture. While the Symptom Checker determines the disease and its clinical area from the user's specified symptoms, the Profiler controls the patient's profile and records clinical information. Users can consult details on diseases and their symptoms in the Knowledge Base, and the Recommender System uses the Symptom Checker and Knowledge Base to recommend doctors who can treat the patient Intent Recognition is made more reliable by using guided commands, which are made possible by the usage of Telegram as a platform for HAB. HAB strives to respond to the end user's requests in as few dialogue steps as feasible and reduce complexity in health-related interactions. HAB has the potential to be an effective tool in the field of healthcare thanks to the adoption of guided orders and the use of an organized approach.

This research article discusses the process for developing a transformer-based chatbot with general Bengali knowledge. [8] Online sources were used to compile a dataset of 2000 Bengali queries and answers about Bangladesh and world politics. An encoder and decoder with multiple heads of attention and position-wise feed-forward network sub-layers were employed in the transformer model design. For predicting sequence probabilities, the model makes use of self-attention and position-wise attention mechanisms. The decoder uses sequence probability prediction to produce the output. Based on the Bengali questions entered the model, the chatbot generates appropriate responses.

The proposed solution [9] is a smart Virtual Assistant that explores unstructured data for information using web crawling and Natural Language Processing (NLP) methods. Prioritizing search context is one of its main goals, along with automating human jobs, providing context-based insights, and creating a comfortable conversational interface. The Virtual Assistant integrates Text-to-Speech (TTS) and Speech-to-Text (STT) APIs for voice and text chats and uses Python frameworks to perform repetitive activities. Front-end web technologies are additionally used to create a customized or generic virtual assistant user experience. Overall, this system provides a quick and simple method for automating tasks and retrieving information.

The recommended AI-based chatbot aims to get beyond the language barrier that tourists to Sri Lanka's archaeological sites experience. The chatbot can deliver precise and necessary data to travelers in their native language by using a combination of the German, Tamil, and English languages. They will be better able to communicate and understand the cultural and historical value of the places they are seeing as a result. The chatbot will make use of machine learning techniques to adapt its responses over time based on human interactions, giving visitors a smooth and effective experience. The proposed chatbot has the potential to improve the entire tourist experience and support the development of Sri Lanka's tourism sector by crossing the language barrier.

1.2 Research Gap

Research A [6] describes how a chatbot is created that can understand user queries and generate appropriate responses utilizing natural language processing, speech recognition, and speech synthesis. For parameter optimization, Support Vector Classifier, Gridsearch, and a custom dataset are utilized. For text-to-voice conversion and speech recognition, respectively, the Python libraries Pyttsx3 and SpeechRecognition are utilized. Natural Language Processing is used to provide an interactive experience with human touch and make sure the user is understood. The chatbot was created to recognize entities and the user's intent using NLU. The system's lack of multilingual support and contextual awareness for native language speakers, however, is the recognized research gap.

Research B [5] chatbot developed by Navod. G makes it easier to communicate and find information through speech and text inputs. Users can ask for information about Sri Lankan archaeological sites in any format, and the chatbot responds to their queries. The user's question is processed by the natural language processing (NLP) module using a complex technique that involves automatically recognizing human speech. Rasa NLU and Rasa Core, an open-source NLP framework, are utilized to construct the NLP module. The chatbot uses Mongo DB to store previous location data in a knowledge database. The chatbot does not, however, support multiple languages or provide contextual learning for native language speakers. This chatbot is web-based as well. This has been determined to be the main issue.

Research C [8] describes the development of a transformer model-based chatbot for Bengali general knowledge. The dataset, which included 2000 Bengali questions and responses about Bangladesh and worldwide issues, was compiled from several web sources. The transformer model architecture, which consists of position-wise feed-forward network sub-layers and encoders, and decoders with multi-head attention, was applied. The model predicts sequence probabilities using self-attention and position-wise attention processes, and the decoder produces the output based on the predicted sequence probabilities. Bengali queries are answered by the chatbot's generated responses. Technology does not, however, support many languages or provide native language speakers with contextual awareness. It is a web-based chatbot, which is another important limitation. It only accepts text input and lacks voice recognition.

Table 1: Research Gap

Features	**Research A**	**Research B**	**Research C**	**Proposed System**
Mobile App	✗	✗	✗	✓
multilingual chatbot	✗	✗	✗ (Only Bengali Language)	✓
Architecture/Algorithms	Speech Recognition, Speech Synthesis, NLP/NLU, Hidden Markov Model, Transformer Model	NLP(NLU)-Rasa NLU, Dialog Management, Restful-API, Mongo DB	Encoder-decoder architecture, Bengali dataset, Seq2seq , LSTM	Speech Recognition, TTS, NLP , Machine Translation, Dialog Management
Complex question-and-answer interactions	✓	✓	✗	✓
Advanced NLP techniques	✓	✓	✗	✓
Accuracy	92.1%	89.91%	85.00%	Higher accuracy is expect
Field	Tourism industry	Tourism industry	General knowledge	Tourism industry

1.3 Research Problem

The Sri Lankan economy depends considerably on tourism, and historical sites are common tourist attractions. However, language limitations often make it difficult for visitors to interact with locals and get accurate details about these sites in their native language. Without access to relevant details in a language they can understand, many tourists could not fully understand the cultural and historical significance of these sites, which presents a huge barrier for the tourism industry. There is a lack of information in languages like German and Tamil, which are also often used by tourists visiting Sri Lanka [10] [11] ,even though some information is available in widely spoken languages like English.

An AI-based chatbot that helps tourists know about historical locations in many languages can be created to address this issue. The chatbot will understand tourists' queries using natural language processing and machine learning techniques, offering accurate and relevant responses in English, German, and Tamil. The suggested chatbot may assist tourists in Sri Lanka have a better overall travel experience by reducing language challenges and encouraging a greater understanding of the nation's rich history and cultural heritage.

2. OBJECTIVES

2.1 Main Objective

The major goal of the research is to create a multilingual chatbot that is integrated into a mobile application for phones that can give tourists reliable and relevant data about historical sites in Sri Lanka while reducing language barriers for tourists who do not understand English. To deliver a better user experience, this chatbot will apply natural language processing (NLP) methods, including a combination of rule-based and machine-learning approaches. In order to respond to users in their own language, the chatbot will automatically detect their input language. Additionally, this study intends to assess whether the created chatbot enhances the overall tourist experience and whether it has the potential to increase the number of visitors to Sri Lanka's historical places.

2.2 Specific Objectives

The research has the following sub-objectives,

- The proposed an AI-based chatbot for tourism that enables users to speak or type in their native language, making the communication process more usable and accessible for tourists who might not be capable in the local language.(English, German, Tamil)
- Automatically identified user’s input language and generate corresponding answers.
- This is a mobile application that enables tourists to get information about historical places and landmarks in a way that feels natural and conversational.
- This chatbot enhances user experience and increases the accessibility of information for all tourists by providing text and voice responses in the user's native language. The user may receive text responses in response to text commands. However, if the user speaks his orders, the user will receive both text and voice responses in the language the user chose.

3. METHODOLOGY

The development and training of a multilingual chatbot utilizing a combination of rule-based and machine-learning techniques are part of the research project's methodology. The adoption of methods for Natural Language Processing will improve the chatbot's comprehension of user intent and context. A mobile application will incorporate the chatbot, and user testing will be done to determine how well it helps tourists who may not speak the local language as them.

3.1 System Architecture

Following diagram shows the proposed system architecture,

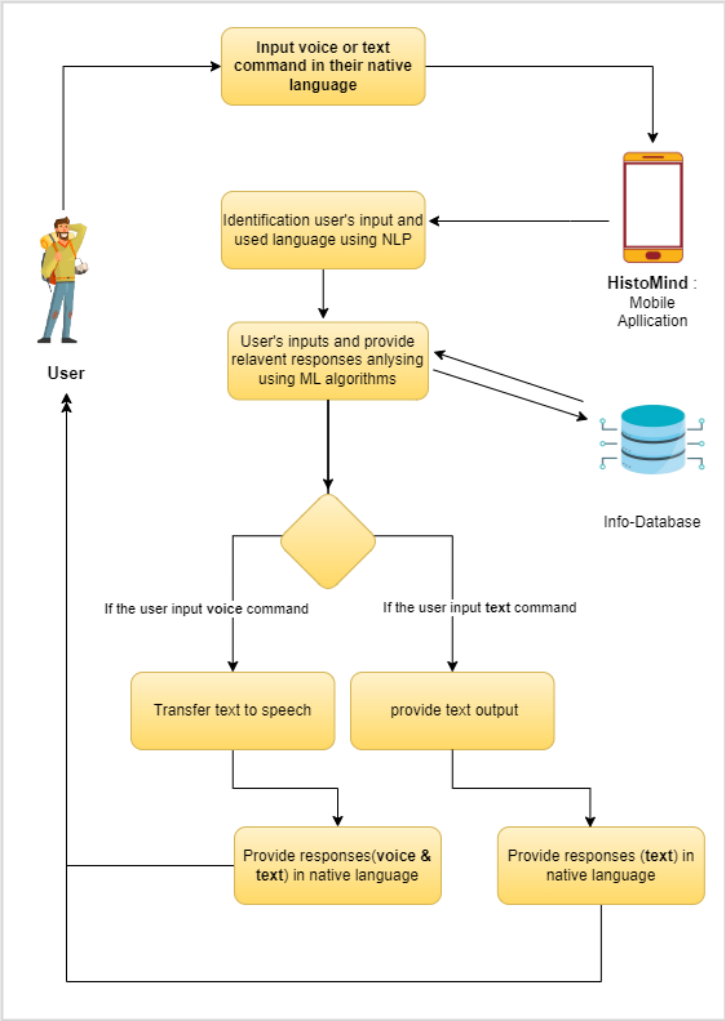

Figure 1: System overview diagram of AI-based chatbot

User Interface - This component has direct communication with the user. The user can voice- or text-input their questions, and it presents the results in the language they have selected.

Language Identification - An appropriate reply is delivered in the same language when this component recognizes the user's input language.

Natural Language Processing (NLP) - In order to understand the user's query and extract essential information like keywords and entities, NLP is required. This part is responsible for analyzing user input and producing appropriate responses.

Database - The chatbot will use the database to store information on tourist attractions and relevant data and use it to respond to user queries.

Machine Learning - The chatbot was created and trained using a combination of rule-based and machine learning techniques. Rasa Core and Rasa NLU are used for managing conversation and translating natural language, while Support Vector Classifier is utilized for categorization.

Text-to-speech (TTS) and Speech-to-text (STT) - Text to voice and speech to text conversion are performed by the TTS and STT components, respectively.

For processing user inputs and providing responses, this architecture makes use of NLP techniques as well as a combination of rule-based and machine-learning approaches. For accessibility and multilingual support, it also has modules for language identification and speech synthesis.

Overall, this system design provides a foundation for the creation of an AI-based chatbot that can help tourists visiting Sri Lanka get overcome language difficulties.

3.2 System Development and Implementation

An actual chatbot system is designed and deployed during the system development and implementation phase. The first stage is to create the chatbot's Natural Language Processing (NLP) module, which involves defining the intents and entities for the many languages the chatbot supports. The chatbot's response-generating module, which chooses the best response to offer for specific user input, is then coupled with this module.

Next, appropriate libraries and tools, such as Python's SpeechRecognition and Pyttsx3 packages, are used to develop the chatbot's speech recognition and text-to-speech conversion capabilities. A suitable database, like MongoDB, also works with the chatbot to store previous data and other historical places' information.

