International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048

Volume 7, Issue 6, pp 208-219, June-2023

https://doi.org/10.47001/IRJIET/2023.706032

Ontology Supported Case-Based Reasoning for Tourist Knowledge Discovery

[1]Aastha Mishra, [2]Preetvanti Singh

[1]Research Scholar, Department of Physics & Computer Science, Dayalbagh Education Institute, Agra, India
[2]Professor, Department of Physics & Computer Science, Dayalbagh Education Institute, Agra, India

***Abstract* - Agra, city of the Taj Mahal, is a famous tourist spot that attracts people from all over the world. The issue that arises is how to store tourism information of Agra more semantically and make the information reusable and sharable so that it enables effective search. This research presents OCBR-Tour System that integrates ontology and case-based reasoning in the tourism domain. Ontology models are developed into ontology forms with class, each class is divided into subclasses in which the relationships of them are direct properties of the class object property, and data property. The research result provides the ontology on information of tourism components in Agra. The ontology is used for information retrieval using DL queries. Case-based reasoning is used to predict the attractions to visit in the city. Rules are generated to further enhance the tour plan for the tourists.**

Keywords: Ontology, Case-Based Reasoning, Decision Table, Knowledge Discovery, Tourism.

I. INTRODUCTION

Modern tourism is a commercially organized and business-oriented set of activities that boosts the revenue of a country and enables the infrastructural development of a city. The tourism sector has now become a mature market that requires transmitting information globally in an effective manner. An efficient knowledge representation system is thus required for facilitating the tourists to search for structured and precise knowledge while planning their journey efficiently.

Tourist knowledge can be defined as the opinions, experiences, and appraisals of travelers regarding target tourist attractions [16]. One way to achieve this is to engage knowledge representation formalisms that can sufficiently capture all relevant facts about tourism objects on which approaches to rendering tourism information services can be based. The organization of knowledge is a very important step towards achieving this goal which can be achieved by creating ontologies as a means of organized representation of knowledge. Ontology presents a formal and direct definition of concepts for a particular domain and provides a platform for the development of reliable knowledge-based services. It provides a uniform representation of knowledge to facilitate knowledge discovery through simple and effective data integration. Using classification and hierarchy, ontology can store and express knowledge in a particular domain.

Usually, travelers enjoy sharing their experiences or knowledge with others. This experience can be used as a reference by others when planning their trips. This enables them to learn more about the attractions they are going to visit. Case-Based Reasoning is an alternative paradigm of knowledge organization where the main source of knowledge is the set of previous experiences. It is a problem-solving approach used to solve a new problem (target case) by remembering a previous similar situation (source case) and by reusing information and knowledge of that situation. The main aim of this study is to integrate Ontology and Case-Based Reasoning for suggesting an efficient tourist plan. The objectives of the paper are to help tourists in enjoying the journey by guiding them through the tourism destination with structured and easily understandable knowledge based on their preferences.

II. RELATED WORK

Ontologies are used in the field of tourism to enable tourists to acquire tourist knowledge efficiently. [6] Designed travel Ontology integrated with SPARQL to enable users to effectively acquire information and enjoy a joyful tour. The developed system focused on attraction, events, accommodation, and regency for tourists. [12] Developed a system for the tourist industry in Thailand by applying natural language queries against a tourism ontology containing tourism information. [17] Suggested the use of Ontology and semantic web rule language to help tourists in obtaining tourism information on the island of Lombok. [15] Implemented ontology-based automatic service composition procedures that can be used to build ad hoc decision-support services for unknown problems. The authors also described several scenarios of decision support in tourism leveraging the proposed human-computer cloud concept. [1] Proposed an ontology model in the tourism domain in Banyumas.[10] proposed the use of ontologies for classifying and querying the details like accommodation, meal, shopping, and site seeing to develop a better e-tourism Web site. Dijkstra's Algorithm with

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Bit maskingwas utilized to provide the e-tourist with an optimal itinerary starting from their accommodation within time constraints. Semantic search can provide relevant results because it can understand the meaning of the context and its connection. [13] Used ontology for information retrieval from a collection of unstructured information. The authors used tourism in Bandung Raya as the ontology domain. The query entered by the users was searched for its relation to the ontology domain. The search was represented by using Vector Space Model. [18] Developed a construction process of a multi-modal tourism knowledge graph. Tourism ontology was constructed by using a semi-automatic method to maintain the semantic consistency of heterogeneous data sources. This method optimized and simplified the concept hierarchy relationship abstracted from the obtained data resources. Concept hierarchy relationships were manually defined according to the actual application scenarios. [5] Introduced a model to automate ontology creation for the real estate domain based on a natural language processing approach which was easy to create in different domains and was time effective.[9] Studied the development and evaluation methods of ontology-based recommender systems and discussed technical ontology use and the recommendation process.[8] developed a model of sarcasm detection formed by fusing K-mean, PCA, and SVM classifiers. The ontology was generated to analyze the sentiments of Oman tourists.

