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TOUR MANAGEMENT SYSTEM WITH AI

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APPROVAL FORM

The undersigned below inform with certainty that they have supervised the Information Technology student Francis K Katsande`s research entitled “Tour Management System with AI”, submitted in partial fulfilment of the requirements for the Bachelor of Science Honours Degree in Computer Science at the Bindura University of Science Education

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ABSTRACT

There is nothing more important than to be acquainted with the place you are planning to visit even before you get there. When it comes to visiting points of interest and recreational places, you need to at least have a glimpse of where you will be sleeping the food you will be eating, not to mention the activities being offered on that particular municipal. With the exponential increase in the number of tourists traveling from one place to another, it is not possible to ignore the need of providing all necessary information to the travellers before they spend money and time visiting the place. The only way to remedy this ever-growing problem, is using recommendation systems. The goal of this project was to build a recommendation system which provides all the necessary information to the sight sightseers thus helping them to easily plan their tour.

DEDICATION

I dedicate my dissertation work to my beloved family. Mostly my brother Blessing Katsande and my uncle Evans Chikowe whose words of encouragement and push for tenacity ring in my ears. I also dedicate this project to my church friend who have supported me throughout the process. And my girlfriend for being there for me throughout the entire program. I am forever indebted to your love

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Table of Contents

Chapter 1: Problem Identification

Introduction

Artificial intelligent has become a critical disruptor in almost everyday industry, including Tourism Industry. In Zimbabwe this idea is now slowly crawling in these sectors, but there is yet more to cover. The introduction of AI in Tourism apps has made the sector more customer centric and technologically relevant. And being more specific this will be very much helpful in our Tourism sector in managing and providing best services to the customers.

These systems, when implemented can improve the processes of the tourism companies and holiday planning for individuals by suggesting destinations routes and prices. Tourism Companies in Zimbabwe can adopt AI to transform the way people travel. It will be providing travellers with the information they need for the best deals on transport and hotels, notifying them when prices are at the lowest points.

Artificial Intelligence in tourism and travel can evolved to the level that it can be used daily to assist travellers, and therefore to enhance future experience. Can also help the analysis of knowledge estimation and resolution of problem that can be difficult for tours to solve.

These facts indicate that the travelling and tourism industry in Zimbabwe can swiftly move towards AI to improve efficiency, service, productivity and reduce costs.

Background of the Study

In Zimbabwe Tourism is regarded as one of the four pillars of the national economy alongside mining, agriculture and manufacturing. And as of now there is a great need in embracing AI in Tourism sector since there is a large number of transit travellers passing through Zimbabwe. Since it is now called the land linked country (no longer called the land locked country), people tend to transit through Zimbabwe by road, so an AI is needed to make those transit visitors travel easily.

Technology can transform the travel and tourism industry, and tourism business that are not responding to this appeal will be out of business sooner or later. And instead of using hunch, AI can be used to create efficient tourism strategies. In other words, technology can enable tourism to benefit from data driven marketing.

Back then, you had to spend time outlining your itinerary, searching for taxes, and sorting through several filters to find that one hotel, but AI can change all that in the following ways like making all relevant information available and suggest best choices in planning tourism trips.

Statement of the problem

According to European Journal of Social Sciences Studies, on research carried out to investigate the challenges faced in the tourism sector of Zimbabwe. They discovered that even though Zimbabwe has a vast potential in terms of tourism potential, it has not been performing well over the last forty years (Munyenza, 2018). For the mean time the country's tourism sector is operating at 30% of its full potential capacity. Adding to that, the sector has remained rigid in terms of growth for the past forty years. Another challenge was that it has also remained elitist for many years thereby promoting foreign at the expense of domestic tourism. Transport is a major hurdle since the collapse of the National Railways of Zimbabwe (NRZ) several decades ago. Finally, the use of air transport to Victoria Falls is nearly equivalent to flying to Europe. Consequently, there is a need to re-surface the main highways and revive the NRZ in order to promote both domestic and foreign tourists.

Aim of research

- To assess the most visited recreational places in Zimbabwe
- To increase foreign tourists there by escalating foreign currency through this sector

Research objectives

- To design and develop a system that is feasible and user-friendly for the management and planning of tour or vacation
- To provide necessary information with various options needed for travel arrangements that are relatively convenient to the user. That they can plan their trips with one click
- To improve search optimization of this system so that it can use AI voice search with commands and keyboards.
- Give a better understanding about the place that the user is going to visit to avoid confusion and chaos.

Research questions

1. What is the current existing AI technology in tourism sector?
2. To what extends is the existing of AI technology in tourism industry effective?
3. How best can we implement the AI technology in the tourism today?
4. How is this system going to be developed and implemented?
5. What problems do you think can be solved by implementing AI in Traveling and tourism sectors today?

Significance of the study

Before the introduction of Artificial Intelligence in the Travel and Tourism, travelling was a chore implementation of the AI in the travel and tourism sector is of relevance to the government of Zimbabwe because for a long time, government agencies have been trying to conduct various researches upon how to increase income from travel and tourism.

Customer satisfaction is vital in the travel industry because it can build a strong brand reputation and success depends on it. This can be done in several ways which include personalization which is the use of smart recommendations which affects the user experience by reducing the steps needed to complete any action.

Dynamic pricing is another issue which makes this project relevant in Zimbabwe. Due to the instability in the current market, users need to know the price of services on real time. AI can help in that by posting the updated prices of services with the little supervision.

Travel and artificial intelligence merge perfectly, since it optimizes every aspect of travel, and as such, improve the hospitality score. Statistically proven, 96% of customers say that the level of customer service impacts their relationship with a company, hence there is a great need to invest in AI technologies to humanize automated responses.

This study is not only relevant to businesses and government authorities only. Knowing that everyone will travel someday made this study also relevance to the general public.

Assumptions

Availability and accessibility of information to explorers will make this sector escalate and vibrate.

Limitations

- The most pressing issue with artificial intelligence is data and network connection to access the internet
- Cyber-attacks are at all-time high, reaching a frequency of 39 attacks per second in 2023.
- Most people are getting left behind as AI in most industries becomes more efficient.

Summary

This chapter forms the platform for the entire project to be carried out, it highlights the existence of problem in real world which calls for a solution. Chapter one states the background of the study and invites ways of solving the problem. It also acts as a framework to build solution guided by the stated objectives of the project. This paves the way for the next chapter which focuses on what others have done in building solutions to some problems of that kind.

