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System for Intelligent Tourist Information using Machine Learning Techniques

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Abstract:

Objectives: To make an intuitive and user friendly information system that is intelligent and learns based on the users' inputs from time to time and provides personalized, customized suggestions.

Analysis: The analysis was done using GSM arena's testing platform to see how responsive it was to user inputs. We sampled data from different platforms that the system runs on. System for Intelligent Tourist Information (SITI) relies on a machine learning algorithm to intelligently retrieve data.

Findings: During our research of information systems, it was found that the current systems lack an interactive or an intuitive approach. In current scenario, Artificial Intelligence (AI) is being employed in every discipline to improve the way that humans interact to get information. This is the main motive behind SITI. For the first time in a Tourist information system, an AI component was realized using machine learning techniques, to intelligently provide personalized information to each user, so a user rating was also requested in a small survey.

Natural language processing (NLP) is vital as users' intents have to be captured irrespective their style of dialogue to give the best of a human touch. An NLP library framework named API.AI was used to accomplish this by a simple means. This is the first of its kind to delve into such depths to provide the best Tourist Information System (TIS) currently available.

SITI can be hooked up and used on popular social networking sites, thus eliminating the need to install an exclusive app for it, thus providing a light and portable solution.

Novelty: The use of machine learning techniques, linked with an NLP framework and portability achieved through web hooks to existing social networking apps are unique and novel features of SITI.

Keywords: NLP - Natural Language Processing, machine learning, AI - Artificial intelligence, Data warehouse

INTRODUCTION

Starting from the second half of twentieth century, Tourism has come to be one of the most important economic activity contributing about 11% of the world GDP with about 1 billion people moving globally. It is probably the only sector with such varied activities with significant contribution to the indigenous economy. The industry is one of the first to do business electronically starting with the airline reservation systems widely regarded as the precursor of today's electronic commerce platforms [1].

With the advancement in Information Technology, modern businesses find it ever so difficult to find a sustained competitive advantage and it is particularly true in the case of travel and tourism industry where there is a constant need to acquire and utilize updated information to assist its management and marketing processes. IT assists firms to manage information dynamically and influences competitiveness by assisting decision makers to make appropriate investments and resource disposal.

IT helps to meet the demands for timely and accurate information by customers and the IT penetration in the tourism and hospitality industries has seen an uptick at an unprecedented rate [2]. This is evident by the ubiquitous presence of IT systems that work hand in hand to assist decision makers to deliver quality service to their customers and to increase operational efficiency and cost cutting. IT directly influences the experiences and behavior of tourists. Without IT systems it would be difficult to direct and manage businesses that require lot of data and information and spoils their spirit of competition. Tourism and hospitality are social phenomena, and the industries associated with them are

largely application oriented. IT also supports consumer centricity, with consumers being able to use technology to select and customize their products as well as to personalize their experience [3][4].

The role of Artificial Intelligence is indispensable for features like individualized pricing, reversed multiattribute auctioning, recommendations in bundling products, Semantic Web applications, and mobile applications which have the potential to take the industry to new heights. At the same time, there are many hurdles for AI which the present methodologies do not take into account for such as the heterogenous nature of tourism industry, the restrictions on ambient intelligence, non technical issues like dynamic market and network structures , pricing and market design, design and experimenting business models, user decision modeling and usage analysis, contribution of multiple disciplines including computer science, management science, economics, law, statistics, sociology, and psychology which traditional models overlook[3].

EXISTING METHODOLOGIES

Semantic web applications: One of the techniques is to utilize semantic web advancements. The mission is to semantically associate by and by scattered parts of data with the goal that it facilitates the client for finding and understanding the data sources and to take into consideration singular utilization of tourism offers. Here foundation information of the importance of web assets is put away as machine-processable (meta-) information. Administrations for discovering, incorporating, or associating data might be founded on the portrayals. Hence, semantics is viewed as a key variable to finding the route in the growing web space, which can supplant the syntactic approach [4].