Ontology is being combined with case-based reasoning for discovering knowledge more efficiently.[3] provided an advancement to develop a case-based fuzzy ontology for diagnosing diabetes.[14] developed a decision support system that uses Case-Based Reasoning to provide physicians with treatment solutions from similar previous cases for reference. The system obtained 84.63% accuracy in disease classification with the help of ontology.[2] integrated case-based reasoning with Ontology by generating a numerical matrix that characterizes the semantic relationship of cases with the domain concepts. A data mining technique was applied to this data matrix to organize the semantic space of cases.[7] developed a decision support system for manufacturing process selection based on ontology-enabled case-based reasoning. An industrial case study was considered to show that ontologies enable process selection by determining competitive matching between product features, material characteristics, and process capabilities and by endorsing effective case retrieval.[4] applied the case-based reasoning method to reuse the knowledge from the most similar previous successful remanufacturing case for the rapid generation of remanufacturing process planning, leading to considerable time and cost savings.

Based on the above review, it can be said that ontology is an effective tool for knowledge representation that can help tourists in acquiring relevant information easily. A combination of ontology and case-based reasoning is playing an important role in the manufacturing industry and healthcare domain. This integration can also be very useful for the tourism industry in helping the tourists to plan their trip after reaching a tourist destination. However, integration of ontology and case-based reasoning is not found in tourism as revealed by the literature review. Thus, this study aims to develop an integrated model with an organized tourism ontology structure to provide information on the tourism components of a city and to develop a suitable tourist plan based on the preferences of the tourists.

III. THE OCBR-TOUR SYSTEM

The focus of this study is to develop an OCBR-Tour System for providing tourists with knowledge of the tourist components of a city and providing a tourist plan based on the tourist preferences and the experience of the travelers. Ontology is used to represent the organized knowledge of the tourism components of a tourist destination. The experiences of the tourists are also stored in the ontology. Case-based reasoning is used to find the similarity between the historic case and the target case, and then rules are generated to suggest a tourist plan to the travelers based on their preferences.

The steps to develop the OCBR-Tour System include:

Step 1: Data acquisition
Step 2: Building the ontology
Step 3: Case-based reasoning
Step 4: Rules Generation

Following are the components of this system:

1) A database: that stores the tourism components of the tourism destination.
2) A set of ontologies: that consists of organized knowledge of tourism components
3) A knowledgebase: consists of related rules and cases,
4) A case-based reasoning component: to generate tourist plans based on the experience of travelers.
5) A rule-base: to suggest detailed plans of travel, and
6) A user interface: for knowledge presentation.

The outline of developing the OCBR-Tour system is shown in Figure 1.

3.1 Data acquisition

The data was gathered by visiting websites to collect the tourism components (attractions, accommodation, and amenities), and through a questionnaire to get the traveler experience. The database of the system stores the data related

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to the preferences of tourists, and the tourism components of Agra, India. Agra, the city of Taj, is taken as a case study because of its popularity as a tourist destination.

3.2 Building the Tourism ontology

Ontology is a formal representation of a set of concepts within a domain and the relationships between those concepts. It describes the classes in a domain, properties of each concept describing various attributes of the classes, and restrictions on properties.

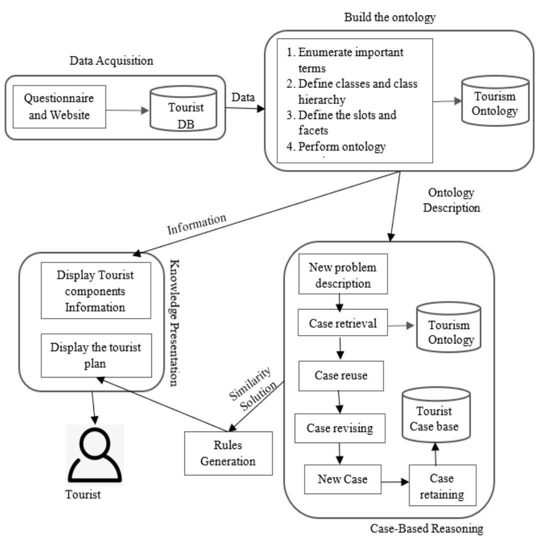

Figure 1: The OCBR-Tour System

The Agra-tourism ontology for this study is developed using the Protégé tool. This Ontology explains the information about the tourist components (attractions, accommodation, food and beverages, and transportation) at Agra. The Agra-tourism ontology has 7 classes that represent the tourism components as shown in Figure 2. Six classes *Accommodation, Attraction, Season, Food, Region, and Transportation* are used to specify the details of various tourism components. 7th class, the Case class is used to form the cases for Case-Based Reasoning. Top-down and bottom-up approaches are combined to develop the Agra-tourism ontology class hierarchy. Classes were created first for the general concept of *Agra_Tourism*. Then the class *Agra_Tourism* was specialized by creating some of its subclasses.