Definition of terms

- **Tourism –** Act of travelling or sightseeing, particularly away from one`s home
- **Automates –** To replace or enhance human labor with machines
- **Itinerary –** A written schedule of activities for a vacation or road trip
- **Dynamic –** able to change and being predetermined
- **Cyber-attacks -** Threats coming from the internet by hackers

Chapter 2: Literature Review

Introduction

This chapter provides a comprehensive review of the existing literature on AI-based tour management systems. It aims to explore and analyse the various approaches, methodologies, and technologies used in the development and implementation of such systems. It focuses on a detailed and systematic review of the already existing tour management technologies and their limitations that have led to the development of this AI based tour management system and to get rid of the problems associated with previously implemented systems.

Reports and documents from the United Nations World Tourism Organisation (UNWTO), World Travel and Tourism Council (WTTC), Zimbabwe Tourism Authority (ZTA), as well as reports from the Ministry of Tourism and Hospitality Industry were used to get an insight into Zimbabwe's tourist destinations and related characteristics.

The literature review will shed light on the benefits, challenges, and potential areas of improvement in AI-based tour management systems. The information gathered from this review will serve as a foundation for the research project and help in identifying research gaps and opportunities for further investigation.

The Evolution of Tour Management Systems in Zimbabwe

The evolution of tour management systems in Zimbabwe has been influenced by various factors, including technological advancements, changing travel trends, and the country's tourism industry development.

Historically, tour management in Zimbabwe primarily relied on manual processes, with tour operators and travel agencies handling itinerary planning, bookings, and logistics. However, with the advent of technology, there has been a shift towards more digital and automated systems.

The introduction of computer reservation systems (CRS) and global distribution systems (GDS) in the travel industry has enabled tour operators in Zimbabwe to streamline their operations, enhance efficiency, and improve customer service. These systems facilitate online bookings, availability checks, and real-time updates.

Furthermore, the growth of the internet and the widespread use of online platforms and travel websites have revolutionized tour management. Zimbabwean tour operators and agencies

have embraced online platforms to market their services, engage with customers, and manage bookings.

In recent years, the integration of artificial intelligence (AI) and machine learning technologies has started to shape the tour management landscape. AI-powered chatbots and virtual assistants have become increasingly common, providing automated responses, personalized recommendations, and 24/7 customer support.

Traditional Approach to tour management in Zimbabwe

Zimbabwe does not have a specific centralized tour management system. The tourism industry in Zimbabwe is managed through various stakeholders such as tour operators, travel agencies, and national parks.

Tour operators and travel agencies in Zimbabwe typically handle the management of tours, including itinerary planning, accommodation bookings, transportation arrangements, and other related services. They operate independently or as part of larger travel organizations.

National parks in Zimbabwe, such as Hwange National Park and Victoria Falls National Park, have their own management systems to oversee visitor activities, park regulations, and wildlife conservation efforts.

Limitations and challenges of traditional systems

Traditional tour management systems in Zimbabwe face several limitations that can hinder their effectiveness and efficiency. Some of these limitations include:

Manual Processes: Traditional tour management systems heavily rely on manual processes, which can be time-consuming and prone to human errors. Tasks such as itinerary planning, bookings, and coordination with various stakeholders are often done manually, leading to inefficiencies and delays.

Lack of Personalization: Traditional systems may struggle to provide personalized experiences for tourists. They often offer pre-designed tour packages with limited flexibility, making it challenging to cater to individual preferences and specific needs of tourists. This limitation can result in a less tailored and less satisfying experience for visitors.

Limited Access to Information: Traditional systems may face challenges in providing up-to-date and comprehensive information to tourists. Access to real-time information about attractions, accommodations, transportation, and local events may be limited, impacting tourists' ability to make informed decisions and adapt their plans accordingly.

Communication Barriers: Communication barriers can arise due to language differences, particularly for tourists who do not speak the local languages in Zimbabwe. Traditional systems may struggle to provide effective communication channels and support for non-native speakers, hindering tourists' ability to interact and receive assistance.

Lack of Automation: Traditional tour management systems often lack automation capabilities, relying heavily on manual processes for tasks such as bookings, confirmations, and customer support. This can lead to inefficiencies, delays, and increased administrative workload for tour operators.

Limited Integration of Technology: Traditional systems may have limited integration with technology and digital platforms. This can restrict the ability to leverage emerging technologies such as AI, data analytics, and mobile applications, which can enhance efficiency, provide personalized recommendations, and improve the overall tourist experience.

Difficulty in Adaptation: Traditional tour management systems may face challenges in adapting to changing market dynamics and consumer demands. The inability to quickly respond to market trends and preferences can result in outdated offerings and an inability to meet evolving customer expectations.

Scalability Challenges: Traditional systems may struggle to scale effectively, particularly during peak tourist seasons or when experiencing a sudden surge in demand. Inefficient processes and lack of automation can limit the ability to handle increased workload and may lead to service disruptions or delays.

It is important for tour operators in Zimbabwe to recognize these limitations and explore opportunities to overcome them by embracing technology and adopting more advanced and automated tour management systems. By doing so, they can enhance operational efficiency, improve customer satisfaction, and remain competitive in the dynamic tourism industry.

Context of Zimbabwe Tourism Industry

The application of AI-based Tour Management systems in the context of the Zimbabwe tourism industry presents unique opportunities and challenges. Zimbabwe is known for its rich cultural heritage, diverse wildlife, and stunning landscapes, making it a popular tourist destination. However, the tourism industry in Zimbabwe faces various challenges, including infrastructure limitations, resource constraints, and the need for improved tour management processes. The integration of AI technologies can play a crucial role in addressing these challenges and enhancing the overall tourism experience in Zimbabwe.

One of the key areas where AI-based Tour Management systems can make a significant impact is in personalized recommendations and itinerary planning. Zimbabwe offers a wide range of attractions, including national parks, historical sites, and cultural experiences. However, tourists often struggle to navigate through the plethora of options and create an itinerary that matches their interests and preferences. An AI-based recommendation system, as discussed in the study by Li et al. (2019), can leverage machine learning techniques to analyse tourist data and provide personalized recommendations tailored to each visitor's preferences, ensuring a more engaging and satisfying experience.