The process can be seen in Figure 1, like this thought is the utilization of ontologies which give a formal conceptualization [5] of a specific space that is shared by a gathering of individuals. Ontologies depict vocabularies as a sort of complex (meta-)information schemata that will be that backings business and authoritative choices by separating valuable data from crude information, individual learning and records to recognize and tackle issues by taking choices. Utilized as a part of request to consolidate semantic metadata and offer included esteem administration's top of semantic depictions [6].

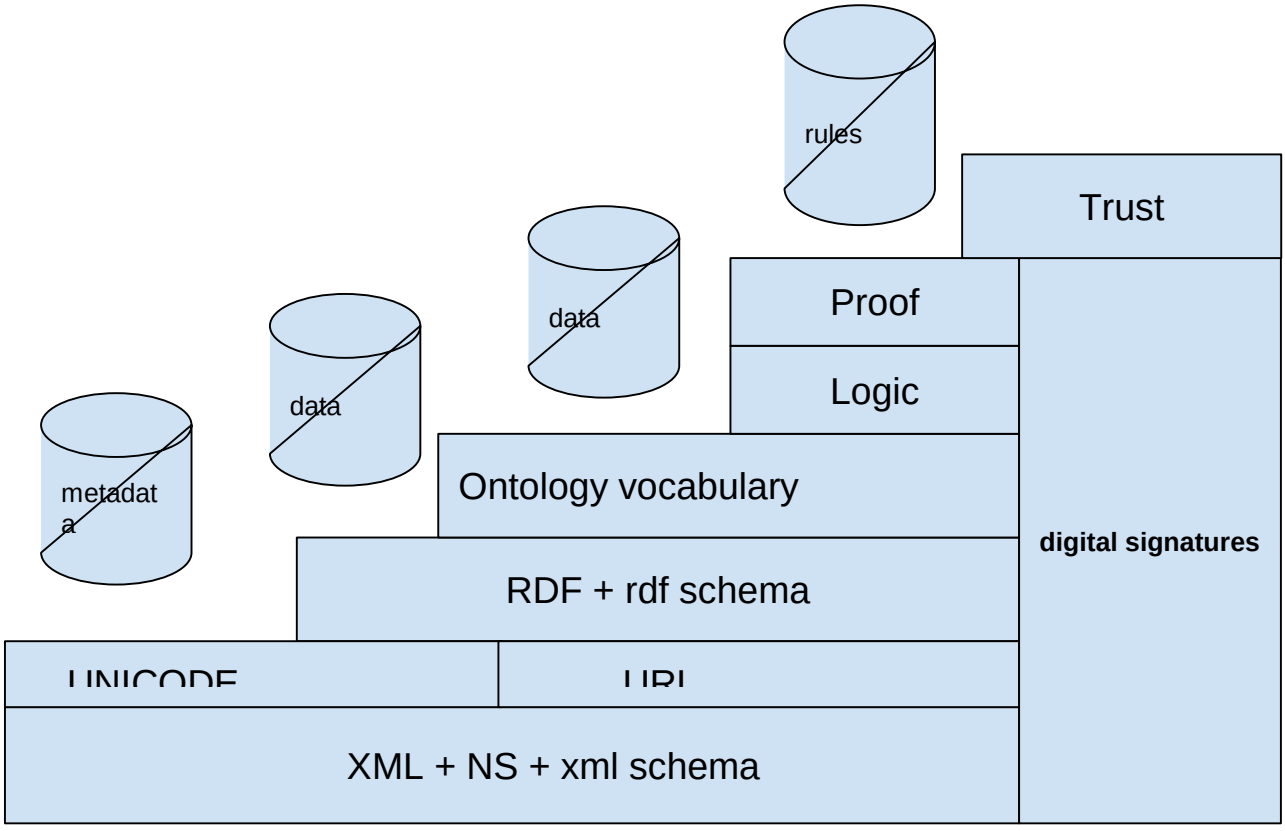

Figure 1. Process flow diagram

Geodata handling deals with how to get these administrations to keep running on cell phones. To move the portrayed GIS parts from overwhelming servers to the customers, lightweight variants of these segments should be made. The European Media Laboratory has executed a first model giving geodata-dealing with and-preparing capacities, for example, topological inquiries for instance, "Is it inside ...?" or "Does it between order ...?" on a PDA utilizing a spatial get to technique utilizing a R-Tree.3 Interoperability is likewise vital, in light of the fact that customers may need to cooperate with various back-end frameworks [7].