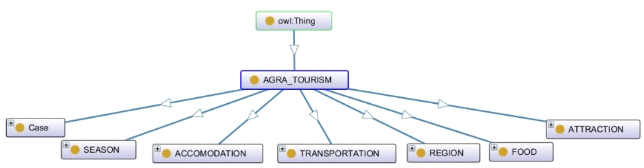

Figure 2: Ontology Classes

The class Accommodation has sub-classes Hotel and Guest House. Attraction class has information about the famous tourist places located in and outskirts of Agra. The class has 7 sub-classes: Monuments, Parks, Religious Places, Market, Events, Wildlife, and nearby places to visit besides Agra. Class Season has five sub-classes which represent the seasons of the city i.e., Winter (November-January), Spring (February-March), Summer (April-June), Monsoon (July-August), and Autumn (September-October). The months are given as data property for the sub-classes. Food has sub-classes food court, restaurant, and café. The class Region has two sub-classes Block (planning and development units of the district) and Tehsil (which are the sub-districts) of the Agra district. Region class helps tourists to locate the place. Transportation class has buses, cars, and cabs as sub-classes which are the modes of transport within the city. The Case class has Tourist ID as its instance. The defined class hierarchy is shown in Figure 3.

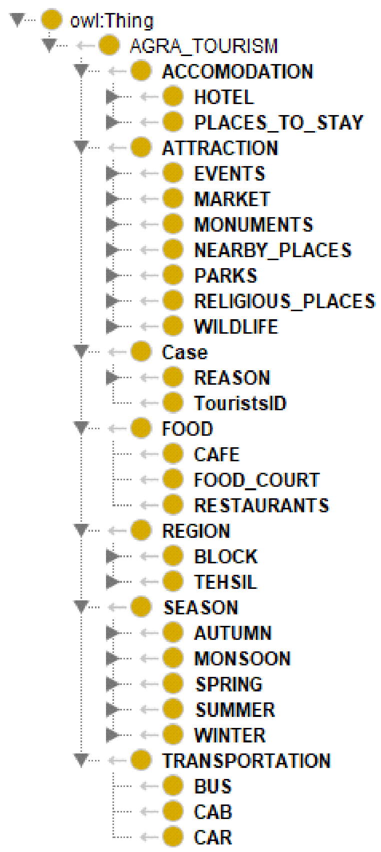

Figure 3: The different levels of the *Agra_Tourism* taxonomy

Next, the internal structure of Classes is defined by mentioning object properties and data properties. Object properties are used to connect an individual to another individual. The 3 identified object properties are *hasLocation, hasLodging, and hasAttraction* (Table 1). The data properties connect the individual to data value through data type. Table 2 shows a few data properties applied in Agra-tourism ontology.

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Table 1: Object Property

Object Property	Domain	Range	Specifies
hasLocation	Attraction	Region	Region belongs to Attraction.
hasLodging	Attraction/Region	Accommodation and Food	Accommodations and Foods close to Attraction and Region.
hasAttraction	Region	Attraction	Attraction close to Region.

Table 2: Data Property

Data Property	Data Type	Domains
Closing Time	String	Attraction
Opening Time	String	Attraction
Famous For	String	Attraction
Months	String	Climate
Max Temperature	Integer	Climate
Min Temperature	Integer	Climate
Phone no.	Integer	Accommodation, Food
Name	Name	Accommodation, Food
Address	String	Accommodation, Food, Attraction
No. of Persons	positive integer	Case
No. of days	positive integer	Case

Properties can have different restrictions like describing the value type, allowed values, and cardinality. For example, Address is a property with value type String.

Figure 4 illustrates the implementation of the OCBR-Tour system by taking an example. A possible conceptualization of the domain Attraction containing the two aspects of the area is shown in this figure. The developed Agra-tourism ontology is shown in Figure 5.