In addition to personalized recommendations, AI-powered chatbots can address the need for real-time information and assistance for tourists in Zimbabwe. The study by Chen et al. (2020) highlighted the effectiveness of intelligent chatbots in handling customer inquiries and providing timely support. In the context of Zimbabwe, tourists often seek information regarding transportation, safety, and local attractions. AI-powered chatbots can serve as virtual assistants, offering instant responses and guiding tourists through their journeys, thus improving communication and enhancing the overall tour management process.

Furthermore, AI-based Tour Management systems can optimize resource allocation and improve tour scheduling in Zimbabwe. The study by Kim et al. (2021) demonstrated the potential of AI algorithms in optimizing tour schedules and resource allocation based on factors such as tourist preferences, transportation constraints, and resource availability. In Zimbabwe, where resource constraints and infrastructure limitations are prevalent, AI-based systems can help tour operators and agencies optimize their operations, ensuring efficient use of resources and enhancing the overall customer experience.

The development of an AI-powered virtual tour guide, as explored by Gupta et al. (2022), can also be of great value in the Zimbabwe tourism industry. Zimbabwe boasts a wealth of historical and cultural sites that can benefit from interactive and informative virtual tour guides. Such AI-powered applications can provide tourists with real-time information, historical facts, and interactive guidance, enriching their understanding and appreciation of the attractions they visit.

Overall, the integration of AI-based Tour Management systems in the Zimbabwe tourism industry holds significant potential for enhancing the visitor experience, improving operational efficiency, and promoting sustainable tourism practices. By leveraging AI technologies, Zimbabwe can overcome various challenges, such as limited infrastructure and resource constraints, and provide tourists with tailored experiences that showcase the country's unique offerings. However, it is essential to address potential concerns related to data privacy, local adaptation, and capacity building to ensure the successful implementation of AI-based solutions in the Zimbabwe tourism industry

AI in the Tourism Industry

The use of Artificial Intelligence (AI) has gained significant attention and adoption in various industries, including the tourism sector. AI technologies offer a wide range of applications

that can enhance the efficiency and effectiveness of tour management processes. Several studies have explored the potential of AI in tourism, focusing on areas such as personalized recommendations, intelligent chatbots, virtual tour guides, and demand forecasting.

A study by Li et al. (2019) investigated the use of AI-based recommendation systems in the tourism industry. The authors developed a recommendation algorithm that utilizes machine learning techniques to provide personalized travel recommendations to tourists. Their results indicated that AI-based recommendation systems can significantly improve customer satisfaction and enhance the overall travel experience.

Another relevant study by Chen et al. (2020) examined the application of intelligent chatbots in tourism. The researchers developed a chatbot prototype that utilizes natural language processing and machine learning algorithms to interact with tourists and provide them with real-time information, recommendations, and assistance during their trips. The findings showed that intelligent chatbots can effectively handle customer inquiries and contribute to a more efficient tour management process.

Tour Management Systems

Tour Management systems are software applications designed to assist in the planning, organizing, and monitoring of tours. These systems typically include features such as itinerary management, resource allocation, booking management, and customer relationship management. Several studies have explored the use of traditional tour management systems and identified areas where improvements can be made.

In their research, Wang et al. (2018) identified challenges associated with traditional tour management systems, including manual data entry, lack of real-time information, and limited integration capabilities. The authors proposed a cloud-based tour management system that leverages cloud computing and mobile technologies to address these challenges. The results demonstrated that the cloud-based approach can enhance data accessibility, improve collaboration among stakeholders, and provide real-time updates for better decision-making.

Similarly, a study by Zhang et al. (2019) investigated the integration of customer relationship management (CRM) systems with tour management systems. The researchers argued that integrating CRM functionalities into tour management systems can improve customer satisfaction, loyalty, and retention. They proposed a CRM-enabled tour management system

that allows tour operators to effectively manage customer interactions, track customer preferences, and tailor tour packages accordingly.

AI Techniques in Tour Management Systems

AI techniques play a crucial role in enhancing the capabilities of tour management systems. These techniques utilize machine learning, natural language processing, data analytics, and other AI methodologies to improve various aspects of tour management. Here are some commonly employed AI techniques in tour management systems:

Machine Learning: Machine learning algorithms are utilized to analyse large datasets and extract valuable insights. In tour management systems, machine learning can be applied to tasks such as customer segmentation, personalized recommendation systems, sentiment analysis of customer feedback, and demand forecasting for optimizing resource allocation.

Natural Language Processing (NLP): NLP techniques enable tour management systems to understand and process human language. NLP is employed to develop chatbots and virtual assistants that can interact with tourists, understand their queries, and provide relevant information or assistance. It enables more natural and efficient communication between the system and users.

Recommender Systems: Recommender systems employ AI techniques to suggest personalized recommendations to tourists based on their preferences, historical data, and contextual information. Collaborative filtering and content-based filtering are common AI techniques used in recommender systems for tour management, helping tourists discover relevant attractions, accommodations, and activities.

Data Analytics: AI-based data analytics techniques are used to extract insights from large volumes of data collected by tour management systems. By analyzing data such as tourist behaviour, preferences, and feedback, AI algorithms can identify patterns, trends, and correlations, enabling tour operators to make data-driven decisions, optimize offerings, and improve the overall tourist experience.

Image and Video Analysis: AI techniques, including computer vision and image recognition, can be employed to analyse images and videos captured during tours. This enables automated tagging, content categorization, and sentiment analysis based on visual

content. It can enhance the management and utilization of multimedia assets for marketing, customer engagement, and personalized recommendations.

AI-based Tour Management Systems

AI-based tour management systems leverage artificial intelligence techniques and algorithms to enhance various aspects of the tour management process. These systems utilize machine learning, natural language processing, computer vision, and other AI technologies to automate and optimize tasks such as itinerary planning, personalized recommendations, real-time assistance, and intelligent decision-making. By harnessing the power of AI, these systems aim to provide more efficient, seamless, and personalized experiences for tourists.

The integration of AI technologies into Tour Management systems holds great promise for enhancing various aspects of tour planning, management, and delivery. However, there is limited research available specifically focused on AI-based Tour Management systems. This research project aims to fill this gap by developing an AI-based Tour Management system that incorporates advanced AI techniques to provide intelligent recommendations, optimize resource allocation, and improve decision-making in tour management processes.