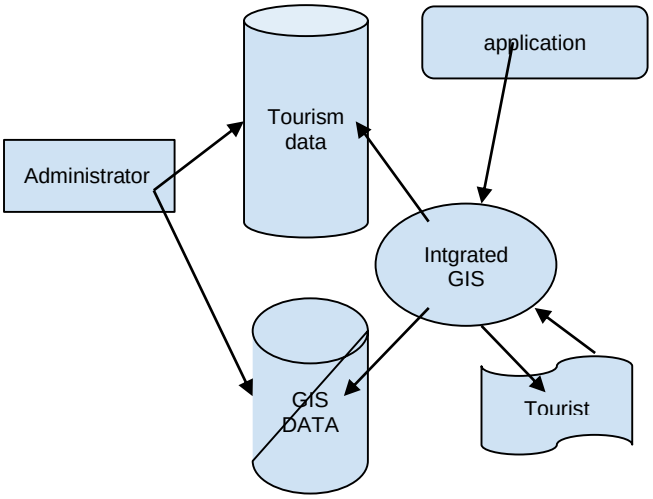

Figure 2. Information model

As seen in Figure 2, In this way, the information model depends on an open standard—the OpenGIS Consortium's Geography Markup Language. Through such advancements, it can understand future applications that may utilize customer side assets to perform GIS administrations. This would likewise diminish reliance on system accessibility. Next thing that should be considered is wise pre fetching and storing procedures in blend with location mindfulness and asset i.e., organize, CPU adaptivity. Additionally examine on refresh and synchronization methodologies or advanced master tocols for versatile geodata transmission over remote systems would likewise be useful [8].

DSS system : A conceivable proposition for an engineering of a dss reasonable for a tourism goal administration association is as follows. through an application interface the client can get to by means of a correspondence by means of a correspondence layer . a mix of bases containing the information, the models, and the records required for the real particular errand specifically, the User Interface commonly a realistic interface is the piece of the framework through which the end client communicates with the framework [9][10].