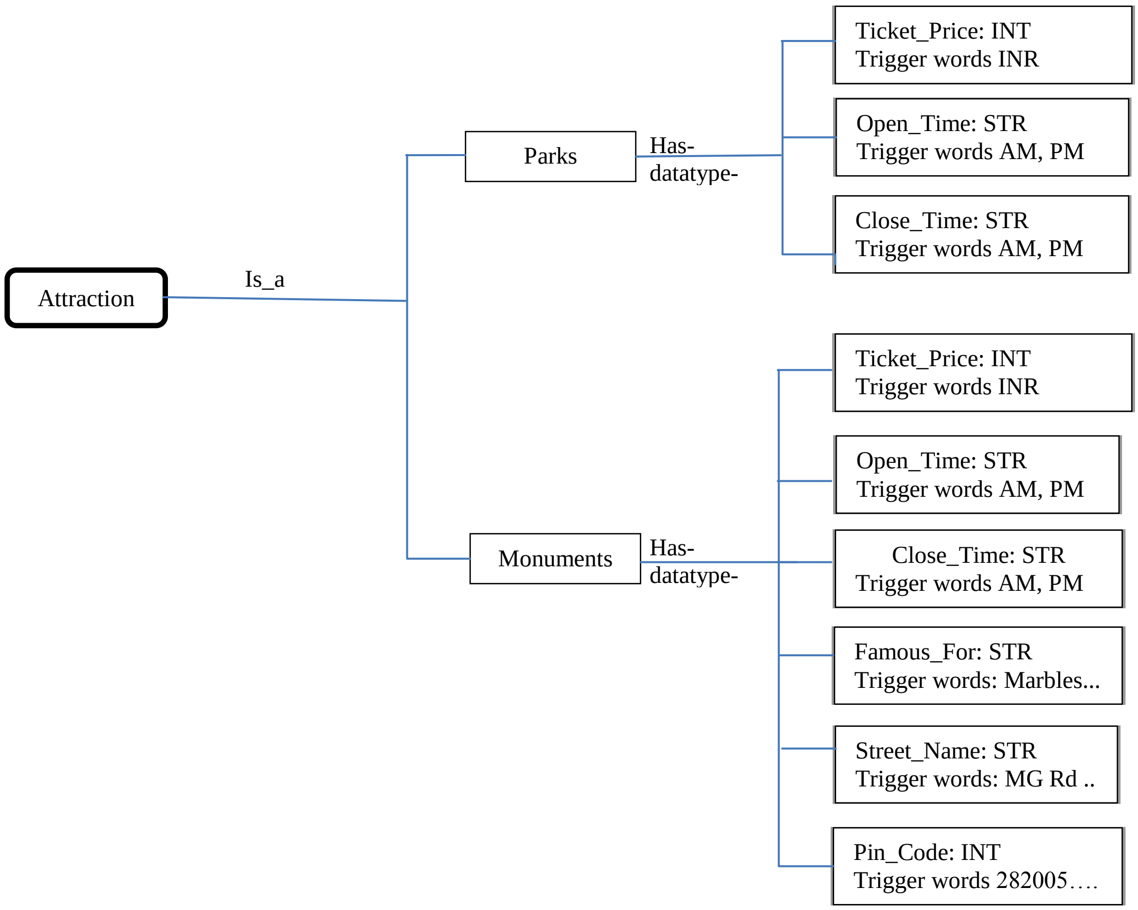

Figure 4: An Ontology Structure of Attraction Domain

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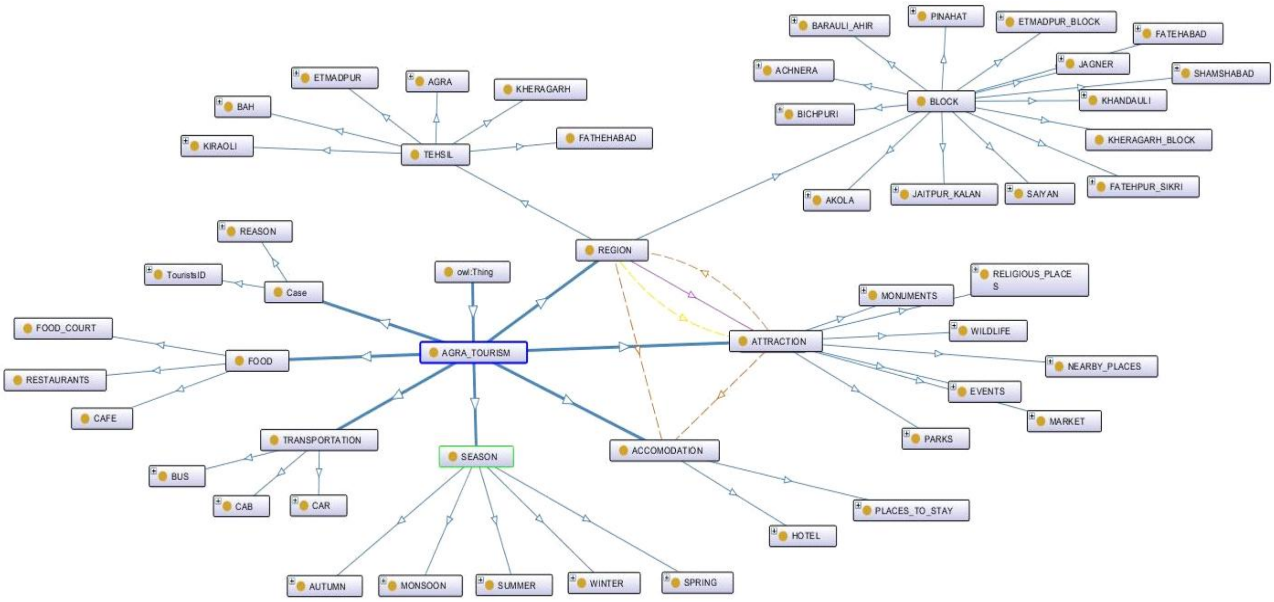

Figure 5: The Agra-Tourism Ontology

Inconsistencies in the ontology are checked by running the Reasoner. The evaluating process is performed using HermiT 1.4.3.456 reasoner. Inconsistencies were not found in the developed Agra-tourism ontology.

To retrieve the information from the Agra-tourism ontology, the DL Query option of Protégé is used. The figure shows the result of a DL query for the user search. Class expression executed by the reasoner provides the instances related to them. For example, class Attraction has AGRA_FORT as its sub-class and AGRA_FORT has instance Rakabganj that defines the location where Agra Fort is situated. The instance stores information related to Agra Fort such as its address, and opening and closing time which will be helpful for the tourist.