A relevant study by Kim et al. (2021) explored the use of AI in optimizing tour scheduling and resource allocation. The researchers developed an AI-based algorithm that considers multiple factors, such as tourist preferences, transportation constraints, and resource availability, to optimize tour schedules and allocate resources efficiently. The results demonstrated that the AI-based approach can significantly improve tour planning and resource management, leading to enhanced customer satisfaction and cost savings for tour operators.

Another study by Gupta et al. (2022) focused on the development of an AI-powered virtual tour guide. The authors developed a mobile application that utilizes natural language processing and computer vision techniques to provide tourists with real-time information, historical facts, and interactive guidance during their tours. The findings indicated that the AI-powered virtual tour guide can enhance the tourist experience by providing personalized and engaging content.

AI-based Recommendation Systems for Tour Planning

AI-based recommendation systems have become integral in tour planning, providing personalized suggestions and enhancing the overall tourist experience. These systems leverage AI techniques such as machine learning and data analytics to analyse vast amounts of data and generate tailored recommendations for tourists. Here are some key aspects of AI-based recommendation systems for tour planning:

Data Collection: AI-based recommendation systems collect data from various sources, including user preferences, historical data, ratings, reviews, and contextual information. This data serves as the foundation for generating personalized recommendations.

Machine Learning Algorithms: Machine learning algorithms form the core of AI-based recommendation systems. These algorithms analyse the collected data and identify patterns, similarities, and correlations to make accurate predictions about user preferences. Collaborative filtering and content-based filtering are commonly used techniques in tour planning recommendation systems.

User Profiling: Recommendation systems create user profiles based on individual preferences, demographic information, and previous interactions. These profiles enable the system to understand users' preferences and deliver recommendations that align with their interests.

Personalized Recommendations: AI-powered recommendation systems provide personalized suggestions for various aspects of tour planning, including destinations, attractions, accommodations, activities, and dining options. Recommendations are tailored to individual preferences, travel history, and contextual factors such as the current location, weather conditions, and time of visit.

Real-time Updates: AI-based recommendation systems can provide real-time updates and recommendations to users. By integrating with live data feeds and considering real-time factors such as weather conditions and crowd levels, the system can suggest alternative options or modify recommendations on-the-go.

Social and Collaborative Filtering: AI techniques enable recommendation systems to incorporate social and collaborative filtering. Social filtering takes into account recommendations from friends or social connections, while collaborative filtering analyses the preferences and behaviour of similar users to generate recommendations.

Continuous Learning: AI-powered recommendation systems can continuously learn and improve over time. As users interact with the system and provide feedback, the algorithms adapt and refine their recommendations, leading to more accurate and relevant suggestions.

Benefits of AI-based Tour Management Systems

Numerous benefits can be attributed to the implementation of AI-based tour management systems. Firstly, these systems enable personalized recommendations based on user preferences, historical data, and contextual information, leading to enhanced customer satisfaction. Secondly, AI algorithms can analyse vast amounts of data from various sources, such as travel reviews, social media, and weather forecasts, to generate real-time insights and suggestions for tourists.

Challenges and limitations

While AI-based tour management systems can offer numerous benefits, they also have some limitations to consider. Here are a few:

Lack of Human Touch: AI systems may lack the personalized and empathetic touch that human tour guides or travel agents provide. They may not be able to understand and respond to individual preferences or unique situations as effectively as a human counterpart.

Limited Contextual Understanding: AI systems primarily rely on data and algorithms to make decisions. They may struggle to understand complex contextual factors that influence travel experiences, such as cultural nuances, local customs, or subtle nuances of a particular destination.

Language and Cultural Barriers: AI systems may encounter challenges in handling diverse languages or dialects. Translating and interpreting accurately in real-time can be complex, leading to potential misunderstandings or inaccuracies, especially in areas with unique local dialects.

Technical Dependence: AI systems heavily rely on technology infrastructure, including internet connectivity, power supply, and system reliability. In areas with limited or unreliable access to technology, AI-based tour management systems may not function optimally.

Lack of Spontaneity and Creativity: While AI systems can offer pre-planned itineraries and recommendations, they may struggle to provide spontaneous and creative suggestions that cater to individual preferences or unexpected circumstances. Human tour guides often excel in adapting and improvising based on the situation.

Ethical and Privacy Concerns: AI systems that collect and analyze personal data for tour management purposes raise privacy concerns. It is essential to ensure that user data is handled securely and in compliance with privacy regulations.

Maintenance and Updates: AI systems require regular maintenance and updates to stay relevant and accurate. Keeping up with emerging technologies and data sources can be challenging and may impact the system's performance over time.

Emerging trends and future directions in AI-based tour management

Conversational Interfaces and Voice Assistants: The rise of voice-based technologies and smart devices has paved the way for conversational interfaces and voice assistants in tour management. Tourists can use voice commands to interact with AI-powered assistants, making inquiries, receiving recommendations, and accessing real-time information. This trend improves the convenience and accessibility of tour management systems.

Augmented Reality (AR) and Virtual Reality (VR): AR and VR technologies are revolutionizing the way tourists experience destinations and attractions. AI-based tour management systems can leverage these technologies to provide virtual tours, immersive experiences, and interactive guides. AR and VR enable tourists to visualize and explore destinations before their actual visit, enhancing their engagement and decision-making process.

Big Data Analytics and Predictive Modelling: The increasing availability of data and advancements in analytics techniques enable tour management systems to leverage big data for predictive modelling. AI algorithms can analyse large datasets, including customer preferences, booking trends, and external factors, to forecast demand, optimize resource allocation, and personalize recommendations. Predictive modelling improves decision-making processes and enhances the overall efficiency of tour management.

Social Media and User-Generated Content: Social media platforms and user-generated content have a significant impact on travel decisions. AI-based tour management systems can leverage social media data to analyse user preferences, sentiments, and trends. By monitoring social media platforms, tour operators can gain insights into customer experiences, identify emerging attractions, and engage with tourists in real-time.

Blockchain Technology for Secure Transactions: Blockchain technology offers secure and transparent transactions, which can benefit tour management systems. AI-based systems can leverage blockchain to ensure secure payment processing, verify the authenticity of reviews and ratings, and create immutable records for transactions and contracts. This trend enhances trust, reduces fraud, and improves transparency in tour management.

