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Ontology Model for Tourism Information in Banyumas

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Abstract. Banyumas has tourism potential to be promoted. An interesting issue that arises is how to store tourism information in Banyumas more semantically and make the information can be shared and reusable. This research proposed an ontology model in the tourism domain in Banyumas. Ontology implementation uses protégé software. Ontology models are developed into ontology forms with class, object property, and data property. Ontology testing uses four questions that are transformed into SPARQL. The results of the research and testing that have been carried out show that the ontology model can store and provide tourism information in Banyumas more semantically.

INTRODUCTION

Tourism is one of the important sectors in Indonesia to provide income for the country. Various types of tourism are available in various regions in Indonesia, ranging from Sabang to Merauke which can be in the form of nature tourism, historical tourism, culinary tourism, and artificial tourism.

Banyumas has potential tourism. Banyumas is a district located in the Southwest of Central Java Province. Banyumas Regency consists of 27 sub-districts and 331 villages. This area stretches from west to east with a length of stretch of 96 km, with an area of 132,759 ha or 1,327.59 km2. Tourism in Banyumas is in demand by local and foreign tourists. Meanwhile, tourism availability in Banyumas has not been supported by the availability of complete information on existing tourism. Tourism information is only obtained through the website media, putting up banners, distributing flyers and holding seminars, but this effort is still one-way. The use of the website as an information provider media still has limitations, because the information provided on the website is not interactive with tourists who need complete information. For example, if tourists want to find information about places of tourism in "Banyumas" then many search results are not appropriate. The search engine gives all words related to "Banyumas" without choosing which information is in accordance with the wishes of tourists.

To overcome this problem, a method has been developed for information exchange known as Semantic Web that utilizes ontology. Ontology is a theory of the meaning of an object, the property of an object, and the relation of an object that might occur in a domain of knowledge. All fields of knowledge in the world including tourism can use the ontology method to be able to connect and communicate with each other in terms of information exchange. With the use of an ontology, it is expected to store tourism information in Banyumas in a more semantically, so that the information can be shared and reusable according to the user's perception of tourism information.

This study aims to develop an ontology model in the tourism domain which is expected to be able to provide tourism information semantically to tourists. Then test the ontology model through questions that are commonly sought by users in accessing tourism information.

The rest of this paper is organized as follows. In section 2, we present a review of related work. Section 3 gives a detailed description of fundamental concept ontology, SPARQL, and ontology tools. Section 4 gives results and discussion about ontology tourism development. And in section 5 are concluded.

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RELATED WORK

Research related to the development and use of ontology has been carried out by many researchers, ontology has been used in various fields including in the field of information retrieval[1][2][3][4][5]use ontology to find documents that are relevant to the user's query. Research conducted by[6]was proposedontology method enrichment on tourism domain.Ontology developed contains four main classes, 15 subclasses, and 199 samples/objects.Research conducted by [7] structuring an ontology of the basic vocabulary of tourism. Different from [8]use the ontology model in the university domain using protégé. Research[9]propose an ontology population on the tourism domain.

FUNDAMENTAL CONCEPT

Ontology

Ontology is the key to implementing web semantics[10]. Ontology can define as *"an explicit specification of a conceptualization"*[11]. Ontology is very important to describe something. Technically, ontology can be represented in the form of objects, properties of objects, and relations between each object[12]. Ontology is represented using the OWL language (Ontology Web Language). At first, the OWL was designed to represent information about the categories of objects and how they relate. OWL can also provide information about the object itself.

SPARQL

SPARQL (SPARQL Protocol and RDF Query Language) is the query language used to access RDF documents. SPARQL is similar to SQL in the relational database. SPARQL makes it possible to do a number of things, namely, extracting values from structured data and semi-structured data, developing data by querying an unknown relation, simpler querying of complex join operations in different databases, and changing data RDF becomes another vocabulary. The SPARQL example is shown in Figure 1.

```
PREFIX pw:<http://wisatabanyumas.info/pariwisatabanyumas.owl#>

SELECT ?subject ?predicate ? object
WHERE
{?subject ?predicate ? object}
```

FIGURE 1. Example of SPARQL

PROTEGE

Protégé is a software developed by Standford, protégé used to process ontology-based knowledge. Protégé is able to apply the concepts of classes, property objects, and property data as well as relationships between them. At present, Protégé has a version of Protege-5.0.0-beta-17. Protégé supports several storage formats including OWL, RDF, XML, and HTML. Protégé provides various plug-ins that can help in the application of ontology.

RESULT AND DISCUSSION

Ontology Design

In this stage, we design ontology. The ontology design uses the approach method proposed by [13]. The results of ontology design shown in Table 1 and Table 2.