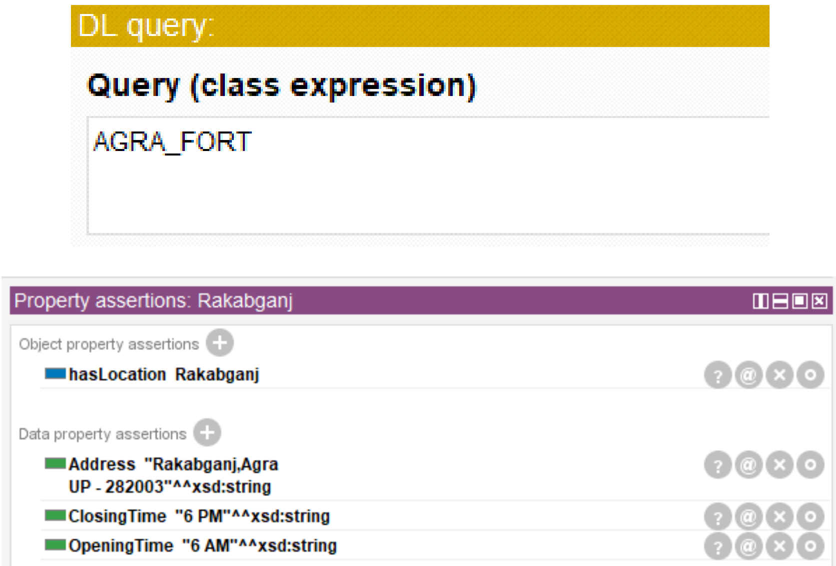

Figure 6: DL Query Execution Result

3.3 Case-Based Reasoning

Cased-Based Reasoning uses previously solved and stored solutions called cases. It uses Artificial Intelligence techniques to remember past experiences. The main concept of Case-Based Reasoning is similar problems have similar solutions. Case-Based Reasoning knowledge is formed as a case-base of previous experiences. This study uses Case-based Reasoning to help the tourists plan their journey.

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3.3.1 Tourist Case Representation

The cases in the tourist case library are represented by the class Case in the Agra-tourism ontology as shown in Figure 7. Each case is represented by an instance of class Tourist ID which is a subclass of class Case. The instances comprise eight attributes (Table 3) that define the cases and are represented as follows in the ontology.

In the case-based reasoning method, a case is described by a set of attributes that identifies the instances of a problem, its solution, and its outcome as follows:

Definition 1. Case

A case is a three–tuple, $C = (C_p, C_s, C_o)$

Where C_p is a set of attributes that describe the problem,

C_s is a set of attributes that describe its solution,

C_o is a set of attributes that describe the outcome obtained by the solution C_s to the given problem C_d.

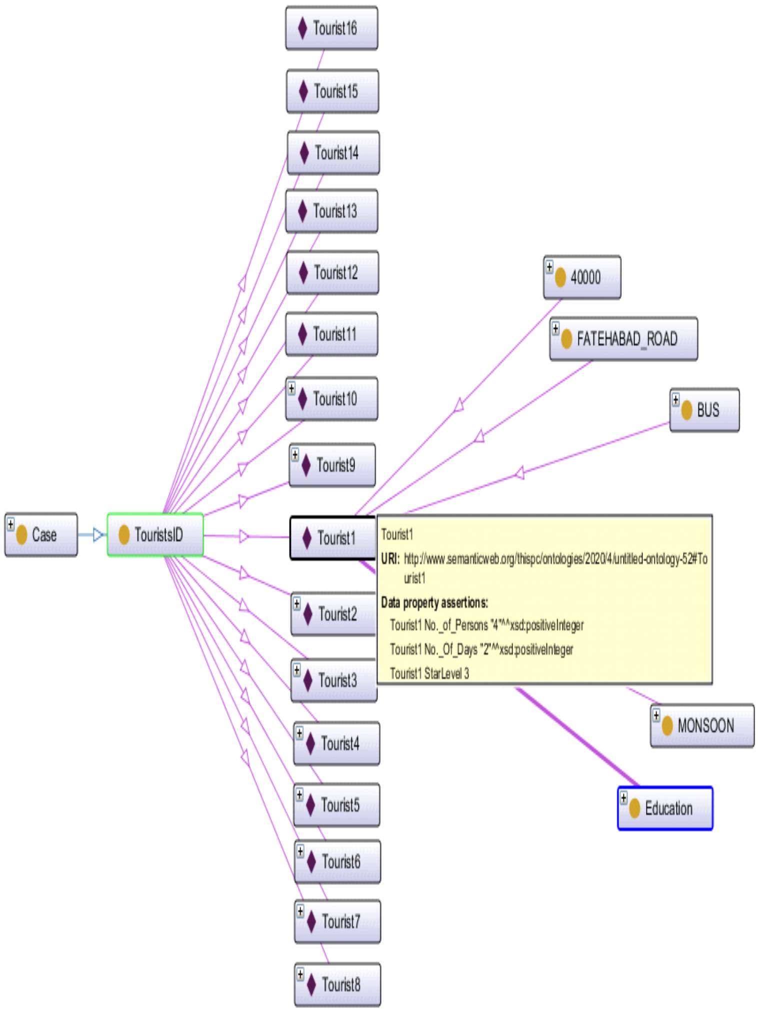

Figure 7: Case Representation in Agra-tourism ontology

Thus, a tourist case can be described as,

Tuple 1 (specification of tourist components and the relevant attributes): Table 3describes the attributes of the cases required to generate tourist plans. These are viewed as the attributes of each tourist record in the database. The attributes are selected by getting a questionnaire filled out by the tourists to analyze their travel plan.