Sustainable and Responsible Tourism Practices: AI-based tour management systems can play a crucial role in promoting sustainable and responsible tourism practices. By analysing data and providing recommendations for eco-friendly activities, reducing overcrowding in popular attractions, and optimizing transportation routes, AI systems contribute to the preservation of natural resources and the well-being of local communities.

Emotion Recognition and Sentiment Analysis: AI techniques for emotion recognition and sentiment analysis are emerging in tour management systems. By analysing facial expressions, voice tones, and social media posts, AI systems can understand tourists' emotions and sentiments, enabling tour operators to tailor services, address concerns, and provide personalized experiences.

Integration with Internet of Things (IoT): The integration of AI-based tour management systems with IoT devices allows for seamless connectivity and data exchange. IoT devices such as smart wearables, beacons, and sensors provide real-time data on tourists' locations,

preferences, and behaviours. AI systems can utilize this data to deliver personalized recommendations, optimize resource allocation, and provide contextual information to tourists.

Conclusion

In summary, this chapter gave a summary of the literature that has been written about the AI based tour management system. According to the research, AI based management systems can benefit from increased security, transparency, and efficiency. There are still some holes in the literature that need to be filled. For instance, there isn't any empirical study on how these technologies are used in tour management systems, and it's important to figure out what characteristics contribute to user acceptability and uptake. The research methodology will be the subject of the following chapter.

Chapter 3: Research Methodology

Introduction

The aim of this chapter is to define the strategies and tools used to achieve the proposed objectives of research and system. With the help of the information attained in the previous chapter the author will formulate the necessary methods to build a solution and be able to make choices among competing strategies to achieve the expected results of the research.

Research Design

Kothari (2002) argued that research is the "art of scientific exploration" which implied that the success of a research is found from the way it is conducted and what it uncovers. Research methodology provides us a progression of the wealth of human acquaintance, tools necessary to carry out research, tools to observe life accurately and objectively. Research design should be a reflexive process operation through every stage of a project. The design stage involves coming up with the different modules of the system and their intended functionality. The core objective of this stage is to ensure that an operative, proficient, sustainable and reliable model of the system is designed.

Requirements Analysis

At this point, it is essential to record all the functional and non-functional specifications of the required system. It is advisable to structure all incoming data, asses it, consider all the limitations which may arise on the customer's side, and come up with a ready-to-follow specification that meets the customer's needs. The research also took into account any type of limitations, such as the complex or the operability of this system to end users

Functional Requirements

- Display 10 most common recreational places in Zimbabwe
- Provide the prices of accommodation, food and activities
- Must provide the best route to the destination

Non-Functional Requirements

- The system is supposed to be easy to install
- The system should have a relatively small response and decision time
- The system should be available all the time and re
- System performance to handle a high volume of tour requests and provide a fast response
- Scalability
- Security and privacy to protect user data, transactions, and personal information
- Usability and user experience
- Maintainability and extensibility

Hardware Requirements

- High-Speed Network of at least 1.0 MB per second.
- Powerful Server with a minimum of 4GB RAM and 500GB of memory
- Mobile Devices for debugging and Testing

Software Requirements

- Operating System Windows
- Mobile Application Development Platform (Android, IOS, and APIs)
- Database Management System (Firebase)

System Development

This stage describes the overview of the system and how it was developed so as to produce the results. It specifies all the software tools and models used in the development of the system.

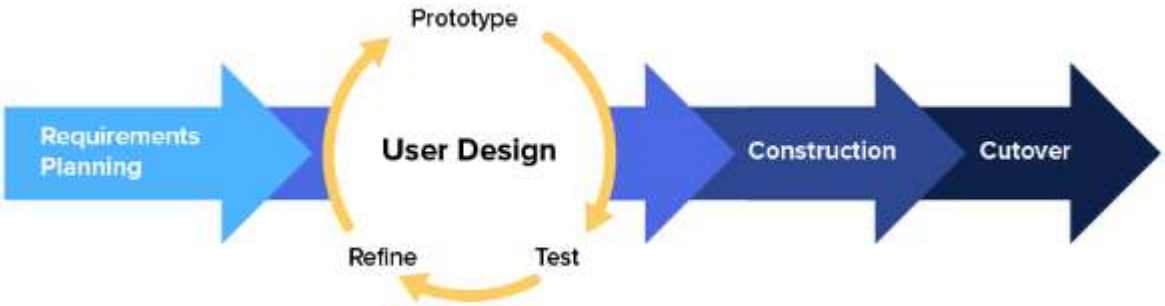
System Development tools

A methodology for software production or system design in software engineering is a framework for structuring, planning and controlling the methods of creating an information system. Researchers have identified many frameworks for different projects and each framework has its own strengths and weaknesses according to its application.

Some of these frameworks include the waterfall model, the Rapid Application Development, the spiral model and the progressive (prototyping) model. The author decided to use the Rapid Application Development (RAD) paradigm model due to its simplicity since the project is relatively small and has a strict time frame. All the requirements of the project have been identified and all the tools are in place hence the Rapid Application Development (RAD) paradigm is the best candidate for such a project.

Rapid Application Development

One of the classical and primitive models for developing a system. The Rapid Application Development (RAD) paradigm is an agile software development methodology that places a premium on application delivery speed and flexibility. To speed up the development process and adapt to changing requirements, it emphasizes iterative development, user participation, prototyping, and constant feedback. The model consists of key phases which are the requirements planning where objectives, scope, and requirements are identified. The user design phase is where the user interface and system design are developed on this stage, the construction phase is where the actual coding and development of the application take place, and developers focus on rapid iteration and implementation of components. The cutover phase is the stage whereby the application is integrated, tested, and prepared for deployment. These phases are illustrated in the below diagram;