The chatbot must be implemented on an appropriate platform, such as a mobile application interface, as the last step in this phase before it can be used by tourists. The chatbot is then put through an intense testing procedure to make sure it is working properly and giving users precise and relevant data. Before the chatbot is made accessible to the public, any problems found during testing are addressed and fixed.

3.2.1 Feasibility Study

Natural Language Processing (NLP) :

Natural Language Processing is referred to as NLP. The study of how computers and human languages interact is an area of artificial intelligence and computer science. NLP aims to make it possible for computers to comprehend, interpret, and create human language. It uses a variety of methods and algorithms for handling and analyzing speech and other natural language data, as well as text. Chatbots, machine translation, sentiment analysis, and speech recognition are just a few of the uses for NLP. NLP is necessary for this chatbot to properly understand user input and respond to it more naturally, enhancing the user experience.

Support Vector Machines (SVM) :

A common machine learning approach for classification and regression tasks is called Support Vector Machine (SVM). It operates by identifying the hyperplane that separates the data into various categories the most effectively. SVM is effective for high-dimensional data and can handle both linear and non-linear data.

SVM can be used for entity recognition and intent categorization in the context of an AI-based chatbot. SVM can be taught to categorize user input into various intents, such as finding a restaurant or making hotel reservations, for the purpose of intent classification. SVM can be used to extract crucial data from user input for entity recognition, such as the name of the eatery or the date of the hotel reservation.

The input data must be labeled with the appropriate intent and entities in order to apply SVM in your AI-based chatbot solution. The ideal hyperplane for separating the data can then be found by training the SVM model on this dataset using a number of parameters and kernel functions. After being trained, the SVM model can be used to categorize coming user input and retrieve crucial data for producing suitable responses.

Combination of Rule-Based and Machine Learning Approach :

Combination of Rule-Based and Machine Learning Approach, If you want your chatbot to be able to handle more complicated queries or requests that don't fit within your predefined set of rules, you could include a machine learning approach. This would allow the chatbot to learn from user inputs and generate better responses over time. For instance, if a user asks, "What are the best historical places to visit in Sri Lanka?" the chatbot can utilize machine learning techniques to analyze the user's input and deliver appropriate responses based on historical facts and user preferences.

3.3 Work Breakdown Structure

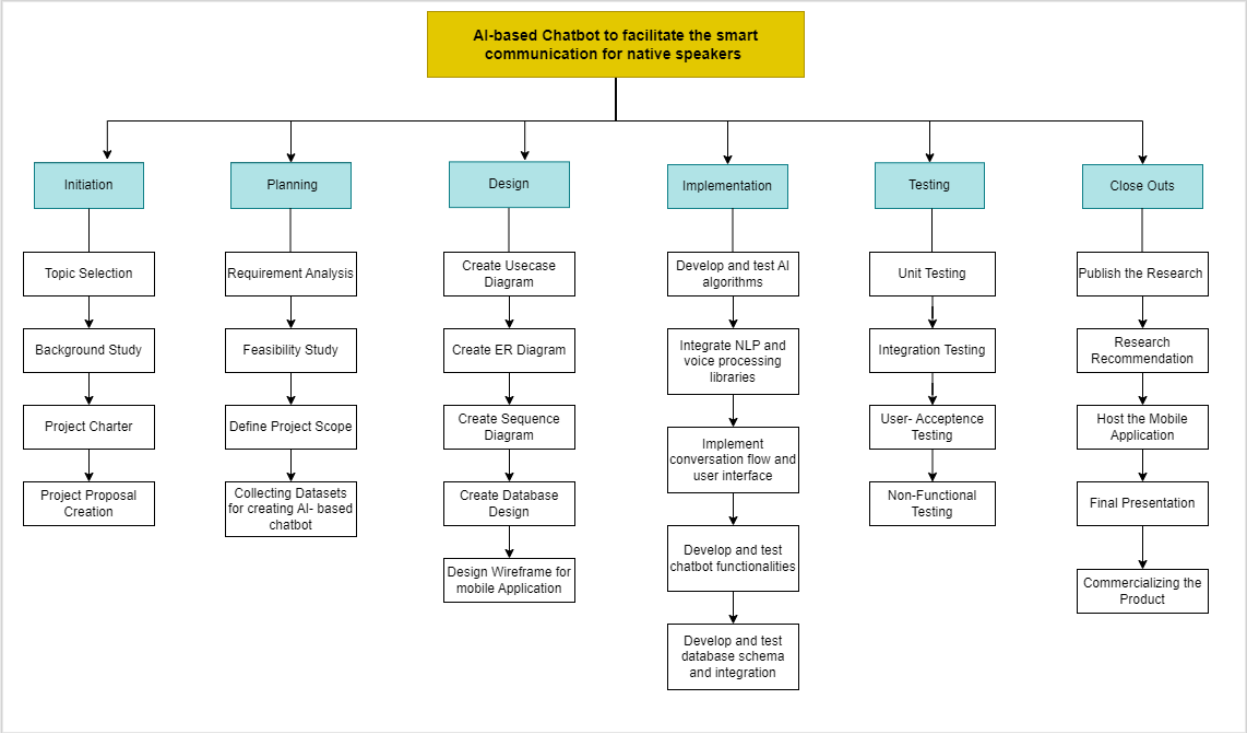

Figure 2: Work Breakdown structure

3.3 Gantt Chart

Research Project Tasks	Priority	Due Date	2022		2023									
			Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Project Topic Selection & Supervisor Selection	1	13-Nov														
Supervisor Selection	1.1	Nov - Jan														
Interest Discussion	1.2	Nov - Jan														
Field Study	1.3	Nov - Jan														
Group Discussion	1.4	Nov - Jan														
Topic Selection	1.5	Nov - Jan														
Feasibility Study	2	Jan - Feb														
Planning/ Investigating	2.1	Jan - Feb														
Techonology Analysis	2.2	Jan - Feb														
Resources Evaluation	2.3	Jan - Feb														
Topic Assestment Form	3	13-Feb														
Project Charter Submission	4	14-Mar														
Project Charter Confirmation Submission	5	16-Mar														
Project Proposal Report(Draft)	6	20-Mar														
Project Proposal Presentation	7	27-Mar														
Design	8	1-Apr														
Field Study	8.1	2-Apr														
Specification	8.2	3-Apr														
Interface Design	8.3	4-Apr														
Implementation of Functions (1)	9	20-Apr														
Testing Level 01	10	16-May														
Unit Testing	10.1	16-May														
Component Testing	10.2	16-May														
Integration Testing	10.3	16-May														
System Testing	10.4	16-May														
User Testing	10.5	16-May														
Project Status Document	11	20-May														
Progress Presentation 01 (50%)	12	25-May														
Prepare Research Paper	13	15-Jun														
Implementation of Functions (2)	14	Jul														
Testing Level 02	15	Aug														
Final Report Draft Submission	16	Aug														
Progress Presentation 02 (90%)	17	10-Sep														
Final Report Feedback	18	2-Oct														
Website Assestment	19	Oct														
Final Report(Soft ound)	20	Oct														
Project Status Document	21	Oct														
Student Log Book	22	Oct														
Final Presentation & Viva	23	Nov														
Final Report (Hard Bound)	24	Dec														

Figure 3: Gantt chart

4. BUDGET AND BUDGET JUSTIFICATION

Table 2: Budget Plan of Overall Project

Component	**Estimated Budget**
Travelling Cost	15,000/=
Deployment Cost	12,000/=
Mobile app hosting on play store	8,000/=
Mobile app hosting on app store	8,500/=
3D development and deployment	100,000/=
Testing	2,500/=
Server	6,000/=
Other (internet. and Phone bills)	5,000/=

5. Commercialization

5.1 Target Audience and Market Space

1. Target Audience

- Tourists
- Students and scholars
- Travel agencies and tour operators

2. Market Space

- Tourism industry
- Education sector
- Mobile app marketplaces

6. PERSONAL AND FACILITIES

Table 3: Description of Personal and Facilities

Name	Key Tasks
Ranasinghe P.R.K.U	• Requirements. gathering and analysis • Creating development environment • Managing Server infrastructure • Audio recording and editing equipment • Setup translation software • Using collaboration tools

7. PROJECT REQUIREMENTS

7.1 Functional Requirements

Functional requirements are the attributes and tasks that a system must keep out in order to meet user needs. The functional requirements for an AI-based chatbot could include:

Language Recognition - The chatbot should be able to differentiate between different user-spoken languages.

Intent Recognition - The chatbot should be able to recognize the user's intent when they ask a question and then respond appropriately.

Contextual Understanding - Based on the user's previous interactions, the chatbot should be able to preserve context across many queries and offer appropriate responses.

Natural Language Processing (NLP) - The chatbot should use NLP methods, such as sentiment analysis, text processing, and speech recognition, for understanding and interpreting user input.

Support for numerous languages - The chatbot should be able to provide responses to user inquiries in different languages.

Knowledge Management - To deliver precise and pertinent answers to user queries, the chatbot should be able to store and retrieve data from a knowledge base.

Error handling - The chatbot must be able to gracefully handle errors and exceptions and give the user the necessary feedback.

7.2 Non-Functional Requirements

For an AI-based chatbot implementation, non-functional requires might be:

- Performance
- Scalability
- Availability
- Security
- Usability
- Multilingual support
- Accuracy
- Adaptability
- Integration with existing systems

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TMP-23-378

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B. Sc. (Hons) Information Technology

(Specialized in Software Engineering)

Department of Computer Science and Software Engineering

Sri Lanka Institute of Information Technology

Sri Lanka

February 2023

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Name	Student ID	Signature
Navoda R.C	IT20209520	

The above candidates are carrying out research for the undergraduate Dissertation under my supervision.

Signature of the supervisor:  Date: 5/8/2023

Signature of the Co-supervisor:  Date: 5/8/2023

ABSTRACT

HistoMind is an innovative mobile application that uses AI technology to revolutionize the tourism industry in Sri Lanka. This app simplifies the process of discovering and exploring historical sites by offering tourists an immersive and comprehensive experience.

Histomind consists of a smart location-based recommendation mechanism with a route planner to recommend nearby historical places for users. It utilizes machine learning algorithms to analyze user location data and historical preferences based on ratings. It provides nearby recommendations and optimizes travel routes, allowing users to explore historical places that align with historically significant or culturally relevant. Users can choose which locations to visit, and the system will plan the shortest possible route to cover all the selected places.

Ultimately, the smart version of HistoMind provides a seamless and personalized experience for users exploring historical places. HistoMind' s chatbot is another significant component of the app that allows users to input text or voice commands in English or their native language and retrieve output in the same language. Additionally, the service supports five different native languages for input and output, making it accessible to a broader range of users. The chatbot also offers users valuable insights into the historical significance of various locations.

The app uses 3D modeling and image processing to offer tourists an immersive and interactive experience. The advanced image processing mechanism identifies historical locations with high accuracy, allowing users to gain valuable insights into the past by simply analyzing images.

HistoMind has the potential to attract more tourists to Sri Lanka, promote its cultural heritage, and contribute to its economic growth. The app is designed to be user-friendly and accessible to all tourists, regardless of their technological expertise. With its advanced location-based recommendation system, AI-powered chatbot, and 3D modeling capabilities, HistoMind offers a comprehensive and immersive experience for tourists, making it an essential tool for anyone visiting Sri Lanka.