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Table 3: The Attributes (Tuple 1)

SNo.	Attribute	Data Type
1.	No of Persons	Numeric
2.	No of Days of Stay	Numeric
3.	Place of Stay	Text String
4.	Season	Text String
5.	Reason	Text String
6.	Mode of Transport	Crisp Set
7.	Start Level	Numeric
8.	Budget	Numeric
8.	Budget	Numeric

Table 4: The Tourist Case Library

Case#	#Persons	#Days	Place of stay	Climate	Reason	Mode Transport	Star Level	Budget ('000 Rs.)
T1	4	2	Fatehabad Rd	Monsoon	Education	Bus	3	40
T2	6	5	Fatehabad Rd	Winter	Leisure	Cab, Car	3	80
T3	3	2	Taj Ganj	Summer	Education	Cab, Car	3	20
T4	2	4	Taj East Gate Rd	Winter	Cultural	Cab	5	80
T5	5	3	Taj Ganj	Monsoon	Ecotourism	Bus	-	30
T6	4	4	Fatehabad Rd	Winter	Education	Cab, Bus	3	40
T7	3	3	Fatehabad Rd	Monsoon	Religious	Car	4	50
T8	10	4	Taj Ganj	Winter	Leisure	Car	4	60
T9	7	3	Rakabganj	Summer	Religious	Bus	4	30
T10	2	3	Taj Ganj	Winter	Ecotourism	Cab, Car	5	20
T11	4	2	Taj East Gate Rd	Winter	Cultural	Car	3	30
T12	6	4	Taj Ganj	Winter	Leisure	Car	4	40
T13	3	2	Fatehabad Rd	Summer	Education	Cab	3	50
T14	2	4	Dayalbagh	Winter	Agritourism	Car	-	40
T15	5	3	Dayalbagh	Winter	Leisure	Car	4	30
T16	10	3	Fatehabad Rd	Monsoon	Leisure	Car	4	20

Tuple 2 (solutions describe the derived tourists'plan, comprising of subclasses): The solution in the OCBR-Tour System consists of Preferred Accommodation (includes the possible places to stay), its Tariff, and Attractions (include the places to visit).

Tuple 3 (outcome describes the results when the solution tuple has been used in a previous situation): The outcome process includes benefits and status. Benefits include taking feedback from the tourists and interpreting the feedback after applying the solutions. Status includes successful or unsuccessful outcomes when the solution tuple has been used in a previous situation.

The tourist case library in this study consists of 16 historical cases. Some journey plans were analyzed to form historic cases.

Table 5: Solutions to the historic cases

Case	Preferred Accommodation	Accom Tariff (Rs)	Attractions
Tourist1	Hotel Celebration	3584/-	Market, Park, Monument
Tourist2	Taj Haveli	4654/-	Market, Park, Monument
Tourist3	ABC Guest House	3894/-	Market, Park
Tourist4	Surya Vilas Palace	4800/-	Park, Monument
Tourist5	Guest House	2850/-	Market, Monument
Tourist6	Hotel Marwari	3960/-	Market, Park, Monument
Tourist7	Bhawna Inn	4597/-	Market, Park, Monument
Tourist8	Taj Villas	8280/-	Monument
Tourist9	Swarahjya Palace	3423/-	Monument
Tourist10	Crystal Sarovar Palace	4302/-	Park, Monument
Tourist11	Guest House	3000/-	Market, Park, Monument
Tourist12	Guest House	1000/-	Market, Monument
Tourist13	Taj Haveli	2654/-	Market, Park
Tourist14	Surya Vilas Palace	4800/-	Market, Park, Monument
Tourist15	Alleviate	3850/-	Market, Monument
Tourist16	Alleviate	3850/-	Park, Monument

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$$S_{ij}^{SET}(C_{HIST}, C_{TAR}) = \frac{|CH_{ij} \cap C_{Tj}|}{|CH_{ij}| + |C_{Tj}| - |CH_{ij} \cap C_{Tj}|}$$

A target case C_{TAR}{5, 4, Fatehabad Road, Winter, Ecotourism, Car, 4, 70,000/-} is considered for comparison with other historic cases (C_{HIST}, i= 1,…, 16) to predict the best-suited tourist plan.

The case retrieval algorithm works as follows: When a new problem is an input into the system, the case base is searched to retrieve all cases with a similar profile. The similarity of the new problem to the stored cases is determined by calculating the distance between case attributes. Once the most similar cases have been obtained from the case base, generate an accurate solution.