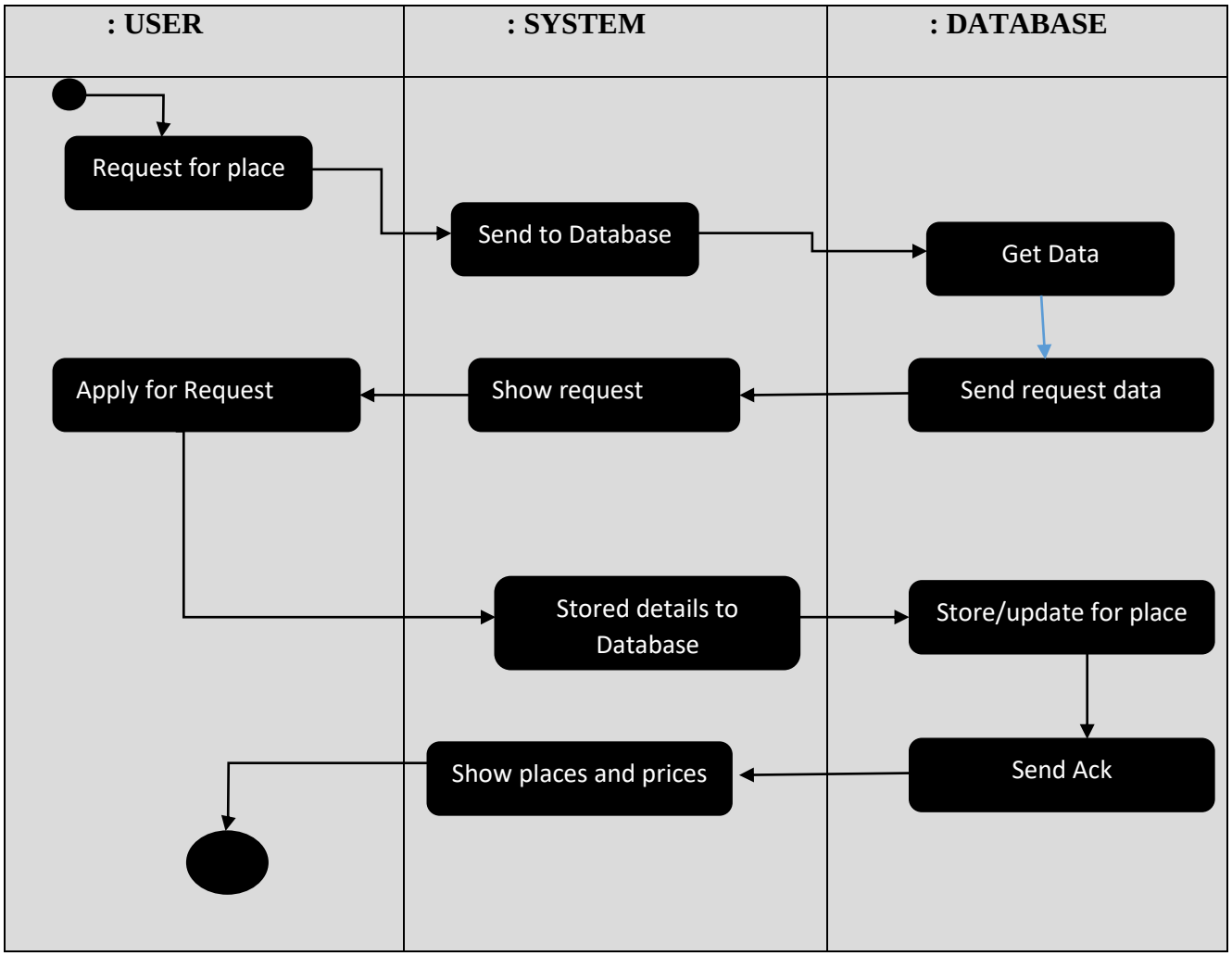


Rapid Application Development Life Cycle.

Data Flow Diagrams

An illustration that depicts the movement of data through a system is called a Data Flow Diagram (DFD). It provides an example of how data is transferred from input sources to various processing steps, and then to output locations. DFDs give a visual picture of the interactions and data flow within the system, making it easier to comprehend how the system works and how data is processed. Data flows reflect the movement of data between processes, everlasting entities represent the functions or activities that alter data within the system, and data stores represent data stores. External entities are the sources and destinations of data that interact with the system but outside the boundaries. Finally, data stores represent the repositories where data is stored and retrieved such as databases and files. DFDs give a broad overview of how data flows through the system, assisting with requirements analysis, system design, and spotting potential areas for enhancement or optimization.

User Data Flow



Data Collection Methods

Surveys, observations, and document analysis are just a few examples of data collection strategies (Babbie, 2016). Depending on the research aims and the resources at hand, these strategies collect data for research or analysis purposes (Bernard, 2017). Most of the data collection in this study was done online, through observations and social media monitoring

Document Analysis – is the examining of existing records, reports, documents, or artifacts to extract pertinent information. When examining historical data, policy documents, organizational records, or public archives, this method is helpful.

Surveys- In surveys, a sample of respondents gets structured questionnaires that are used to collect data. Researchers can collect data using this strategy on attitudes, opinions, behaviors, and demographic traits. You can conduct surveys online, over the phone, via mail, or in person.

Observations - observations entail routinely observing and documenting actions, occurrences, or phenomena. Researchers can carry out observations as active participants (participant observation) or as observers only. The methods used for observations can be physical or digital (for example video recordings), organized or unstructured.

Although there are other ways to get data, the author chose to employ observation as a method. The researcher had the opportunity to examine the system's accuracy and the solution's response time through observation.

System Implementation

The part of the software development lifecycle known as system implementation is when the designed system is constructed, tested, and put into use. It entails converting the system's specs and design into a useful and functional software program. System implementation also involves the art of coding, testing, integration, deployment, system documentation, and user training.

The tools and languages used during the development and implementation of the system are:

- Dart Object-oriented programming language was used to implement functions of the system.
- Firebase Database, is a non-SQL database mostly suitable for mobile apps whereby data is stored in blocks and accessed using jQueries.

- APIs, are application programming interfaces that are injected to perform some functionalities with the application. For example, Google Maps APIs.
- Android Studio, an intelligent IDE used to test and debug the system.

Summary of how the system works

The system displays all the necessary information to the tours at all times and it is a continuous process which does not stop, it provides the best 10 recreational places in Zimbabwe and all their details like costs of accommodation, food and refreshments offered as well as best routes to get there.

Summary

This chapter mainly focused on the methodology used in the development of the system and how it was designed. Different techniques were used to come up with the system and implementing machine learning made it possible to come up with the proposed solution. The system functionalities and how the system data flows from the start to the end are as well illustrated in this chapter. The results obtained from the developed solution were discussed and analysed in the following chapter. The next chapter also draws a conclusion on the obtained results.