Keywords: Location-based recommendation, hybrid recommendation, rout planning, shortest path, optimizing

TABLE OF CONTENT

LIST OF ABBREVIATIONS

Abbreviation	Description
LBS	Location-based services
3D	Three-dimensional

1. INTRODUCTION

1.1. Background & Literature survey

1.1.1. Background

The HistoMind project was initiated to enhance the tourism industry in Sri Lanka by leveraging the capabilities of AI to provide tourists with a comprehensive and immersive experience. The project's primary objective is to simplify the process of discovering and exploring historical sites by providing users with personalized recommendations and information in an engaging and user-friendly manner.

The project's main components include a location-based recommendation system with a route planner, a chatbot, 3D modeling, and image identification. The location-based recommendation system uses machine learning to provide tourists with recommendations on nearby historical places, and it offers information about the country's rich history and culture in an engaging and user-friendly manner. This is a useful tool for individuals interested in exploring historical places. It incorporates advanced machine learning algorithms to analyze the user's location data and historical preferences to provide nearby recommendations. Users can choose which locations to visit, and the system will then plan the shortest possible route to cover all of the selected places, optimizing travel time and reducing unnecessary travel. This system allows users to efficiently explore historical places that align with their interests and preferences, making their travel experience more enjoyable and fulfilling.

The chatbot allows users to interact with the app and learn more about Sri Lanka's history and culture. Users can input text commands or voice commands in either English or their native language and retrieve output in the same language. Additionally, the service supports five different native languages for input and output, and users can retrieve output in both text and voice formats when inputting voice commands.

The 3D modeling and image identification components offer an immersive and interactive experience for users, allowing them to explore historical sites in detail and gain valuable insights into their historical significance. The image processing mechanism is designed to identify historical locations with high accuracy, making it possible for users to gain valuable insights into the historical significance of various locations simply by analyzing images.

Overall, the HistoMind project aims to attract more tourists to Sri Lanka, promote its cultural heritage, and contribute to its economic growth. The app offers an immersive and engaging experience for tourists, allowing them to discover and explore historical sites easily, receive personalized recommendations based on their location and preferences, and interact with a chatbot to learn more about the country's history and culture. The project's cutting-edge technology and user-friendly design set it apart from existing methods and make it a significant step towards promoting tourism in Sri Lanka.

1.1.2. Literature survey

The tourism industry plays a crucial role in the economic growth of many countries, including Sri Lanka. [1] The paper by Chathura Mohotti, Chandana Jayawardena which is based on the tourism industry and the HR cchallenges in Sri Lanka, highlights the needing of innovative thinking and action for enhancing tourism industry in Sri Lanka. [2]

Mobile applications have become an essential part of the tourism industry as they enable tourists to plan, explore and enhance their travel experiences. [3]

paper authored by S. G. Tsiramua, K. Abuladze, and G. Tsiramua describes a mobile technology-based approach to tourism that outlines the tours and infrastructure objects that can be accessed through mobile applications. In essence, the paper presents a framework for utilizing mobile technology to provide tourists with information and access to various tourist destinations and amenities. [4]

Mobile applications are increasingly used in the tourism industry to enhance the user experience and provide customized recommendations. [5]

The use of location-based services in mobile applications has become increasingly popular in the tourism industry, allowing users to discover nearby attractions and receive personalized recommendations based on their preferences and location. [6]

However, existing approaches typically only provide recommendations without facilitating easy access to those locations.

Location-based services (LBS) are a common feature of tourism mobile applications, allowing users to discover nearby attractions and receive personalized recommendations based on their preferences and location.

Research has shown that mobile applications can enhance the tourism experience by providing real-time information, personalized recommendations, and interactive experiences. The article written by Wahidah Husairi Lam Yih Dih, Heng Foo Yen, and Neesha Jothi explores a custom-made tour information system for tourists that is tailored to their specific needs throughout their tourism journey. [7]

The paper by Xiongbin Wu[1] , Hongzhi Guan and others discusses the route planning based on the user preferences of tourism attraction, time, and cost the budgets. [8]

They emphasize that the weakness of the previous research is considering only the shortest path rather than user’s desire. In our system we consider both.

1.2. RESEARCH GAP

For many years, researchers have been working on location-based recommendation systems, and several experiments have been undertaken to build and enhance such systems. Despite the numerous advances made in this field, there are still several research gaps that must be filled.

The research gap will address the following issues. The following examples show how specific features have been handled in previous research. These are only a few of the features.

Research A [9]

Location-based historical site recommendation algorithms, according to this research, often depend on nearby place weighting and popularity-based techniques, without necessarily considering significant elements of the historical site, such as its historical value, cultural relevance, or architectural style. However, the most visited places are not always the most historically or culturally significant. Future study might investigate methods to combine these crucial aspects into the recommendation system, possibly via the use of machine learning techniques to better understand the user's interests and preferences. By doing so, we can improve the likelihood of visiting areas with low tourist appeal but high historical importance, so encouraging a more extensive and diversified investigation of historical sites.

The goal of many travel recommendation systems is to provide users with a list of popular tourist attractions that they might be interested in visiting. However, this approach can sometimes result in users visiting only the most well-known and heavily promoted locations, while missing out on other culturally significant but less popular places. This can lead to a lack of diversity in the types of places that people visit and a loss of cultural exploration opportunities.

To address this issue, researchers could explore techniques to balance the recommendation of popular tourist attractions with the promotion of less popular but historically significant places. One approach could be to use a recommendation algorithm that incorporates user preferences and historical data to suggest a mix of popular and less popular places to visit.

Research B [10]

Although the current hybrid travel recommender system employs collaborative-based, popularity-based, and nearby location weighted recommendation techniques, it does not consider the historical or cultural importance of the suggested vacation destinations. This strategy may result in a skewed suggestion of only the most popular tourist spots, which may or may not be the most historically significant or culturally significant locales.

As a result, there is a research gap in building a hybrid recommendation system that considers both adjacent location weighting and the historical significance or cultural relevance of the suggested historical sites. A system like this may give users more complete and tailored travel

recommendations, encouraging a more varied and egalitarian study of historical places. Future study might look at how to include these elements into the hybrid recommendation system and compare its performance to other techniques.

Research C [11]

A potential research gap could be the lack of studies that have explored the combination of both A* algorithm and the improved Dijkstra's algorithm in the context of road network route planning. While there have been studies on optimizing A* algorithm and improving Dijkstra's algorithm separately, there is a potential opportunity to investigate how these two algorithms can complement each other to achieve even more efficient and accurate route planning results. Additionally, there may be a need to explore the scalability of these algorithms to handle larger and more complex road networks.

Product Reference	Research A	Research B	Research C	**Proposed System**
Mobile-based approach	✗	✗	✗	
Location-based recommendation	✓	✓	✗	
User preference- based recommendation	✓	✓	✗	
Location’s significant elements-based recommendation.	✓	✗	✗	
Hybrid recommendation	✓	✓	✗	
Optimizing Shortest Path Algorithm for Multiple Destination Route Planning	✗	✗	Dijkstra’s algorithm only	Both Dijkstra’s algorithm and A* algorithm

Table 1.1: Research Gap 01

1.3 Research Problem

Sri Lanka has a rich history spanning 2500 years and is home to several archaeologically significant historical sites. With around 2.3 million visitors arriving in 2019, this business has a direct influence on the country's economy. However, the impact of COVID-19 has reduced the number of tourists by 76% in 2021. Immediate action is required to revitalize this industry.

While several programs have been launched to increase the number of visitors visiting the nation, the technology industry has produced very few software solutions. Although there is a plethora of information accessible regarding historical sites, new methods for publicizing them are neglected. Furthermore, there is presently no strategy in Sri Lanka that allows tourists to see more historical sites at a lower cost in a single trip season.

As a result, there is a need to investigate the possibilities of location-based recommendation mechanisms and route planning to assist visitors in visiting historical sites with distinctive cultural traits. A solution like this would boost the tourism sector while also contributing to the country's economic progress.

2. OBJECTIVES

2.1 Main Objectives

The smart location-based recommendation system with a route planner's primary goal is to deliver individualized suggestions to travelers visiting Sri Lanka based on their present location, previous preferences, and local tourist sites. The suggestion algorithm proposes less popular but historically significant locations to promote the country's cultural traits. Furthermore, the route planner component allows users to pick numerous points of interest and generate an optimum route using the shortest path method. The approach attempts to assist travelers in visiting more historical sites in a single trip season at the lowest possible cost and time, while also promoting less popular tourist destinations. Overall, the goal is to improve the visitor experience and strengthen the tourism industry, which has a significant influence on Sri Lanka's economy.

2.2 Specific Objectives

construct a location-based recommendation mechanism.

The goal of this objective is to construct a system that suggests historical locations to users depending on their present location. It entails using geographical data to recommend adjacent historical sites rather than merely major tourist locations. This goal will entail creating algorithms and models to detect historical locations and utilize them to create user suggestions.

Incorporate local tourism attractions.

This goal tries to recommend nearby tourist attractions that may be of interest to the user in addition to proposing historical places. This might include restaurants, shops, or other points of interest around the suggested historical locations. The idea is to offer a thorough and individualized travel experience that extends beyond simply viewing historical places.

Prioritize historical worth over popularity.

This goal is closely related to the first one since it includes stressing historical value over popularity when making suggestions. Rather than merely promoting the most famous attractions, the idea is to highlight lesser-known historical sites that nonetheless have substantial cultural significance.

Create a route planner.

The goal of this objective is to give users a tool that allows them to plan their journey itinerary by choosing various points of interest on a map. The algorithm will then calculate the shortest

route to each of these locations, considering travel time and distance. This goal will entail creating algorithms to compute the most efficient path depending on the user's choices.

Improve the efficiency of the algorithm used to calculate the shortest route between numerous locations: This goal entails enhancing the efficiency of the algorithm used to calculate the shortest route between many destinations. This might involve optimizing for speed, limiting trip distance, or considering other aspects that may have an influence on the user's travel experience. The purpose is to deliver the most efficient and effective travel plan feasible to consumers

3. METHODOLOGY

The initial step would be to gather information on historical landmarks and adjacent tourist attractions in Sri Lanka. Gathering information from tourism websites, guidebooks, and other relevant sources might be part of this process. The data would need to contain each site's location, historical and cultural value, popularity, and other pertinent information.

Location-based Recommendation Algorithm: A location-based recommendation algorithm would be created to propose historical locations depending on the user's present location. This algorithm would recommend the finest historical locations to visit based on the user's present location, historical and cultural value of each site, and popularity. Furthermore, the algorithm would consider adjacent tourist attractions that complement the historical sites being proposed.

A historical value-based recommendation system would be built in order to prevent promoting solely popular sites. This algorithm would recommend historical sites based on cultural and historical worth rather than popularity.

Route Planner Algorithm: The route planner algorithm would be created to assist people in planning their trips to historical sites. The algorithm would allow the user to pick many locations to visit and would recommend the quickest path to visit all of them. This algorithm might be tuned to recommend the optimum route based on parameters such as traffic, distance, and time limitations.

Finally, a user interface would be created to offer users a smooth experience while accessing the component. Users would be able to examine the recommended historical sites, choose which ones they wanted to visit, and view the proposed route. It would also include more information on each historical site and neighboring tourist attractions.