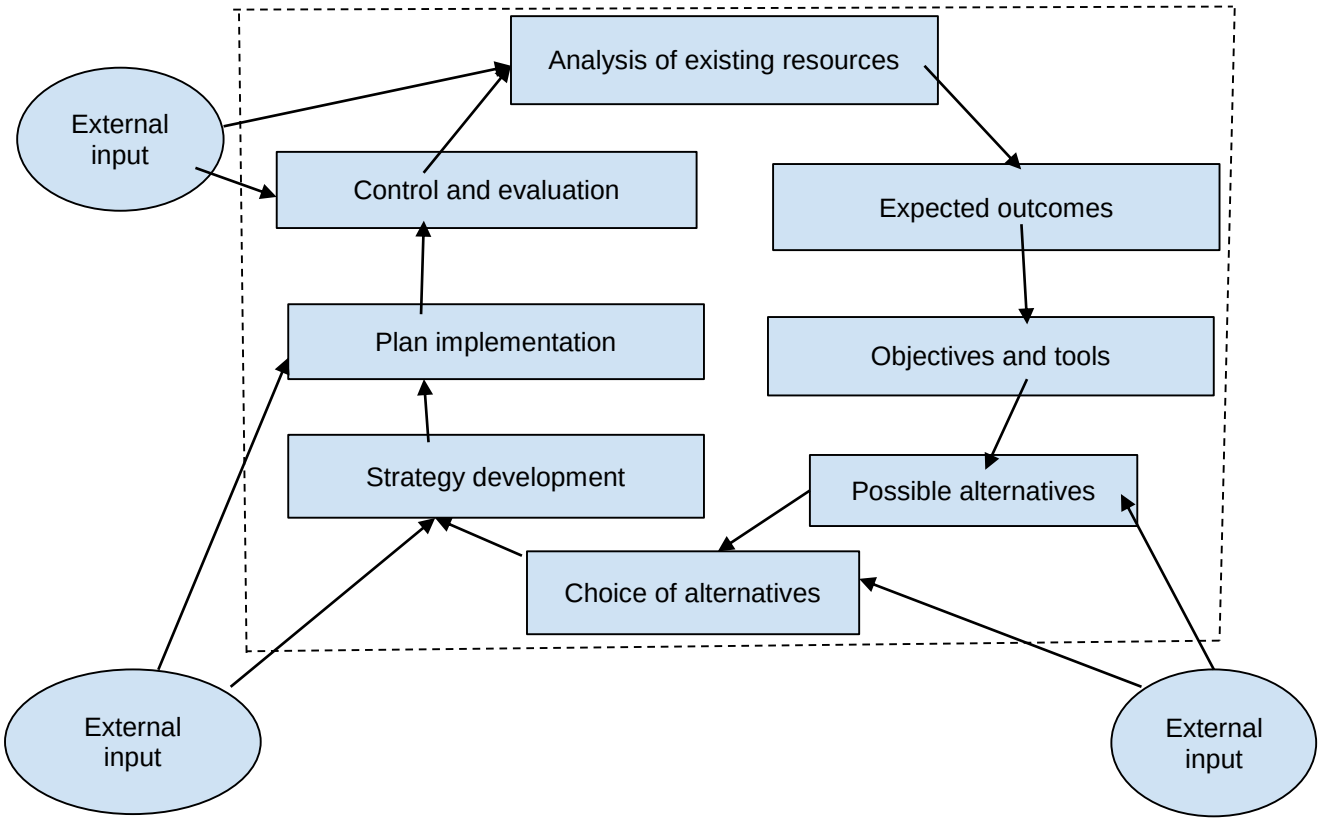

Figure 3. User Interface Model

In Figure 3, The User Interface has additionally the obligation to deal with the authorisation framework permitting distinctive client typologies to perform diverse undertakings. the correspondence layer in view of web innovations and their standard conventions sets up and gives the availability functionalities. this layer practically speaking permits the client to achieve the parts required. the utilization of the web involves accessibility and simple access to database and learning base frameworks regardless of the possibility that conveyed acrosss an assortment of various physical areas [11].

GPS tourist guide - We built up a visitor application that made accessible voyages through Mawson Lakes and North Terrace region of the city of Adelaide. The visit is stacked by means of the visit choice from the menu bar. All client information is pen based [12].

The structure can be seen in Figure 4, The distinctive modes are examined in the accompanying area. From the menu bar inside Tourist Guide the client may look over one of the accompanying choices: Load Tour, Exit, Tour Information, Map Information,

GPS Information, and Tour Creation. The rest of this area will examine the operation of the guide mode and visit mode. The visit creation is introduced in a later segment. The GPS mode gives a standard GPS representation, and thusly is not talked about.