Let the historic cases in the case library be represented as $C_{HIST} = (CH_{11}, CH_{12}, \ldots, CH_{MN})$ where M is the number of cases in the case library. Each CH_{ij} has j attributes j =1,…, N. Let the Target case be $C_{TAR} = (C_{T1}, C_{T2}, \ldots, C_{TN})$. To retrieve similar events from historical cases, similarity calculations are performed. The similarity calculations for determining the local similarities depend on the data types of the attributes. The possible data types for the chosen attributes (Table 3) are numerical, text string, and crisp set.

For the numerical data type, the similarity value is calculated by:

$$S_{ij}^{NUM}(C_{HIST}, C_{TAR}) = 1 - \sqrt{\left(\frac{CH_{ij} - C_{Tj}}{max\, CH_{ij} - min\, CH_{ij}}\right)^2} \quad (1)$$

Where CH_{ij} and C_{Tj} are the j[th] attribute values in the two cases C_{HIST} and C_{TAR}, and $(maxCH_{ij} - minCH_{ij})$ is the largest scope of the case.

The similarity for the textual string type parameter is calculated as:

$S_{ij}^{STR}(C_{HIST}, C_{TAR}) = 1$, if the input value of C_{Tj} is included in the textual string value of CH_{ij} (2)

= 0, if C_{Tj} and CH_{ij} are totally different from each other.

The similarity of crisp data type is computed as:

The global similarity value is calculated by using the following formula. The value of similarity is between 0 (not similar) and 1 (most similar).

$$Sim(C_{HIST}, C_{TAR}) = \sum_j w_j S_{ij}^{NUM}(C_{HIST}, C_{TAR}) + \sum_j w_j S_{ij}^{STR}(C_{HIST}, C_{TAR}) + \sum_j w_j S_{ij}^{SET}(C_{HIST}, C_{TAR})$$

Here $w_j = (w_1, w_2, \ldots, w_M)$ is the weight for each attribute j.