3.1 System Architecture

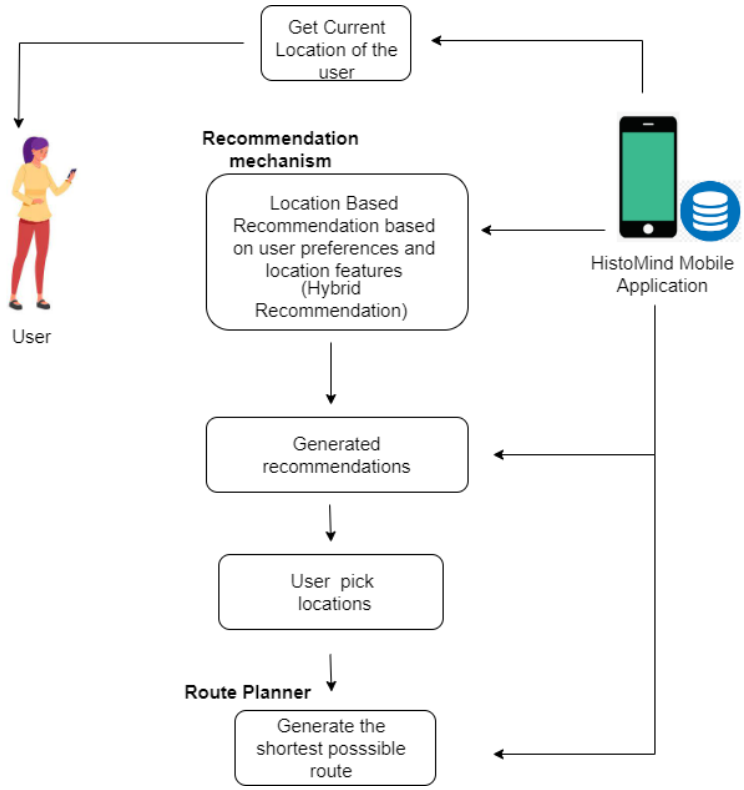


Figure 3.1: Proposed Methodology

User Interface: The Histomind mobile app will include an easy-to-use interface for users to engage with the system. On the map, users may examine local recommended historical sites and tourism attractions, choose preferred areas, and calculate the best itineraries.

Location-Based Recommendation Mechanism: Based on the user's present location, the algorithm will recommend historical sites and surrounding tourist attractions based on their historical and cultural relevance, rather than popularity alone. The algorithm will consider aspects such as the historical value of the landmark, its closeness to the user's present location, and its popularity among tourists.

Route Planner: Using the shortest path method, the system will allow users to pick several historical sites and tourist attractions on the map and build an optimum route. The algorithm will consider the distance between places, travel time estimates, and the historical value of each location.

Shortest Path Algorithm Optimization: The shortest path algorithm will be optimized in order to minimize calculation time and ensure efficient route design. This will entail designing efficient data structures and algorithms to improve system performance.

Backend Services: A backend server will be used to maintain user data and provide extra capabilities such as user authentication, user preferences, and historical data analysis.

Data Sources: The system will rely on information gathered from a variety of sources, including government historical site databases, travel blogs, and social media. The information will be utilized to construct a comprehensive and up-to-date database of Sri Lanka's historical sites and tourist attractions.

Integration: To improve functionality and user experience, the system will relate to third-party services such as Google Maps and social networking sites.

Security measures will be used to secure user data and prevent unwanted access. This will include systems for safe data storage, encryption, and authentication.

3.2 System Development and Implementation

Gathering needs: The first phase is to gather requirements for the Histomind app from stakeholders, which covers user and system requirements. To evaluate the needs of potential customers, surveys and interviews are conducted, as well as talks with stakeholders.

Design: The system architecture, user interface design, and database schema are created based on the requirements acquired in phase one. This process entails creating a high-level design document that includes the application flow, functional and non-functional requirements, and database design.

Development: Once the design is complete, the Histomind app is built using the suitable technological stack. During the development process, the front-end and back-end modules are coded, integrated, and tested individually.

Integration and testing: The Histomind app relate to third-party APIs at this phase, and the system is rigorously tested for performance, security, and usefulness. Unit tests, integration tests, and system tests are among the tests.

Deployment: The Histomind app is deployed to the production environment once it has been thoroughly tested. This step involves configuring the server environment, configuring the database, and installing the required applications.

Maintenance and support: Following deployment, the Histomind app receives maintenance and support to maintain its proper operation. This includes monitoring the system, dealing with any difficulties or defects that develop, and upgrading the system to include new features or functionality.

Deployment: The Histomind app is deployed to the production environment once it has been thoroughly tested. This step involves configuring the server environment, configuring the database, and installing the required applications.

Maintenance and support: Following deployment, the Histomind app receives maintenance and support to maintain its proper operation. This includes monitoring the system, dealing with any difficulties or defects that develop, and upgrading the system to include new features or functionality.

User training and documentation: Stakeholders are given user training sessions on how to utilize the app. A user manual is also being written to explain how to use the Histomind software.

3.2.1 Feasibility Study

Technical feasibility:

The system's technical practicality will necessitate the integration of numerous technologies such as GPS, map APIs, and machine learning algorithms. These technologies are generally available and have been widely employed in previous systems, making the suggested system technically practical.

- Collaborative Filtering: This algorithm proposes historical sites and tourist attractions based on comparable users' likes and habits. The system may propose comparable historical landmarks and neighboring tourism attractions to users based on their search and visit history.

- Content-Based Filtering: Based on the user's choices and interests, this algorithm proposes historical sites and tourist attractions. The algorithm examines the user's search history and recommends historical sites based on historical significance and tourism attractions based on relevance to the user's interests.

- Clustering is a machine learning approach that groups together comparable data elements. Clustering can be used in this component to group historical sites and tourist attractions based on characteristics such as historical relevance, location, popularity, and visitor ratings.

- Decision Trees: Decision trees are a common machine learning approach for classifying data. Decision trees may be used in this component to identify historical sites and tourism attractions based on their historical importance, popularity, and visitor ratings.

- Shortest Path technique: This technique may be used to find the shortest path between several historical sites and tourist attractions that the user has chosen. This algorithm may be improved to minimize computing time and provide the consumer with a faster answer.

    - Dijkstra's Algorithm is a graph search algorithm that finds the shortest path between a starting node and all other nodes in a weighted graph. It operates by keeping track of a set of visited nodes and a priority queue of unvisited nodes, with the priority of a node in the queue determined by its distance from the beginning node. Iteratively, the method picks the unvisited node with the shortest distance and relaxes the distances of its nearby nodes, changing their priority in the queue as needed. When a node is visited, Dijkstra's Algorithm finds the shortest path to it, making it an optimum solution.

    - A* (A-star) Algorithm is a graph traversal and path search algorithm that combines the advantages of Dijkstra's Algorithm and greedy best-first search. A* is an informed search algorithm that estimates the distance to the objective as well as the real cost of traveling from one node to another using a heuristic function. The heuristic function assists A* in prioritizing searching along the most promising path to the destination node, minimizing the search space and increasing the algorithm's efficiency. A* algorithm is also guaranteed to find the shortest path if the heuristic is admissible (never overestimates the distance to the goal).

- Reinforcement Learning: Reinforcement learning may be used to improve the route planner by considering aspects such as traffic congestion, weather, and time of day. The user may save time and visit more historical sites and tourist attractions in a shorter amount of time by optimizing the route planner.

- Neural Networks: Image recognition using neural networks may be used to identify historical sites and tourism destinations based on photographs. This may be utilized to give the user more accurate recommendations.

Economic feasibility:

The cost of developing the system will be determined by several factors, including the size of the development team, the length of the project, and the technologies employed. However, the system's potential benefits, such as increased tourism and money for the Sri Lankan economy, make it fiscally feasible.

Operational feasibility:

To offer accurate information about historical sites and neighboring tourist attractions, the system will require the assistance of key agencies such as the Sri Lanka Tourism Development Authority and the Department of Archaeology. However, the system is practically practicable due to the availability of such information and the willingness of these agencies to collaborate.

Legal feasibility:

The system must comply with various rules and regulations in Sri Lanka, such as data privacy legislation and tourist restrictions. However, if these laws and regulations are followed, the system can be legally viable.

3.3 Work Breakdown Structure

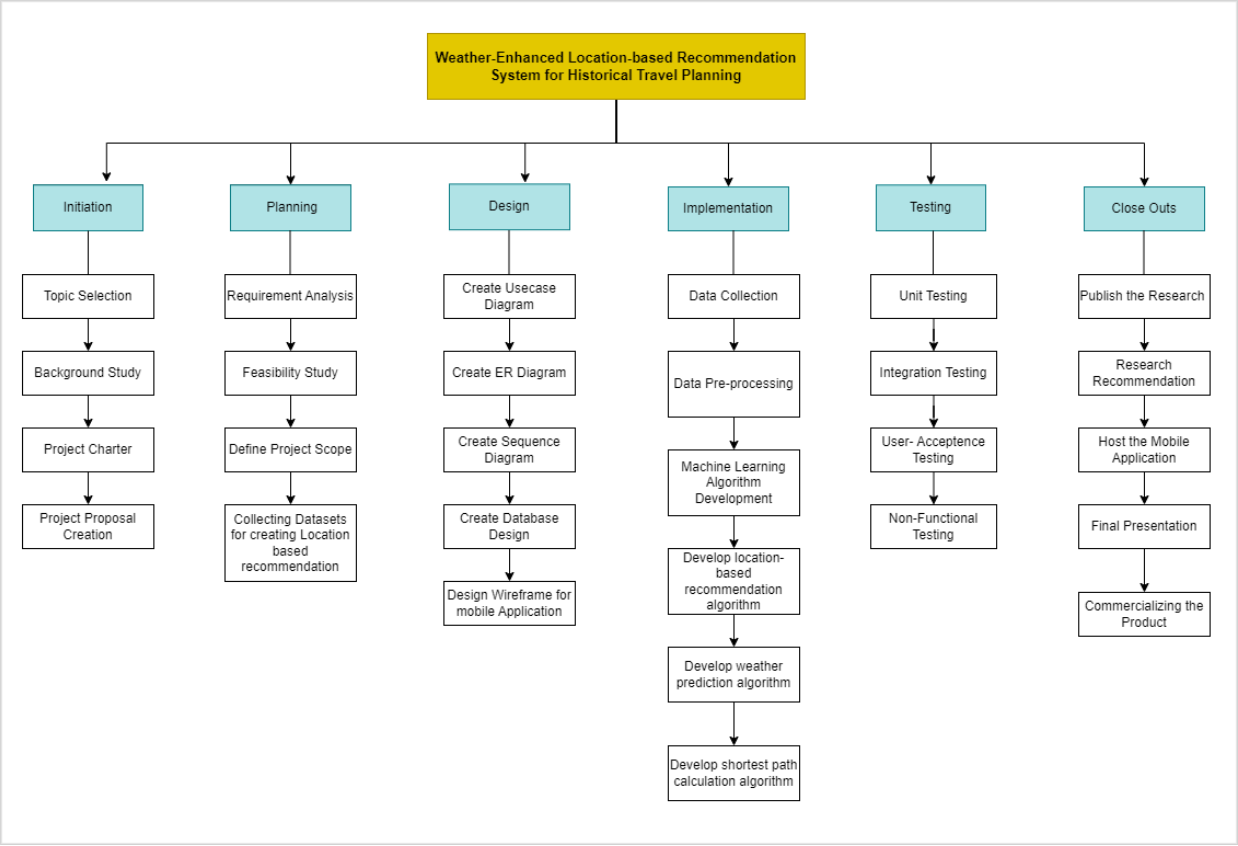
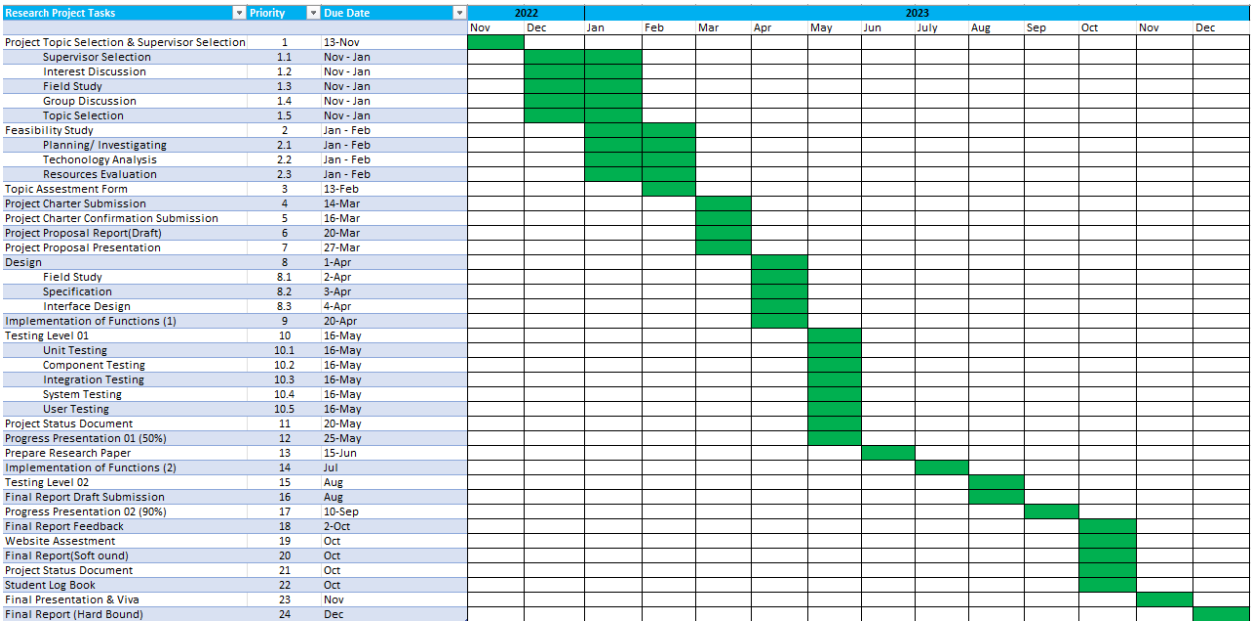