Chapter 4: Data Presentation, Analysis and Interpretation

Introduction

The need to analyse the efficiency of the developed solution comes after the completion of the system. Accuracy, performance and response time were the matrices used to determine the efficiency and effectiveness of the developed solution. Data collected in the previous chapter was analysed to produce meaningful results. The developed system's behaviour was as well observed under different conditions and the outcome was presented. The white box, black box and unit testing play major roles in determining the system behaviour in different conditions.

Testing Methodologies

Testing is an essential part of the development process and this chapter shows the test that were undertaken and the results the produced. The testing is measured against the functional and the non-functional requirements of the proposed solution. A combination of manual and automated testing techniques is used to achieve a thorough examination. Unit testing, user interface testing, system testing, white box testing, and black box testing are just a few of the stages that make up the systematic testing process, below is a detailed explanation of the testing methodologies

Black box Testing

Black box testing allows a person without the knowledge of the internal structure of the system to test it against the functional and sometime the non-functional requirements of the system. Black box testing's objective is to assess an application's adherence to predetermined requirements, as well as its functionality, usability, and general accuracy, from the viewpoint of the end user. It looks for mistakes, flaws, and unexpected behaviours that could be brought on by flawed reasoning, a lack of functionality, or interface problems. For performing black box testing on this project, the researcher conducts a sample of five users. The users were chosen under the following criteria:

- Focus on requirements and specifications, Black box testing is based on comprehending the requirements and specifications of the program. Test cases are created to cover many scenarios, verifying that the application performs as anticipated and satisfies the established criteria.

- Lack of knowledge of internal implementation, the testers have no understanding of the application's internal architecture, code, or design. They only know the possible inputs and the anticipated outcomes that should be produced that is if the user login, he or she should be able to request a ride and they will be matched with available drivers.
- Input and Output Analysis, the focus of testing is on examining the inputs given to the application and confirming the outcomes it generates. The application's response to various input combinations is evaluated by testers, who contrast the actual outputs with the predicted ones.

White box Testing

White box testing allows the developers and other stockholders to test the internal structure of the system for instance error handling among others.

The author carried out this test to see how the system handled cases like running the system without training data and running the system without prior detection knowledge (without training).

White box testing's goal is to verify the software's internal parts, code routes, and logical flows. One way of white box testing is by creating test cases that exercise certain code segments, conditions, loops, and branching by knowing the underlying structure to make sure they behave as predicted and satisfy the specified quality standards. One way to perform white box testing, the tester needs to be equipped with the programming language used to implement the system, that is why white box testing is not done by random people who do not know about how the development and implementation of systems works

White box testing enables testers to validate the software's core logic, data flow, and control flow. It offers information on the implementation's flaws and weaknesses and sheds light on the maintainability and quality of the code. White box testing is especially helpful for finding problems with control flow, handling errors, and boundary conditions. Listed below are the key features taken into consideration when the author was carrying out white-box testing

I. Fixing issues

Fixing issues is the process of locating and taking care of errors or flaws found during the testing phase. Since white box testing gives testers access to the internal design and source

code of the program being tested, they can identify the main sources of problems and resolve them. In the context of this research, fixing issues was done through the use of unit tests whereby each module is tested for bugs when an error is found and the researcher is not able to solve it, the researcher would therefore request assistance from sites such as Stack Overflow and developer's groups on social media and other communities. The process of fixing issues starts by identifying the issue, therefore prioritizing the issue, resolving the issue, code modification, and lastly, performing unit testing to ensure that the bug has been resolved.

II. Understanding the system architecture

White box testing must include an understanding of the system architecture. In white box testing, the internal architecture, style, and code of the software are all accessible to the testers. Testers develop a thorough grasp of the system architecture thanks to this visibility, which they can then utilize to create efficient test cases. The process of understanding the system architecture includes the following;

Gaining System Insights: Tester examines the system architecture to learn more about the organization of the software components, their interactions with one another, and the flow of data inside the system. Examining architectural diagrams, system documentation, and code documentation to comprehend the software's general structure and design.

Finding Testable Components: Knowing the system architecture aids in finding specific parts or modules that can be independently tested. Testers can pinpoint critical interfaces, entry points, and boundaries between various components, which enables them to concentrate their testing efforts on particular system components.

Designing Test Cases: With an understanding of the system architecture, testers may create test cases that put various paths and features of the software to the test. To check for accuracy and find potential problems, they can focus on certain components or the interconnections between components. To establish the inputs, expected outcomes, and necessary test data for each test case, testers use architectural information.

User Interface Testing

User Interface (UI) Testing also known as Automation Testing focuses on confirming the proper behaviour and functionality of the system user interface. The main objective of UI testing is to make sure that the user interface components of the application, such as buttons, forms, menus, and visual elements, work as expected and offer a positive user experience. This test was carried out by automating user interactions, validating expected results, visual validations, and ensuring usability. By using different Android emulators from the Android studio and physical Android devices, the researcher was able to perform User interface testing by running the app on the devices and evaluate whether the User interface support different versions of screen dimensions.

System Functionality Testing

The purpose of system functionality testing is to ensure that the software behaves correctly and performs the intended tasks or operations by user expectations. System functionality testing involves evaluating various features, functions, and capabilities of the software to validate that they work as designed. It aims to identify any issues that may arise. In this context, it ensures that users are able to login into the system and insert the destination as well as the current location they will be. After inserting this information, the system must be able to validate the information and display the top 10 best recreational places in Zimbabwe. After the user selects the desired place, the system must display all the important information on that particular place that is, the costs, services offered and the best route.

Security Testing

Security testing seeks to find flaws, weaknesses, and potential security hazards in a system or application. Security testing aims to safeguard the system from unauthorized access, attacks, and misuse as well as to assess the efficiency of security measures. It also aims to maintain the confidentiality, integrity, and availability of data. It includes authorization and authentication techniques, data security, and security code review.