TABLE 1. Class, Subclass of and Object Property of the designed ontology

Class	Subclass Of	Object Property
Facility	Thing	hasHave
Location	Thing	
Village	Location	HasDistricts
Districts	Location	HasVillage
Tourism	Thing	
NaturalTourism	Tourism	LocatedIn
ShoppingTourism	Tourism	LocatedIn
CulinaryTourism	Tourism	LocatedIn
WisataRekreasi	Tourism	LocatedIn
HistoryTourism	Tourism	locatedIn
Hostelry	Thing	
Hotel	Hostelry	locatedIn, hasHave
GuestHouse	Hostelry	locatedIn, hasHave

TABLE 2. Data Property, Domain and Range of the designed ontology

Data Property	Domain	Range
Nama	Village	Districts
Name	Districts	Village
Name, Foto, Decsription	NaturalTourism	Village
Name, Foto, Decsription	ShoppingTourism	Village
Name, Foto, Decsription	CulinaryTourism	Village
Name, Foto, Decsription	RecreationalTourism	Village
Name, Foto, Decsription, worshipPlace	HistoryTourism	Village
Name, Foto, Decsription, Phone	Hotel	Village Facility
Name, Foto, Decsription, Phone	GuestHouse	Village Facility

Ontology Implementation

The next stage after ontology design is the implementation of the concept of ontology using protégé. At this stage, classes and subclasses are created. The result of ontology implementation shown in figure 2.

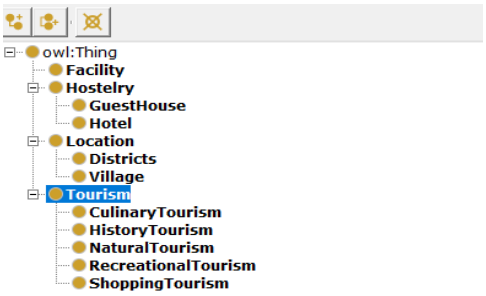

FIGURE 2. The ontology implementation

Figure 2 is the ontology implementation. Thing is the root class. For the object property of the tourism domain ontology can be seen in Figure 4. Property object connects between each class that has been created. For example, the CulinaryTourism class has a relation with the class village that is associated with the locatedIn property object.

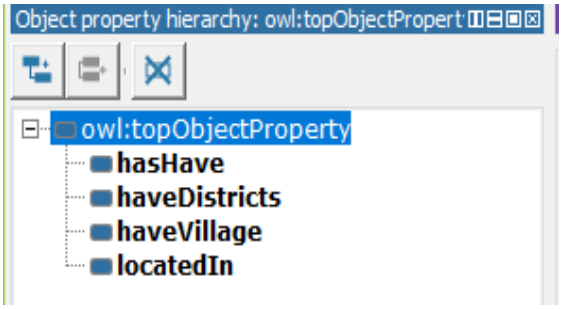

FIGURE 3. Object Property

Figure 3 is an implementation of a property object that connects or relations between classes. While Figure 4 is an implementation of data property owned by each class, for example, the Hotel class has data on property name, description, photos, and phone.

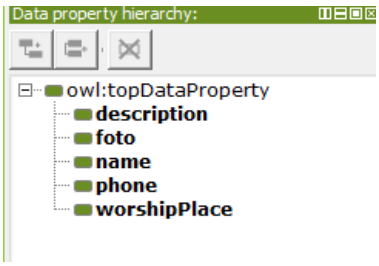

FIGURE 4. Data Property

Individual

The next step is to add individuals. This individual can be an instance of a subclass or superclass. An individual example is the individual HotelQueenGarden, where the individual has data on property name, description, and photos. In addition, HotelQueenGarden has a hashave and locatedInobjectproperty, as shown in Figure 5.