Figure 3.4: Work Breakdown Structure

3.4 Gantt Chart



Research Project Tasks	Priority	Due Date
Project Topic Selection & Supervisor Selection	1	13-Nov
Supervisor Selection	1.1	Nov - Jan
Interest Discussion	1.2	Nov - Jan
Field Study	1.3	Nov - Jan
Group Discussion	1.4	Nov - Jan
Topic Selection	1.5	Nov - Jan
Feasibility Study	2	Jan - Feb
Planning/ Investigating	2.1	Jan - Feb
Techonology Analysis	2.2	Jan - Feb
Resources Evaluation	2.3	Jan - Feb
Topic Assestment Form	3	13-Feb
Project Charter Submission	4	14-Mar
Project Charter Confirmation Submission	5	16-Mar
Project Proposal Report(Draft)	6	20-Mar
Project Proposal Presentation	7	27-Mar
Design	8	1-Apr
Field Study	8.1	2-Apr
Specification	8.2	3-Apr
Interface Design	8.3	4-Apr
Implementation of Functions (1)	9	20-Apr
Testing Level 01	10	16-May
Unit Testing	10.1	16-May
Component Testing	10.2	16-May
Integration Testing	10.3	16-May
System Testing	10.4	16-May
User Testing	10.5	16-May
Project Status Document	11	20-May
Progress Presentation 01 (50%)	12	25-May
Prepare Research Paper	13	15-Jun
Implementation of Functions (2)	14	Jul
Testing Level 02	15	Aug
Final Report Draft Submission	16	Aug
Progress Presentation 02 (90%)	17	10-Sep
Final Report Feedback	18	2-Oct
Website Assestment	19	Oct
Final Report(Soft ound)	20	Oct
Project Status Document	21	Oct
Student Log Book	22	Oct
Final Presentation & Viva	23	Nov
Final Report (Hard Bound)	24	Dec

Figure 3.5: Gantt Chart

4. BUDJET AND BUDGET JUSTIFICATION

Component	Estimated Budget
Travelling Cost	15,000/=
Deployment Cost	12,000/=
Mobile app hosting on play store	8,000/=
Mobile app hosting on app store	8,500/=
3D development and deployment	100,000/=
Testing	2,500/=

Server	6,000/=
Other (internet. and Phone bills)	5,000/=

Table 4.1: Budget

5. PERSONAL AND FACILITIES

Name	Key Tasks
	▪ Gathering historical place data from reliable sources and creating a database ▪ Creating a recommendation system that suggests historical places based on current location and historical value. ▪ Implementing a route planner that generates the shortest path between multiple selected historical places. ▪ Integrating map and location services to retrieve current user location and plot historical places on the map. ▪ Optimizing the shortest path algorithm (such as Dijkstra or A*) for efficient route planning ▪ Developing a mobile application interface for the user to access the recommendation and route planning features. ▪ Testing and debugging the system to ensure accuracy and reliability. ▪ Deploying the system on a reliable hosting service for user access

Table 5.1: Description of Personal and Facilities

6. PROJECT REQUIREMENTS

6.1 Functional Requirements

Location-based recommendation mechanism:

- The system must have access to the user's current location.
- The system must be able to suggest historical places based on the user's current location.
- Along with historical sites, the system could recommend neighboring tourism attractions.
- The recommendation algorithm must give historical value precedence over popularity.

Route Planner:

- On the map, the user must be able to pick numerous historical locations.
- The system must find the shortest path between all the destinations.
- To achieve effective routing, the system must employ an optimum shortest path algorithm.

User Interface:

- The mobile app must feature a user-friendly UI.
- The proposed historical sites and nearby tourist attractions must be displayed on the interface.
- The interface must map the specified historical locations.
- The interface must show the recommended path as well as choices for customizing it.

Optimization:

- To reduce computing costs, the system must optimize the shortest path algorithm.
- Based on real-time traffic data, the system must optimize the user's path.

Data Management:

- The system must save information on historical sites and tourist attractions.
- To maintain data accuracy, the system must update data on a frequent basis.
- To reduce computational costs, the system must have effective data management.

Security:

- The system must maintain the privacy and security of user data.
- Data storage and transmission must be secure in the system.
- User authentication and access control must be included in the system.

6.2 Non-Functional Requirements

Performance:

User requests for location-based suggestions and route planning should be handled rapidly by the system.

Reliability:

Because visitors may rely on it for trip plans, the system should be dependable and have little downtime.

Scalability:

The system should be able to accommodate an increasing number of users and locations without experiencing substantial performance reduction.

Security:

The system must be secure, and user data must be kept safe. User location and travel plans, for example, should be encrypted and securely kept.

Usability:

The system should be simple to use, with a simple interface and easy-to-follow instructions for travelers.

Accessibility:

All users, including those with disabilities, should be able to utilize the system, and it should adhere to accessibility requirements.

Compatibility:

To optimize user accessibility, the system should be interoperable with a wide range of mobile devices, operating systems, and web browsers.

Maintainability:

The system should be simple to manage, and upgrades should be simple to install without generating downtime or interruptions.

7. COMERCIALIZATION

7.1 Target Audience and Market Space

Target Audience

- Tourists
- Explorers
- Sri Lankan tourism industry professionals.
- Sri Lankan government officials responsible for promoting and developing the tourism industry.
- Technology enthusiasts.

Market Space

- Visitors to Sri Lanka, particularly those interested in historical sites and cultural tourism.
- Tour firms and travel agencies who offer Sri Lanka as a destination and seek to provide their clients with a unique and personalized experience.
- Local tour guides who may utilize the app to improve their services and provide their consumers with a more engaging experience.
- Sri Lankan government organizations and tourist agencies can utilize the app to promote historical sites and encourage tourism.
- Technology businesses and investors with an interest in the tourist sector might utilize the app as a case study to build comparable solutions in other nations.

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HistoMind : AI-Powered Historical Place navigator

Project Proposal Report

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B.Sc. (Hons) Degree in Information Technology Specialising in Information Technology

Department of Information Technology

Sri Lanka Institute of Information Technology
Sri Lanka

February 2023

Declaration

I declare that this is our own work, and this proposal does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any other university or Institute of higher learning, and to the best of our knowledge and belief, it does not contain any material previously published or written by another person except where the acknowledgment is made in the text.

Name	Student ID	Signature
Munasinghe N.N.De.Z	IT20122478	

The above candidates are carrying out research for the undergraduate dissertation under my supervision.

Supervisor: Mr. S.M.B Harshanath

Signature: Date: 05/08/2023

Co-Supervisor: Dr. Samantha Rajapaksha

Signature:

Abstract

This research project aims to create a high-quality hologram of historical places using 3D modeling techniques. The objective is to create an attractive and realistic hologram that can captivate tourists who have only seen these historical sites in two-dimensional pictures or videos. The research will address two main problems: how to use 3D modeling techniques to create accurate and realistic objects, and how to make a better-quality hologram with good texture and lighting. The research will use sculpting tools to shape the objects into a 3D representation and apply digital textures to create a more realistic appearance. Lighting and rendering techniques will be utilized to produce shadows and highlights, giving the objects a more physical appearance. Additionally, the research will investigate the use of a mist wall to display the hologram for a more realistic effect, although this may be limited by budget constraints. The study aims to fill a research gap by creating a cheaper and high-quality hologram of historical sites that can be viewed by tourists, and can potentially have broader applications in the tourism and education sectors.

Table of Contents

1. INTRODUCTION

The technique of 3D modeling includes implementing specialized software to produce a three-dimensional representation of an object or scene. Applications for the completed 3D model include visualizations, simulations, animations, and video games, among other things.

Blender & Google Colab are only a few of the numerous techniques and tools available for 3D modeling. Each method has its own advantages and disadvantages, and some objects or settings may suit it more than others. The capacity to alter the model's geometry to produce various shapes and forms is one of the most crucial elements of 3D modeling. Vertices, edges, and faces can be modified, as well as by applying deformers and other modifiers.

A 3D model can be transferred to a variety of file formats once it is finished so that it can be utilized by different programs for 3d modeling.

Contrarily, holography is a process that makes use of light to render a scene or object in 3 dimensions. Holography captures the entire three-dimensional structure of an object, as opposed to conventional photography, which only captures a two-dimensional image of a substance.

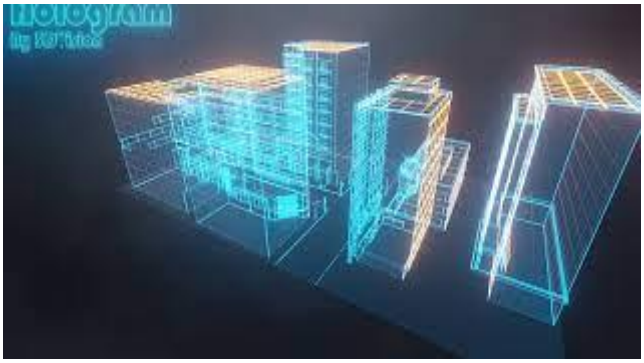
Holograms and 3D models can both be used to represent three-dimensional objects, but they all have unique qualities and uses. Holograms, for instance, have the benefit of being actual things that can be seen without the use of special tools, whereas 3D models are frequently applied to virtual or digital applications.

Holography and 3D modeling are efficient methods for producing and visualizing three-dimensional structures and situations, and they have a variety of uses in a number of sectors.