USER	*Compatibility Test*	*Functionality Test*	*Performance Test*	*Security Test*	*User Interface* **Test**	*Usability Test*
1	8	8	7	8	9	9
2	6	9	7	9	10	8
3	7	6	8	9	9	7
4	9	7	8	8	9	7
5	9	9	7	7	8	6
AVERAGE RATINGS	7.8	7.8	7.4	8.2	9	7.4

Performance Testing

The test focuses on evaluating a system or application's performance, responsiveness, scalability, and stability under diverse workload situations. Performance testing is to gauge and assess the system's efficiency in terms of speed, throughput, resource use, and dependability.

Performance testing is crucial to ensuring that the system can support the anticipated user load and operate at peak and average levels of efficiency. It aids in locating performance bottlenecks, gauging reaction times, evaluating resource usage, and figuring out the system's capacity constraints.

The performance of the tour management system is essential, testing for load, stress, endurance, and scalability of the system is important to ensure that the system does not crush under different workloads.

Compatibility Testing

Compatibility testing is essential for providing a seamless user experience and maximizing software adoption in the diverse technical environment of today, where users access programs from a variety of devices and platforms. It aids in locating any compatibility problems or discrepancies that might develop as a result of variations in software, hardware, or environmental elements.

From the tests carried out from a selected sample of 5 users, here is the summary of yielded results from every user about ratings of the system on a scale of one to ten.

System accuracy refers to the degree of accuracy and correctness with which a system or application generates outputs or results that correspond to the desired or expected outcomes. It gauges how effectively the system delivers accurate and trustworthy information or responses. For many systems, accuracy is a crucial quality trait, especially those that deal with sensitive or essential data, calculations, or decision-making processes. It makes ensuring that the system generates trustworthy and dependable outputs, which are necessary for conducting calculations, depending on system-generated data, or making informed judgments.

Conclusion

The test results indicated the system to have a high rate of accuracy, it can be seen that it had an average of 100% accuracy using the confusion matrix. Talking about the measuring parameters, among precision, recall, accuracy and f-measure, it can be seen that precision and recall are immensely deployed parameters since their trade-off relationship is a pragmatic measure for the achievement of prediction. Though the necessary model is presumed to have high precision and high recall, applicable in an ideally separable data.

Chapter 5: Recommendations and future work

Introduction

In the previous chapter, the researcher focused on presentation and analysis of obtained data. An overview of the study goals and a synopsis of the significant elements and features of the created system comes first in the chapter. The discussion of the research's findings and implications is then followed by a discussion of the inferences made from the findings. The chapter also looks at possible future lines of research and development in the area. This chapter covers the research and development of the solution in line with the set objectives. This chapter will also examine the difficulties encountered by the researcher in designing and carrying out this study

Aims and Objectives Realization

The aim of the author was to design and implement a Tour Management System with AI. To this end the author managed to design a system that managed to use machine learning. The system was implemented and tested and it proved to be 100% accurate in detection since when it ran a couple of times displaying most common recreational places in Zimbabwe along with the costs and best routes. The system proved to be easy to use and was implemented well.

Challenges faced

the author faced challenges in obtaining the data for training processes, there was need for accurate data which was difficult to obtain therefore it slowed down the implementation process.

Limitations of AI-based Tour Management Systems

This section examines the key limitations associated with AI-based tour management systems. It highlights the following aspects:

Lack of Human Touch: AI systems, by their nature, lack the personalized and empathetic touch that human tour guides or travel agents provide. The absence of human interaction can diminish the overall travel experience, particularly in terms of understanding individual preferences and responding to unique situations.

Limited Contextual Understanding: AI systems primarily rely on data and algorithms, which can hinder their ability to comprehend complex contextual factors that influence travel experiences. Cultural nuances, local customs, and subtle aspects of a particular

destination may be challenging for AI systems to fully grasp, potentially leading to generic and less authentic recommendations.

Language and Cultural Barriers: AI systems may encounter difficulties in handling diverse languages or dialects. Real-time translation and interpretation can be complex, leading to potential misunderstandings or inaccuracies, especially in areas with unique local dialects. Additionally, cultural barriers can affect the system's ability to provide culturally sensitive recommendations.

Technical Dependence: AI systems heavily rely on technology infrastructure, including internet connectivity, power supply, and system reliability. In areas with limited or unreliable access to technology, AI-based tour management systems may not function optimally. Technical disruptions can hinder the system's performance and adversely affect user experiences.

Lack of Spontaneity and Creativity: While AI systems can offer pre-planned itineraries and recommendations based on historical data, they may struggle to provide spontaneous and creative suggestions that cater to individual preferences or unexpected circumstances. Human tour guides often excel in adapting and improvising based on the situation, which is an area where AI systems currently fall short.

Implications and Recommendations

This section explores the implications of the identified limitations and provides recommendations to overcome them. The following recommendations are put forward:

Hybrid Approach:

Combining the strengths of AI systems with human expertise can lead to a more comprehensive and personalized tour management experience. Incorporating human tour guides or travel agents alongside AI systems can provide the necessary human touch, adaptability, and cultural understanding that enriches the travel experience.

Continuous Learning and Adaptation:

Implementing AI systems that can learn from user feedback and adapt to evolving preferences is crucial. By continuously improving recommendation algorithms and incorporating user insights, tour management systems can enhance personalization and relevance, resulting in more satisfying experiences for travelers.

Multilingual and Multicultural Support:

Improving language capabilities within AI systems is essential to overcome language barriers. Advanced natural language processing techniques and accurate translation capabilities can facilitate effective communication with travelers from diverse linguistic backgrounds.

Context-Awareness:

Developing AI algorithms that incorporate contextual information about a destination can enhance the system's ability to provide relevant and up-to-date recommendations. Integrating cultural databases, real-time event information, and local insights can significantly improve the contextual understanding of the AI system.

User Control and Transparency:

Designing AI-based tour management systems that provide users with control over their data and decision-making process is crucial. Transparent explanations of how recommendations are generated, giving users the ability to customize their preferences, and respecting privacy regulations can foster user trust and confidence.

Collaboration and Partnerships:

Promoting collaboration between AI developers, tour operators, travel agencies, and local stakeholders is key to advancing AI-based tour management systems. Sharing insights, data, and expertise can facilitate a more comprehensive and contextually aware approach to tour management.

Future Work

The researcher did not have enough time and proper tools that is enough dataset to carry out the research on a production scale. Future work involves developing and testing the system on all the recreational places in Zimbabwe using google maps and voice search engine.

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