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```
Algorithm 1. Case retrieval algorithm.
Input:          A new case CT with its attribute CT= (CT1,…,CTN )
Output:   Similarity degree of a new case within the case base
Local variables: Old case CH with a set of features CH (C11, …,CMN),
                   and M is the number of cases and N is no. of case
                   attributes
               Data-type = {numeric, string, crip set},
               W is the weight of the attributes w =(w1, w2,…,wN),
Begin
        Starting from i=1, select one case Ci (0≤j≤N)
        Begin
          For each CHij of CH do (0≤j≤N), 0≤i≤M
          Begin
             Compare attribute value of CH and CT:
                 if attribute (data-type) =‘numeric’ then do Eq. (1)
                 if attribute (data-type) =‘string’ then do Eq. (2)
                 if attribute (data type) = crispest then do Eq. (3)
          End
          Compute wj for each j.
          Calculate the global similarity SG of each retrieved case by
          using Eq. (4).
          The case with the highest SG value is chosen as the solution
          of CT
      End
End
```

For example, the similarities between case 1 of the case library (Table 4) and the new case can be computed as follows:

The data type of the 1st attribute (No. of Persons) is numeric, therefore the similarity using equation (1) will be, considering the maximum number of tourists = 10 and minimum =1,

$S_{11}^{NUM} = 0.89$

Using equations (1), (2), and (3) the similarities for the remaining attributes will be computed as:

$S_{12}^{NUM} = 0.33$, $S_{13}^{NUM} = 1$, $S_{14}^{NUM} = 0$, $S_{15}^{NUM} = 0$

$S_{16}^{NUM} = 0$, $S_{17}^{NUM} = 0$, $S_{18}^{NUM} = 0.625$

Similarly, the calculations were done for all the cases to determine the similarities between C_{HIST} and C_{TAR}.

Now weights are computed for each attribute using AHP[11]. The computed weights are

w_j = {0.0842, 0.1169, 0.0767, 0.2624, 0.0496, 0.0614, 0.0251, 0.3236}^{T}

The computed global similarity (from equation (4)) for the cases is

$Sim\ (C_{HIST}, C_{TAR})$ = {0.3970, 0.8149, 0.3675, 0.4101, 0.3456, 0.2341, 0.5689, 0.2367, 0.6790, 0.4563, 0.3451, 0.4343, 0,3102, 0.4151, 0,6734, 0.2450, 0.5673)^T

The value of $Sim2$ is the highest, therefore the retrieved historical case CH2 is selected as the most similar case to the target case (Figure 8).

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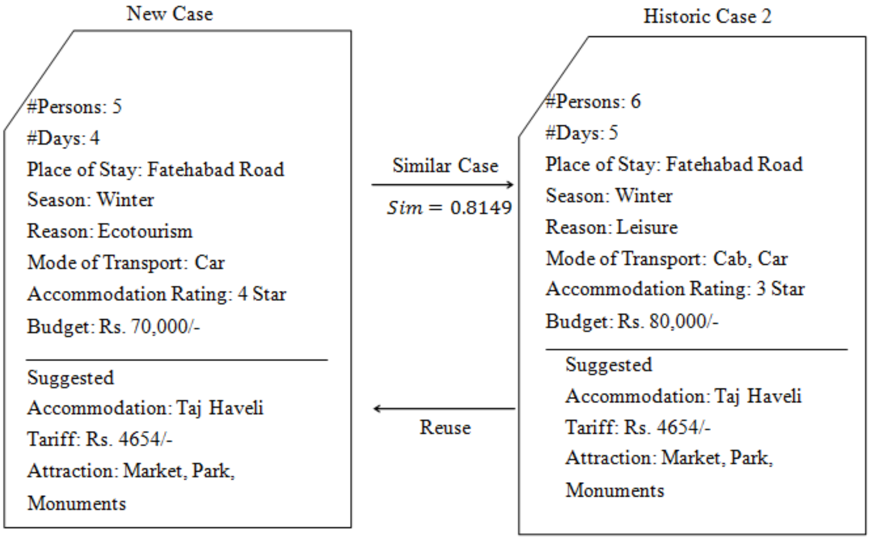

Figure 8: The Solution to the target case

This best-matching case is re-used to solve the new problem. The new description and its solutions are retained as anew case in the case base to help find solutions for future situations.

3.4 Rule Generation using Decision Table

Once a similar case is retrieved, rules are generated to suggest a detailed plan to the tourists based on their preferences for the attraction at Agra.

For this, several criteria related to each attraction are selected for determining the preferences of a tourist. For example, the identified criteria for Market are (the brackets show the values of the criteria).

Crowded: the market is crowded (Yes/No)
Location: Location of the Market (as given in the class region of the Agra-tourism ontology)
Street shopping: preferring street marketing (Yes/No)
Street Food: preferring street food (Yes/No)
Items to purchase: (marble work, jewelry, garments, fabrics, leather footwear, bags, purses, silk dress material, religious items).

Now the tourists are asked to fill out a questionnaire to get their preferences. Decision tables are created based on their preferences to generate rules for giving them a detailed plan. The identified criteria are listed in the condition stub and the solutions are given in the action stub of the decision table.

A total of 23 rules are generated for the attractions. Decision Table 1 shows the generated rules for the attraction Market, and Decision Table 2 shows the generated rules for Monuments and Parks.

Decision Table 1: Rules for the Attraction Market

	R1	R2	R3
Crowded	N	-	-
Location	Near Taj	-	-
Street shopping	Y	Y	Y
Street Food	Y	Y	N
Items to purchase	Ethnic Wear, leat products	marble work, jewelry	Religious Items others
Old Market	N	Y	Y
Market	Sadar Bazaar	Kinari Bazaar	Raja Ki Mandi

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Decision Table 2: Rules for the Attraction Monuments and Park

	R1	R2	R3
Mode of transport	Car	Cab	Bus, Cab
Preferences	Monuments	-	-
Reason	Education	Y	Y
Place of stay	Rakabganj	Y	N
No of days	2	5	2
Budget	≥ Rs 70,000/-		
Monuments	Taj, Fort, Taj Nature Walk; Keetham, Wildlife SOS, Tomb of Akbar, Mariam's Tomb		

Thus, the complete solution to the target query {5, 4, Fatehabad Road, Winter, Ecotourism, Car, 4, 70,000/-} is{Market: Sadar Bazaar, Park: Taj Nature Walk, Monuments: Taj Mahal, Agra Fort, Tomb of Akbar, and Mariam's Tomb; Plus Keetham, Wildlife SOS as the purpose for coming to Agra was Education tourism}.

IV. CONCLUSION

In this research, ontology is integrated with case-based reasoning to provide tourists with the detailed tourist plan and also provide them with the information of tourism components of a city. Agra, a city of India, is taken as a case study because of its popularity as a tourism destination. The developed OCBR-Tour System is built to find out the influence of ontology in getting relevant information according to user needs that can help tourists in planning their journey. Combining Case-Based Reasoning with ontology helps in generating a travel plan based on the travel history that can help a new traveler. Further rules are generated to provide the tourist with a detailed travel plan.

For future research, ontology can be combined with other methods to get better results. In addition, to meet the users' needs, knowledge or information on ontologies needs to be enriched by adding other individuals or classes that might add or change the information about tourism destinations. This ontology can also be developed into an Agra tourism web so that it makes it easier for tourists to find tourist information when they want to visit Agra city.

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ISSN (online): 2581-3048
Volume 7, Issue 6, pp 208-219, June-2023
https://doi.org/10.47001/IRJIET/2023.706032

Database Tourism Ontology Thai lexme Tokenizer User Interface Input Keyword Spell Check POS Bigram Query Triple Check Unknow-Sentence Handling SPARQL Know Unknow.

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Citation of this Article:

Aastha Mishra, Preetvanti Singh, “Ontology Supported Case-Based Reasoning for Tourist Knowledge Discovery” Published in *International Research Journal of Innovations in Engineering and Technology - IRJIET*, Volume 7, Issue 6, pp 208-219, June 2023. Article DOI https://doi.org/10.47001/IRJIET/2023.706032

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