2. BACKGROUND AND LITERATURE SURVEY

Meanwhile in the 3d modeling and holography there are lots of software and applications. Using Polygonal modeling, NURBS modeling and sculpting we can get a better 3d model. Making a 3D models of historical places and turn them to a hologram and display it with high quality with the cheapest way is the hardest thing because making a large hologram costs more and to get a good quality we must have a high quality 3d model to display.

Making holograms and 3D model of most famous historical places with high details is some kind of hard but making a good quality hologram can impress the audience specially the tourists who have seen them only with 2d pictures and videos.



3. RESEARCH GAP

The research gap will be fixed in one of the following ways. The examples that below show how specific features have been discussed in earlier studies. These are simply a few of the features.

1 - Making a cheaper good quality hologram.

2 - 3D modeling historical places with great quality and include every important things.

3 – Try to make a larger hologram with mist wall .(For more realistic)

Features	**Hologram Quality**	**Larger hologram**	**3d model quality**
Research[1]	✗	✗	✓
Research[2]	✗	✓	✗
Histomind	✓	✓	✓

4. RESEARCH PROBLEM

In Sri Lanka I never have seen a hologram in my life so in this research we will make it happen. So, the 1st research problem is how can 3D modeling techniques be used to create realistic and accurate objects. In that problem we can use Accuracy and realism can be increased by using measurements and pictures as references of the object or scene that is being modeled and we can do Sculpting. Sculpting means, by employing digital sculpting tools, sculpting entails molding an object's shape into a 3D depiction. When designing organic shapes like characters and animals, this approach is frequently used. By applying these approaches, 3D modeling can be utilized to produce objects that are accurate and realistic replicas of real-world items or settings in addition to being eye-catching.

Another Problem is how we make a better hologram with good quality. In that case we have create a good quality 3D model and use mode textures to get more realistic view and make the Hologram.

5. OBJECTIVES

Main Objective

The main objective of the part is to make a higher quality hologram of historical places to take the attraction.

Specific Objectives

A 3D model is "textured" by adding textures to its surface to give it a realistic appearance. To give the thing a more genuine physical appearance, this may entail including details like lumps, scrapes, and flaws. A realistic 3D model must have realistic lighting and rendering. While your lighting can be utilized to produce shadows and highlights, rendering is the process of turning a 3D model into an end result or animation.

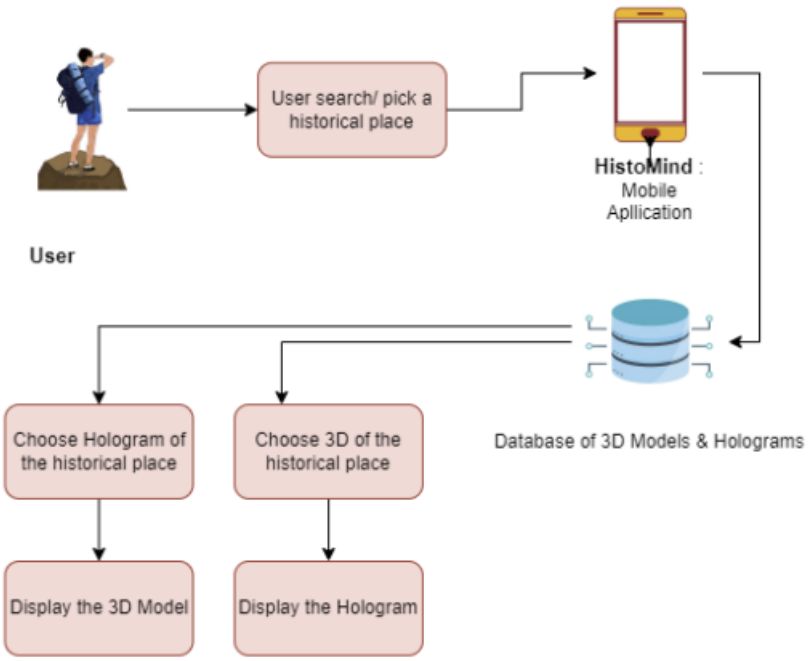
Other Objectives

If we get enough budget, there is a plan to make a mist wall and display the hologram on it. It costs lots of money, so it is a little bit hard to make that.

6. METHODOLOGY

The Purpose of my function is to provide a 3d modeling and holographic experience of historical places. It uses the Unreal Engine 5 to create an interactive 3D model of historical places in sri Lanka. The function displays a hologram of the historical place allowing the user to explore and interact with it. Additionally, the function is designed to be cost effective ensuring the experience is accessible to all.

7. SYSTEM DIAGRAM



8. TECHNOLOGIES

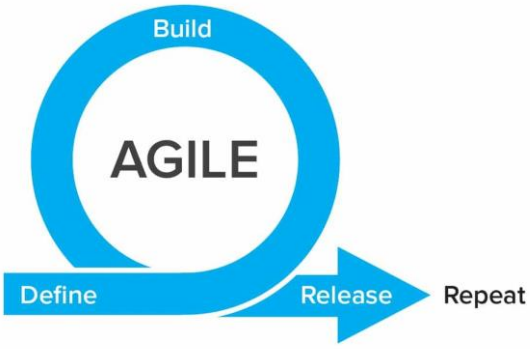
DaVinci Resolve 16

Blender

Unreal Engine

9. SOFTWARE SOLUTIONS

The process of setting up software takes time; we have less than a year to develop the system, and every step must be finished quickly. As an outcome, I have chosen agile software development, which is appropriate for projects that require speedy and effective implementation. Agile development stresses gradual and iterative development, which allows for greater flexibility in the development process. This implies that modifications and changes can be made as the project advances.



Requirement Gathering

- By another research about this topic.
- Other 3d models that already published.
- About Hologram research.

Design

Design a 3D model a historical place and covert the 3d model to a hologram. By using the above technologies.

Develop

Developing the hologram interface because others have to see the hologram project.

Testing

During the test period, it means that We have to check that all the function are going great and working well. So, in that case we can look for our flaws so we can fix those bugs until we get our final outcome.

Deploy

When we come the deploy stage we have to introduce to small group of strangers because we can get the reactions and feedbacks from them and identify our mistakes.

10. DESCRIPTION OF PERSONAL AND FACILITIES

Student ID	Task Description
IT20122478	Making a 3D model of a historical place with high quality. Make a hologram for that 3D model. Make a display for the hologram because other have to see that.

11. SOFTWARE SPECIFICATIONS, RESEARCH REVIEW, DESIGN COMPONENTS, PROJECT REQUIREMENTS

User Requirements	Design Requirements	Review
Users are allowed to interact with the hologram of historical places	High quality display and the display of the hologram that I'm going to make.	Reviewed by some 3D model workers in the industry.

Functional Requirements

Display with high definition: The hologram needs to be able to show graphics with sharp details and high quality. This is necessary to produce engaging and realistic holographic experiences.

To make the hologram interaction authentic and immersive, the hologram display should be visible from a variety of perspectives. Utilizing specialized optics and projection technologies, this is accomplished.

The hologram screen ought to have a sizable viewing surface to support a variety of holographic images, from little things to expansive scenes.

Non-Functional Requirements

The hologram display should be capable of displaying holographic pictures without lag or delays, and it should have quick response times. This is necessary to produce a seamless and engaging user experience.

The display should be simple to maintain and service, with any required modifications or repairs being able to be completed rapidly. By doing this, downtime is reduced and a long duration of the display's availability is maintained.

12. JUSTIFICATION

Both holography and 3D modeling are very efficient processes for creating and viewing three-dimensional objects and situations, while they each have unique benefits and applications. They are useful tools now and will continue to be so in the future across a wide range of companies.

Two examples of 3D modeling methods with distinct benefits and drawbacks are Blender and Google Colab. One of the most significant features of 3D modeling is the capacity to change the geometry of the model to produce different shapes and forms. Vertices, edges, and faces can be changed, as well as deformers and other modifiers, to achieve this.

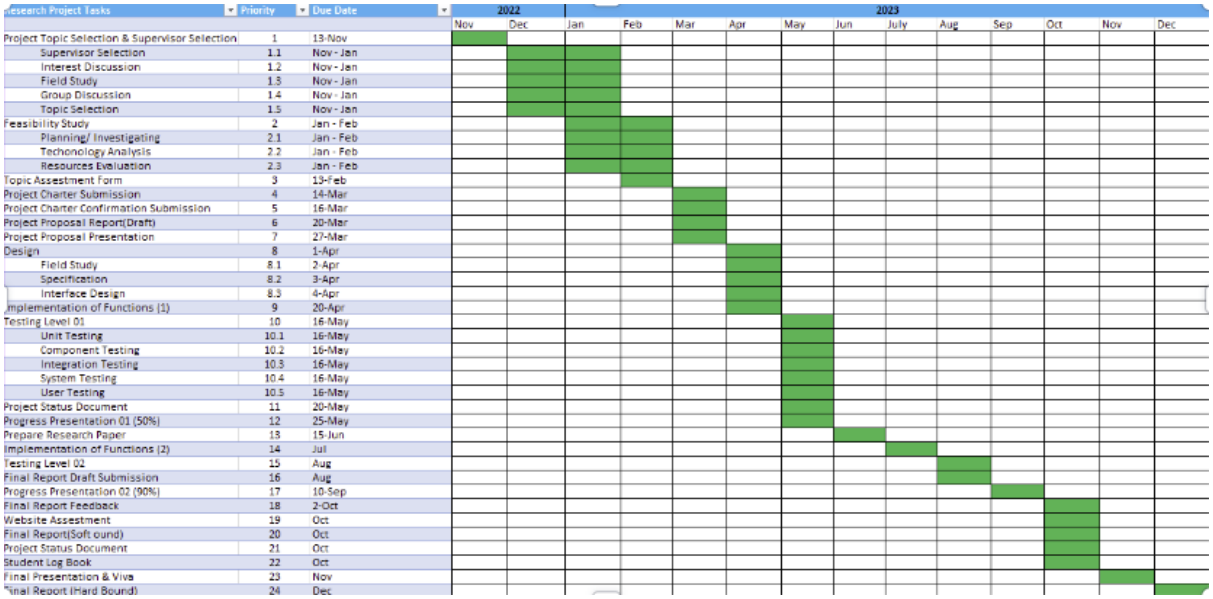
13. CONCLUSION

In conclusion, the goal of producing higher-quality holograms of historical locations is an admirable project that has the potential to significantly improve visitor appeal and experience. Holographic representations are now more immersive, realistic, and detailed than ever before thanks to cutting-edge technology and methods.

By lessening the amount of physical traffic and wear and tear on the site itself, these holograms can not only be utilized to present historical monuments in a fresh and interesting way but also to maintain and protect them. This is particularly crucial for delicate or sensitive regions that could be affected by many visitors.

Holographic representations of historical sites have the potential to revolutionize both tourism and education. It can draw more tourists and assist to bring these sites to life in a way that was before unattainable by offering a more immersive and engaging experience.

14. GRAND CHART



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Techonology Analysis	2.2	Jan - Feb
Resources Evaluation	2.3	Jan - Feb
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Final Report(Soft ound)	20	Oct
Project Status Document	21	Oct
Student Log Book	22	Oct
Final Presentation & Viva	23	Nov
Final Report (Hard Bound)	24	Dec

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AI-Powered Historical Place navigator

TMP-23-378

Project Proposal Report

Priyaratne K.K.M.M – IT20008178

B.Sc. (Hons) Information Technology

Specialized in Information Technology (IT)

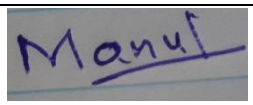
Department of Information Technology

Sri Lanka Institute of Information Technology Sri Lanka

February 2023

DECLARATION

To the best of our knowledge and belief, this proposal does not contain a previously published or written by another person material, except where the acknowledgement is made in the text. I henceforth declare that this is my own work, and this proposal does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or Institute of higher learning.