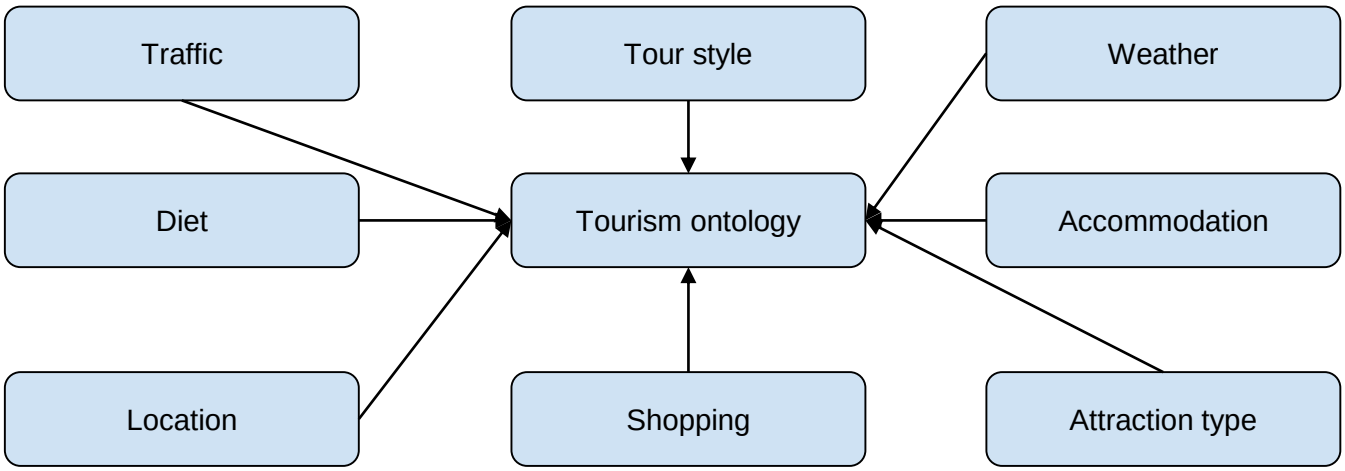

Figure 4. Structure of Proposed Work

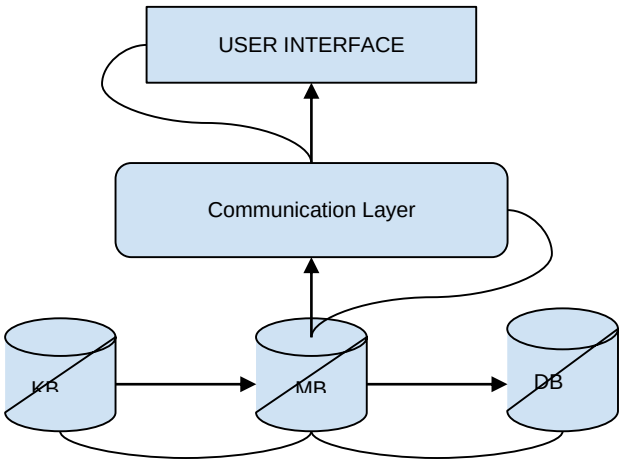

Figure 5. Communication model

PROPOSED METHODS

The venture manages the execution of the machine learning part of the traveler data framework. the data framework and NLP (characteristic dialect preparing) parts will be actualized with support from systems and instruments accessible, while the machine learning segment will be executed by us. The simple overview of the working of the system is depicted as in Figure 5.

User interface is provided by the respective application that the user chooses to use, the communication layer is handled by the NLP framework, the function of the communication layer is to retrieve the message from the user and process it and understand the intent of the message and pass the intent further. The intent is looked up for a match in the metadata database (MB) and sent to the knowledge base. Knowledge base (KB) is a collection of association rules that are learnt by the system. After the application of the rules from the knowledge base, the required reply has to be accessed from the database (DB). Finally the suitable reply is sent to the user via the communication layer to the user interface.

The calculation that is picked depends on example based learning. Case based learning model is a choice issue with cases or cases of preparing information that are esteemed vital or required to the model. Such techniques commonly develop a database of illustration information and contrast new information with the database utilizing a likeness measure to locate the best match and make a forecast.

From Figure 5, we can see that the process flow is simple and straightforward Therefore, example based techniques are additionally called victor take-all strategies and memory-based learning. Concentrate is put on the portrayal of the put away occasions and similitude measures utilized between occurrences.

SOM (Self Organizing Maps) is a helpful calculation is an able calculation for our intelligent framework since it manages gaining from cases of databases accessible in the data framework and furthermore on the notable information from every client.

System design/block diagrams

The system model starts with the user who interacts with the front end which is connected to the database and the NLP framework via the backbone support application. Further going down, the machine learning module gets fed from the database and the NLP. It processes the data and sends the result back to the database for future reference and NLP for voice output and finally to the user.

The model is illustrated in the Figure 6. The databases contain both the tourism databases and natural language libraries and also other information such as authorization details, personalized data, and the core of the language processing and machine learning algorithm. The databases are accessed as and when required by the support application directly and by the natural language processing component via the same.

Machine learning and data analysis is then applied on the retrieved data and the results are sent back to the user via the front end provided by the support application.