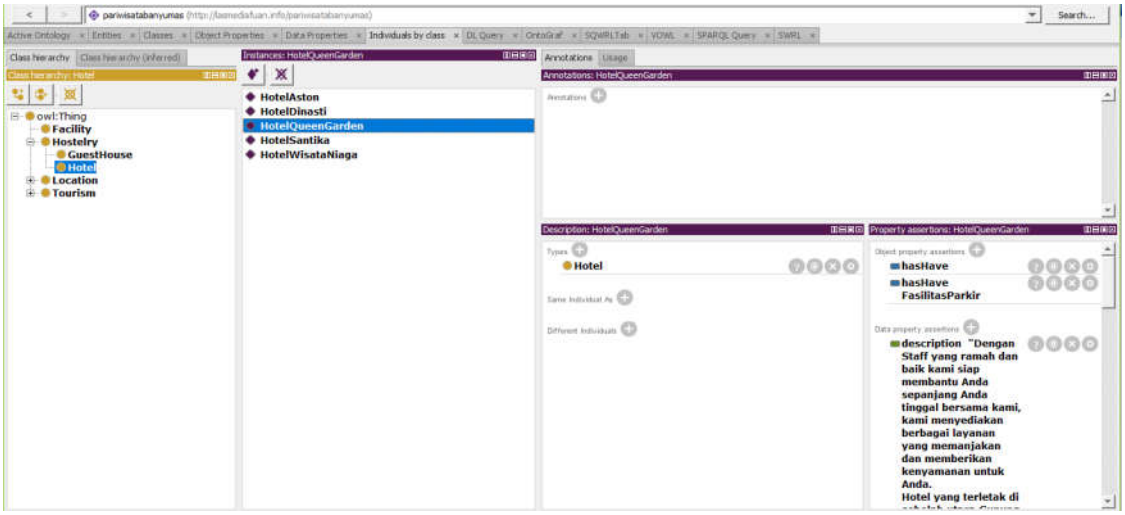

FIGURE 5. Individual of Hotel Queen Garden

Ontology testing

The next stage before ontology can be used in the development of web semantics, it is necessary to test the ontology knowledge. Ontology testing is carried out using several knowledge-based questions. The list of questions used to test ontology is shown in Table 3.

TABLE 3.The list of questions for ontology testing

No	Code	Questions
1	Q1	What is the tourism in Banyumas?
2	Q2	What are the hotels in Banyumas? show with hotel name, village and sub-district name!
3	Q3	Show tourism in Banyumas, which includes historical tourism.
4	Q4	Are there historical tours in Banyumas which also include religious tourism?

The next step, the list of questions in table 3 is converted into sparql format

1. SPARQL for Q1.

```
SELECT *WHERE {
?subject rdfs:subClassOfpw:Tourism.
?name rdf:type ?subject.
?name pw:name ?tourismname.
?name pw:description ?description.?namepw:foto  ?foto.
}
```

2. SPARQL for Q2.

```
SELECT *
WHERE {
```

```
?subject rdf:typepw:Hotel.
?subject pw:name ?name.
?subject pw:locatedIn ?village.
?village pw:haveDistricts ?districts.
}
```

3. SPARQL for Q3.

```
SELECT *
WHERE
{
?subject rdf:typepw:HistoryTourism.
?subject pw:name ?name.
?subject pw:description ?description.
?subject pw:foto ?foto.
?subject pw:locatedIn ?village.
}
```

4. SPARQL for Q4.

```
SELECT *
WHERE
{
?subject rdfs:subClassOfpw:Pariwisata.
?nama rdf:type ?subject.
?nama pw:name ?tourismname.
?nama pw:description ? description.
?nama pw:foto  ?foto.
OPTIONAL
     {
     ?name pw:worshipPlace ? worshipPlace.

     }
FILTER REGEX(?worshipPlace,'Y','i').
}
```

After convert question to SPARQL, running SPARQL into Protégé, and will display result as shown in Figure 6.

SPARQL query:

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX pw: <http://lasmediafuan.info/pariwisatabanyumas#>
SELECT * WHERE {
?subject rdfs:subClassOf  pw:Tourism.
?name rdf:type ?subject.
?name pw:name ?tourismname.
?name pw:description ?description.?name pw:foto  ?foto.
}
```

subject	name	tourismname	description	foto
NaturalTourism	PancuranTujuh	"Pancuran Tujuh (Pitu	"Pancuran pitu (Jawa	"https://lh3.googleus
NaturalTourism	TelagaSunyi	"Telaga Sunyi"^^<ht	"Telaga sunyi adalah	"https://lh3.googleus
HistoryTourism	MuseumBri	"Museum BRI"^^<htt	"Di kota inilah cikal bɛ	"https://lh3.googleus
NaturalTourism	PancuranTiga	"Sumber Air Panas Pɛ	"Pancuran Telu adala	"https://lh3.googleus
RecreationalTourism	WanawisataBaturade	"Wanawisata Baturra"	"Wanawisata Baturra"	"https://lh3.googleus

FIGURE 6. The result of execute SPARQL for Q1

CONCLUSION

This research has developed ontology in the tourism domain in Banyumas. Based on ontology modeling for the tourism domain in Banyumas. Tourism information can be represented in Ontology-based knowledge model. Knowledge of tourism information is stored in class, object property, and data property. There are several classes such as tourism class with subclass Culinary Tourism, Recreational Tourism, Nature Tourism, History Tourism, Shopping Tourism. Hostel class with subclass Hotels and Guest Houses SPARQL can be used to answer user's query for accessing tourism information. For further research, Ontology that has been developed can be implemented into the web semantics.

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