Name	Student ID	Signature
Priyaratne K.K.M.M	IT20008178	

The above candidates are carrying out research for the undergraduate Dissertation under my supervision.

05/08/2023

Signature of the supervisor

Date

(Mr. S.M.B Harshanath)

05/08/2023

Signature of the co-supervisor

Date

(Mr. Samantha Rajapaksha)

ABSTRACT

A research topic that focuses on creating algorithms and methods for automatically recognizing historical locations from digital photos is historical places identification using image processing. With the help of visual cues collected from photographs, this research aims to automate the identification and classification of historical locations.

The suggested method would include applying image processing techniques to extract elements like textures, colors, forms, and patterns from digital photographs of historic locations. In order to categorize fresh photographs based on their visual resemblance to already recognized historical locations, a machine learning model would then be trained using these attributes.

The system would be helpful for several purposes, such as tourism, the preservation of cultural assets, and historical research. The technique could make it easier for tourists to travel through and learn about historical sites by automatically identifying historical locations from digital photos. By pointing up historic sites that might be in danger of being damaged or destroyed, it could also help with the protection of cultural heritage.

Keywords: Historical places, Image processing, Machine learning

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List of abbreviations

GPS	Global Positioning System
CV	Computer Vision
TIFF	Tagged Image File Format
CNN	Convolutional Neural Network
DB	Database
ML	Machine Learning

1. INTRODUCTION

Historical places are an important part of our cultural heritage, and it is important to preserve and promote them for future generations. However, identifying and classifying historical places can be a challenging task, especially when dealing with large numbers of sites spread across a wide geographic area.

Image processing techniques have emerged as a promising tool for identifying and classifying historical places. By using computer algorithms to analyze digital images of historical sites, it is possible to automatically identify key visual features that are unique to each location. These features can then be used to train machine learning models that can classify new images based on their similarity to previously identified historical places.

The use of image processing to identify historic locations may have a variety of advantages. For instance, the capacity to swiftly identify and locate historical sites of interest can be useful to tourists, while scholars can use the system to quickly evaluate massive amounts of data and find trends in the distribution of historical sites. Also, by highlighting locations that might be at danger of destruction or damage, the system might aid in the preservation of cultural heritage.

1.1 Background and Literature survey

Historical places identification using image processing is an interesting and challenging research area in the field of computer vision and image processing. The identification of historical places from images is a challenging task due to the variability in the appearance of historical places, differences in illumination, viewpoint, scale, occlusion, and clutter in the images. Researchers have proposed various techniques to address these challenges and improve the accuracy of historical place identification.

In recent years, the use of deep learning algorithms, such as convolutional neural networks (CNNs), has shown promising results in historical place identification. CNNs can learn hierarchical features from the images and achieve state-of-the-art results in image classification tasks. Researchers have proposed various CNN architectures, such as VGG, ResNet, and Inception, for historical place identification.

Extrapolating pertinent elements from images is a crucial part of identifying historical locations. Many feature extraction techniques, including Histogram of Oriented Gradients (HOG), Scale-Invariant Feature Transform (SIFT), and Speeded Up Robust Features (SURF), have been proposed by researchers. These methods are capable of extracting from images robust and individual traits that can be applied to the identification of historic places.

Other image processing techniques, including principal component analysis (PCA), discrete Fourier transform (DFT), and local binary patterns (LBP), are also being studied as potential tools for identifying historical locations. These methods can increase the accuracy of historical site identification by extracting relevant details from the images.

Researchers have also investigated the use of other technologies, such GPS and augmented reality, for the identification of historical locations. While augmented reality can offer users an immersive exploration of historical places, GPS can provide location data that can be used to identify historical places.

The identification of historical sites through image processing is a difficult and intriguing study field that may help with the promotion and protection of historical sites. The accuracy and effectiveness of existing procedures must be improved, and new methods and technology for historical location identification must be explored.

1.2 Research Gap

The requirement for more diverse and representative datasets is one of the main research gaps in the identification of historical locations using image processing. The application and generalizability of the developed algorithms are constrained by the fact that most existing datasets concentrate on certain geographic areas or categories of historical locations. Further work is required to create extensive datasets that span a variety of historical locations from various areas and eras and that document changes in lighting, weather, and other environmental factors.

Another research gap is the need for more effective techniques for feature extraction and selection. Current approaches rely on handcrafted features or deep learning-based feature extraction, but there is still room for improvement in terms of accuracy and computational efficiency. Furthermore, there is a need for more research on feature selection, which can help reduce the dimensionality of the feature space and improve the performance of machine learning models.

Another area that requires further investigation is the development of more effective techniques for cross-domain transfer learning. Historical place identification often requires learning from limited annotated data, which can lead to overfitting and poor generalization. Transfer learning techniques can help alleviate this problem by leveraging knowledge from related domains or tasks, but more research is needed to identify effective transfer learning methods for historical place identification.

Finally, there is a need for more research on the integration of historical place identification systems into real-world applications, such as tourism and cultural heritage preservation. Such systems must be user-friendly and reliable and must take into account the needs and preferences of different user groups. More efforts are needed to develop systems that are accessible to a wider range of users and that can provide value to different stakeholders in the cultural heritage sector.

Overall, even though image processing has made tremendous progress in the identification of historical sites, there are still a lot of research gaps that need to be filled in order to increase the precision, effectiveness, and usability of these systems.

1.3 Research Problem

The research problem in historical places identification using image processing is how to develop a reliable and accurate image recognition system that can effectively identify and classify historical landmarks or buildings based on digital images.

One of the key challenges in this field is the development of algorithms that can accurately distinguish between different types of buildings and landmarks, even when the images may have variations in lighting, angle, or resolution. Additionally, some historical landmarks may have undergone significant changes over time, making it challenging to identify them based on historical images alone.

The availability and caliber of data present another problem. Despite the abundance of image data that is accessible online, it may not always be correctly labeled or categorized, making it challenging to use for training machine learning algorithms. It can also be difficult to compile a complete dataset for all historical landmarks because they can be dispersed throughout a number of different locales.

Additional issues include the requirement to verify that the system is both accurate and strong enough to work consistently in real-world circumstances, as well as the development of strategies to account for the changes in architectural styles across different cultures and locations.

Create an effective and dependable system that can correctly identify and categorize historical landmarks while taking into account variations in image quality, historical changes, and cultural differences is the overall research problem in the field of historical places identification using image processing.

2. OBJECTIVES

2.1 Main Objective

Using image recognition technology, the fundamental goal of historical place identification is to identify historical sites and landmarks quickly and precisely through visual analysis. This has applications in several industries, including tourism, instruction, and the preservation of cultural heritage. Technology can identify the historical location represented in an image by analyzing aspects like architecture, landscapes, and distinctive cultural elements using image recognition algorithms. Users may benefit from this by getting more context and information about the historical site, its importance, and its history. By giving precise and comprehensive information on the site, which can be used to guide restoration and conservation activities, technology can also be used to help preserve historical sites.

2.2 Specific Objectives

Following are some specific goals that could be pursued in the context of using image recognition technology to identify historical sites:

1. Develop an image recognition system capable of accurately and precisely identifying historical locations and landmarks by examining numerous visual characteristics such as architectural styles, landscapes, and distinctive cultural components.
2. Compile a comprehensive database of historical sites and landmarks from around the world, including images, descriptions, and historical information, to be used as a reference for the image recognition system.
3. Train the image recognition system using machine learning techniques, and continuously improve its accuracy and efficiency through feedback and updates from users.
4. Provide a user-friendly platform, like a smartphone app or website, that allows users to contribute images of important landmarks and historical places and obtain details about the site's significance, history, and cultural setting.
5. Make use of the image recognition system and database to inform users about important historical locations and landmarks in the interest of encouraging tourism, education, and the preservation of cultural heritage.
6. Work together along with local groups and organizations to make sure that the data the image recognition system provides is accurate, sensitive to cultural differences, and respects the traditions and setting of the area.
7. Create collaborations with tourism and heritage organizations, governmental bodies, and other stakeholders to encourage the usage of the image recognition system, increase its effect, and promote its diffusion.

3. METHODOLOGY

The following steps make up the methodology for using image processing to identify historical places:

- Image acquisition: The first phase is to gather images of important historical sites. A variety of techniques, including the use of drones and ground-level imaging, can be used to accomplish this.
- Pre-processing: Noise, blur, or other distortions may be included in the acquired images. Pre-processing is therefore required to improve the images' quality. Noise reduction, image smoothing, and contrast enhancing are examples of pre-processing techniques.
- Feature extraction: The pertinent features are taken out of the pre-processed images in this step. The characteristics can be visual characteristics like texture, color, and intensity, or geometric characteristics like edges, corners, and forms.
- Feature matching: The features as are extracted from the images as well as those in a reference database have been compared. The reference database includes characteristics of popular locations from history.
- Classification: The images can be classified as belonging to a certain historical place or not if the features are compared with the reference database. Machine learning algorithms like Support Vector Machines (SVM) and Random Forests can be used for this.
- Localization: Using the image's GPS coordinates, the location of the historic site can be verified after it is identified.
- Visualization: Maps or augmented reality techniques can be used to show the location of a recognized historic location.

In all, collecting images, pre-processing them, extracting features, comparing them with a reference database, classifying the images, localizing the historical place, and visualizing it comprise the methodology for identifying historical places using image processing. The effectiveness of the pre-processing techniques, the resilience of the feature extraction algorithms, the correctness of the reference database, and the quality of the acquired images all have a role in how accurate the methodology works.

3.1 System Architecture

The system architecture for historical places identification using image processing typically involves several stages of image processing and analysis, which can be broadly divided into the following steps:

Data Acquisition: The system first acquires a digital image of a historical landmark or building. This can be done through various sources such as online image databases, social media platforms, or user-submitted images.

Preprocessing: Preprocessing is done on the acquired image to improve its quality and get rid of noise and distortion. Techniques like image scaling, filtration, or color correction can be applied to this.

Feature Extraction: In this stage, features of the historical landmark or building are extracted from the preprocessed image. These features may include texture, color, shape, or structural characteristics.

Classification: The historical building or landmark is then put into a certain category or kind using the retrieved features. Convolutional neural networks (CNNs) and support vector machines are example of machine learning methods that can be used to do this (SVMs).

Verification: Once the historical landmark or building is classified, the system verifies the classification by comparing it with other images of the same landmark or building from different sources.

Output: The system then outputs the classification results together with any additional details concerning the historical structure or monument, such as its geographic location, architectural style, or historical significance.

The system architecture may also include a feedback loop that continuously improves the accuracy of the classification model by incorporating user feedback or additional data. Additionally, the system may be designed to work in real-time, allowing users to capture and classify historical landmarks or buildings on the spot.

3.2 System Development and Implementation

Development and implementation of systems for historical sites the design of an automated system that can identify historical structures and sites from digital images is known as identification using image. The steps in the process are as follows.

Planning: The project's scope, stakeholders, and system requirements must all be defined in the first stage. To do this, it is necessary to specify the kinds of historical sites the system will identify, the structure of the images used as input, and the desired results.

Data Collection: The following step is to gather images of famous buildings and places from various archives, online databases, and user-generated content. To help with identification, the images should be annotated with pertinent metadata, such as location and historical context.

Image Processing: The images are then processed using computer vision algorithms to identify and extract features that are unique to each historical place. This may involve techniques such as object detection, feature extraction, and image segmentation.