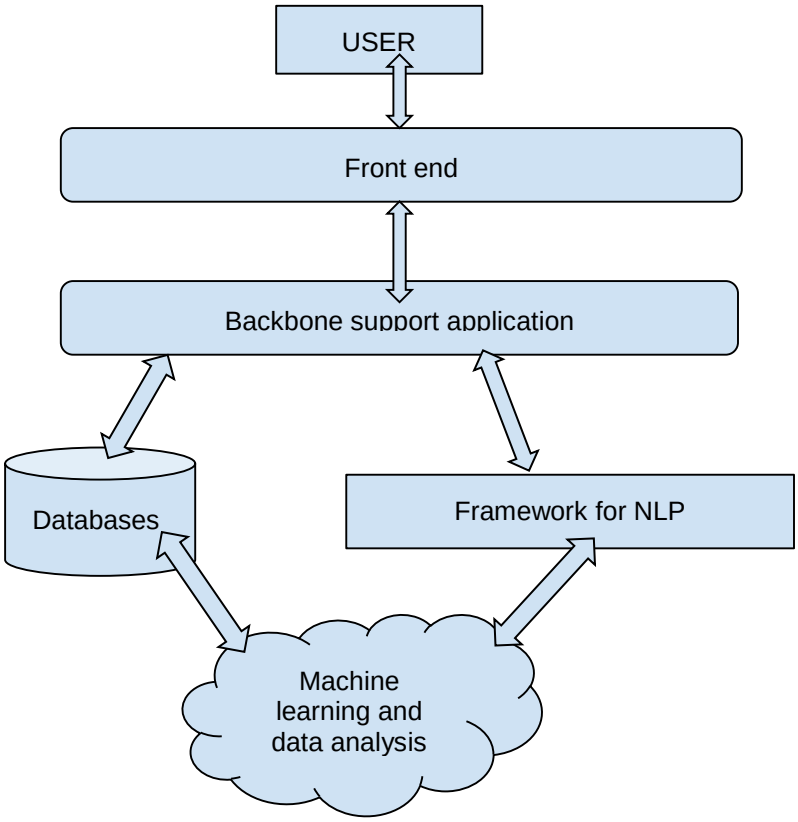

Figure 6. Database Model

Working / operation

The client can enter his inclinations or visit with a bot on the off chance that he prefers, to get a customized proposal, this is expert with the machine learning part that examinations the information and applies information disclosure rules, on the present reactions as well as on notable information of go of that individual.

The client can sign into record his past visits, and other verifiable information which will help anticipate all the more precisely as the self sorting out maps work better when more sources of info are bolstered and it has more information accessible from the databases to learn and unite speedier. In this manner the client can get precise suggestions of what to do in a visitor put or what to pick.

A proactive spatial-setting module gives tips in view of the client's area and interests in regards to close-by objects of intrigue. So, it is pivotal to incorporate fine-grained client and setting models into such a support of raise acknowledgment and shield visitors from killing such an element. The framework utilizes more than the client's position and the area of items to convey proposals. Notwithstanding settling what "nearby" means to the client in the present circumstance includes an extensive variety of individual parameters and logical data.

The application has three principle parts :

1. data framework

2. NLP

3. AI part - machine learning and information investigation

The application can be partitioned into three principle layers as indicated by the segments

Layer 1 : spine/bolster application, for example, google places web administration or apple maps API that can give the database gathering that is required to execute the data framework.

Layer 2 : NLP system "NLTK" offers help for regular dialect preparing that is required in the application for the client collaboration with the talk bot. It is an open source library that serves as a stage for regular dialect handling.

It gives simple to-utilize interfaces to more than 50 corpora and lexical assets, for example, WordNet, alongside a suite of content preparing libraries for characterization, tokenization, stemming, labeling, parsing, and semantic thinking, wrappers for mechanical quality NLP libraries, and a dynamic talk gathering.

Layer 3 : This layer manages the AI segment i.e, machine learning and information investigation which is the center of the venture and will be totally customized by us. While there are numerous great calculations accessible for machine learning, we chose to run with the execution of an occurrence based learning procedure called Self Organizing Maps.

CONCLUSION

In this paper, we introduced a critical component of " Artificial Intelligence " that makes the experience of using such travel advisors more interactive, intuitive and fun to use. The machine learning algorithm brings in a behaviour that humans are most touched by - the process of knowing and feeling like having a companion or a friend that stays and kearns about the person and makes personalized suggestions.

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