Machine Learning: A tagged dataset of historical images is used to train machine learning algorithms so that the system can identify historical structures and sites on its own. In order to obtain high accuracy, it is necessary to create a training set and test set of images, choose best machine learning model, and optimize the model's parameters.

Deployment: Once the system is trained and tested, it can be deployed in different settings, such as mobile apps, web-based applications, or standalone software. The deployment involves integrating the system with other technologies, such as location-based services, databases, and user interfaces, to enable users to interact with the system easily.

Maintenance and Improvement: To maintain the system's integrity and usability, constant maintenance and improvement are needed. This calls for regular updating of the training data and machine learning models, performance monitoring, and user feedback.

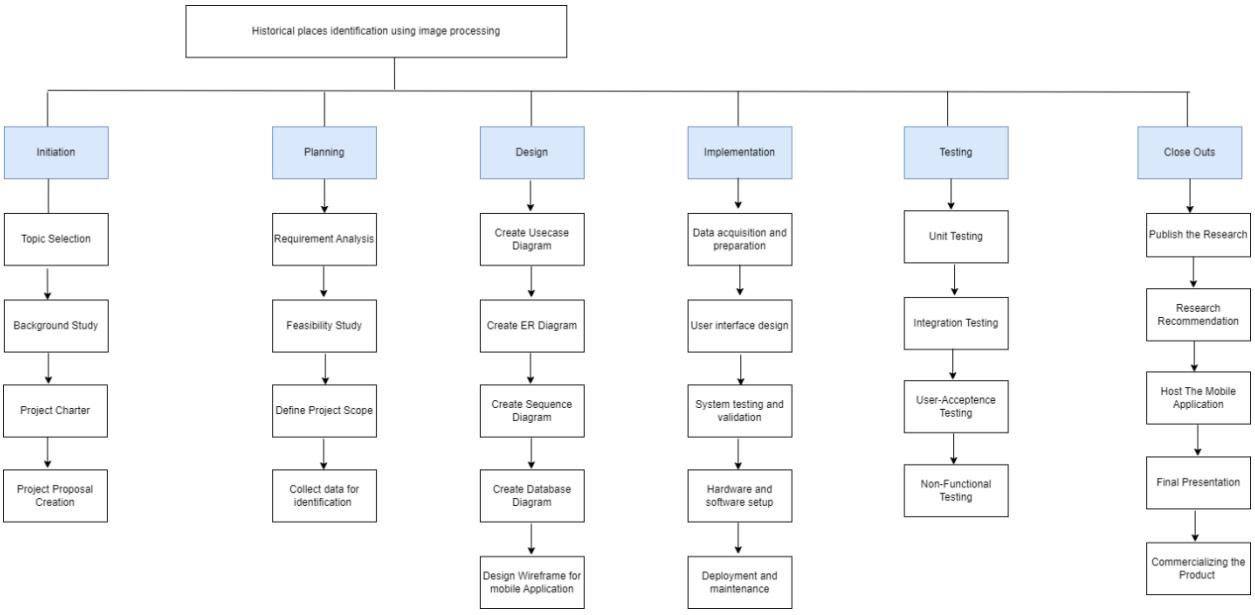
3.2.1 Feasibility Study

Here are some technologies, algorithms, and configurations that could be used for the task of identifying historical places using images.

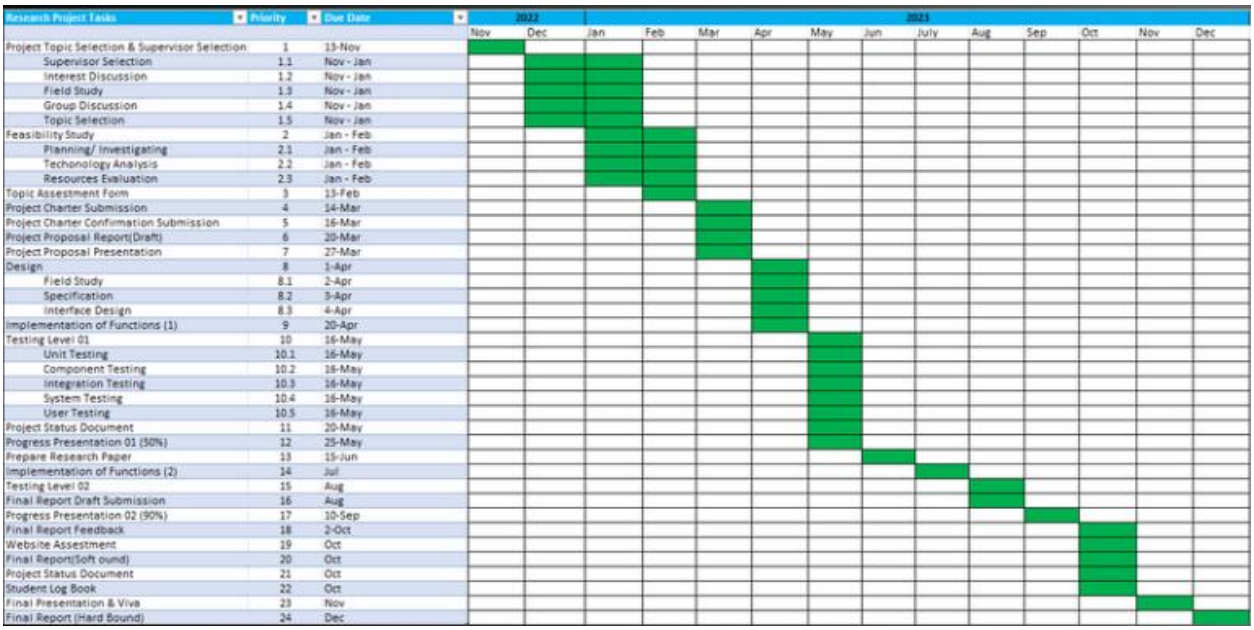
- Image recognition software: This type of software uses machine learning algorithms to identify and categorize images based on visual features. It can be trained to recognize specific landmarks, buildings, or other features that are indicative of historical places.
- Object detection algorithms: Object detection algorithms are used to identify specific objects within images. This could be used to identify specific historical landmarks within a larger image.
- Geographic information systems (GIS): Maps can have images uploaded to them using GIS tools, making it possible to identify historic places and their environs more precisely.
- Optical character recognition (OCR) software: Text within images can be recognized with OCR software. This could be used to identify identifying text or historical markers within an image.
- Convolutional neural networks (CNN): Images can be analyzed and classified using CNNs, a form of machine learning algorithm. They may be used to identify historical sites in images and have been employed in a range of image recognition applications. CNNs offer several advantages for historical places identification, including the ability to automatically learn features from the data, without requiring manual feature engineering. They can also be trained on large datasets of labeled images, allowing them to recognize patterns and features that are indicative of specific historical places. However, training a CNN can be computationally expensive and requires a large amount of labeled data. Additionally, CNNs may not be suitable for all types of historical places identification tasks, depending on the nature of the images and the specific features of interest.

Finally, the type of project and the resources available will determine the specific technologies, algorithms, and settings used. These tools can, however, be go into to identify historical places using images with careful thought and research.

3.3 Work Breakdown Structure



3.4 Gantt Chart



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4 BUDJET AND BUDGET JUSTIFICATION

Project Stage		Estimated Budget
Planning and Documentation	DEVELOPMENT	500/=
Development		10000/=
Testing		1000/=
Scope changes		1000/=
Project Management		1000/=
Server		1000/=
First phase marketing and sales		2000/=
Other (internet and Phone bills)		2000/=

5 PERSONAL AND FACILITIES

Name	Key Taks
Priyaratne K.K.M.M	• Requirements gathering and analysis • Collection and selection of images • Personal and facilities identification • Feature extraction

6 PROJECT REQUIREMENTS

6.1 Functional Requirements

Functional requirements are the features and capabilities that a system or software application must provide to meet the needs of its users. Here are some examples of functional requirements for a system designed to identify historical places using images.

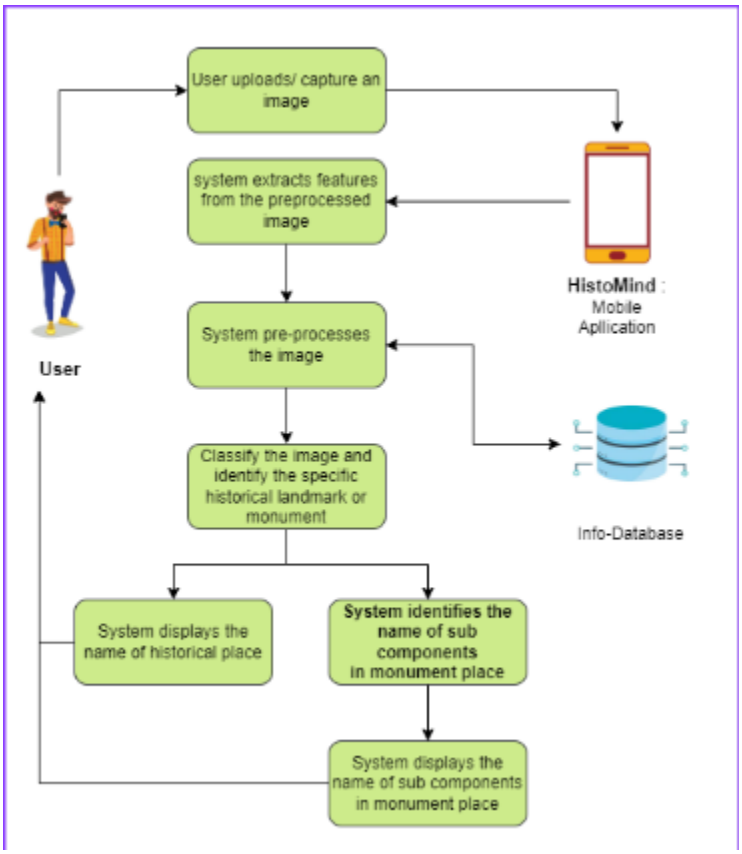
- ❖ The system should be able to collect a set of images of historical places from different sources, such as online databases, user submissions, or social media.
- ❖ The location should be able to be found by the system. matching the database's information
- ❖ The system should be able to store the images and associated metadata, such as the location and date of the image, to enable future retrieval and analysis.
- ❖ Based on user comments and new data, the system should be able to employ methods of machine learning to increase its accuracy and effectiveness over time.

6.2 Non-Functional Requirements

Following are some non-functional requirements that might be taken into account for an image recognition system used to identify historic places.

- Performance
- Accuracy
- Internet connectivity
- Facilities
- Reliability
- Collaboration

7.1 System Diagram



7.2 Technologies

7.3 Software Solutions

There are many software options available for doing image processing and computer vision tasks, for example identifying historic places.

- OpenCV: OpenCV is a free and open source toolbox for computer vision that offers functions for object detection, object recognition, and image processing. It can be applied to tasks such object recognition, feature extraction, and image matching.
- MATLAB: Tools for numerical computing, data analysis, and visualization are available by using the proprietary software platform called MATLAB. For tasks including feature extraction, image enhancement, and object detection, it provides a number of image processing and computer vision functions.
- TensorFlow: TensorFlow is a machine learning library that was created by Google and can be downloaded as open-source software. It offers tools for creating and refining machine learning models. It can be used for things like image categorization, image segmentation, and object recognition.

The tools and features offered by these software programs can be utilized to carry out tasks involving image processing and computer vision. The project's specific needs, the development team's level of expertise, and the resources at hand will all influence the software that is selected.

8. REFERENCES

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