



Culture Ontology to Enhance Social Cohesion

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Abstract. Culture plays a pivotal role in shaping our understanding of the world, guiding our interactions, and influencing our behavior. In African societies, culture often lies at the heart of social cohesion and collective identity, providing a sense of belonging and a framework for social navigation. This paper presents an ontology of culture, with a focus on African culture, and specifically on the system of joking kinship in Burkina Faso. The ontology covers various aspects of culture including art, religion, mythology, cuisine, history, education, economy, social structure, and locality. The ontology is designed to provide a framework for representing, analyzing, and understanding culture, with the aim of promoting social cohesion and preserving cultural heritage. The ontology is enriched with properties and object properties, including a unique object property representing the system of joking kinship, a traditional social relationship that fosters tolerance, facilitates conflict resolution, and contributes to social harmony. The ontology is designed to be used in conjunction with Semantic Web technologies to support various applications related to cultural events and practices.

Keywords: Culture · ontology · Social Cohesion · Semantic Web · rules

1 Introduction

Culture, as a complex system of knowledge, beliefs, art, law, morals, customs, and capabilities acquired by individuals as members of society, plays an indispensable role in fostering social cohesion and shaping collective identity. This is particularly evident in African societies, where cultural practices and social structures provide a framework for interactions, influence behavior, and contribute to a sense of belonging [1].

A quintessential manifestation of this cultural influence on social cohesion is the system of joking kinship, prevalent in many African communities, including Burkina Faso. This unique social relationship, transcending blood ties, allows for open communication and jesting, fostering bonds, promoting tolerance, and facilitating conflict resolution. It is a vital mechanism for maintaining social harmony and strengthening communal ties [2, 3].

However, the rapid pace of modernization and globalization poses challenges, threatening to erode these traditional practices and potentially weakening the social fabric. Younger generations may find themselves disconnected from these cultural roots, underscoring the urgent need for tools that preserve and promote cultural knowledge and practices.

In response to this challenge, this paper delves into the ontology of culture, with a particular focus on African culture and the system of joking kinship in Burkina Faso. We present a comprehensive ontology that encapsulates various cultural dimensions, including art, religion, mythology, cuisine, and social structures. Our objective is to provide a robust framework for the representation, analysis, and understanding of culture, aiming to bolster social cohesion and preserve the rich cultural heritage that is integral to African societies.

By doing so, we contribute to the ongoing efforts to maintain cultural continuity, ensure the transmission of traditional knowledge to future generations, and uphold the social mechanisms that have sustained African communities for centuries.

2 Related Work

The study of culture and its representation in the digital space has been a topic of interest for many researchers. Here, we review some of the significant works related to our study.

OntoSOC: Sociocultural Knowledge Ontology by Guidedi Kaladzavi et al. [4] presents a sociocultural knowledge ontology modeling approach based on Engeström Human Activity Theory (HAT). The ontology is designed to organize data, facilitate information retrieval, and introduce a semantic layer in the social web platform architecture. The authors envision the platform as a collective memory and Participative and Distributed Information System (PDIS) that allows communities to share and co-construct knowledge on permanent organized activities.

When Cultures Meet: Modelling Cross-Cultural Knowledge Spaces by Anneli Heimbürger [5] introduces an idea for constructing an information system, a cross-cultural knowledge space, which could support cross-cultural communication, collaborative learning experiences, and time-based project management functions. The system design is based on a cross-cultural ontology, and the system implementation on XML technologies. The author discusses the concept of time in a cultural context and the role of cultural competence in achieving project goals and promoting creativity and motivation through flexible leadership.

These works provide valuable insights into the representation of cultural knowledge in the digital space and the use of ontologies for structuring and retrieving this knowledge. Our study builds upon these works by focusing on the cultural experience, including the African culture, and proposing an ontology that captures various aspects of this experience.

3 Semantic Web Tool to Enhance Culture

The Semantic Web is an extension of the World Wide Web that enables people to share content beyond the boundaries of applications and websites. It has been described as a framework that allows data to be shared and reused across applications, enterprises, and

communities. The Semantic Web is a collaborative effort led by the World Wide Web Consortium (W3C), which promotes common formats for data on the World Wide Web. By encouraging the inclusion of semantic content in web pages, the Semantic Web aims at converting the current web dominated by unstructured and semi-structured documents into a “web of data” [6].

Ontologies play a crucial role in the Semantic Web, providing a shared and common understanding of a domain that can be communicated between people and machines. They are used for knowledge representation and are essential for tasks such as data integration, content-based indexing, database design, and information retrieval. Ontologies can be used to improve the accuracy of web search and enable machine-automated reasoning [7].

In the context of enhancing culture, Semantic Web tools can be used to create a rich, interconnected digital representation of cultural heritage. This can be achieved by using ontologies to represent complex relationships between different cultural artifacts, historical events, and cultural groups. For example, an ontology could be used to represent the relationships between different works of art, the artists who created them, the historical periods they belong to, and the cultural movements they are associated with. This would allow users to navigate through cultural heritage in a non-linear way, discovering new connections and gaining a deeper understanding of culture [8].

In addition to these general-purpose tools, there are also tools specifically designed for the cultural domain. For instance, the CIDOC Conceptual Reference Model (CRM) provides an ontology for cultural heritage information, which is widely used in museums, libraries, and other cultural institutions [13].

While existing ontologies like CIDOC CRM offer valuable frameworks for cultural heritage representation, our project required a bespoke ontology to accurately capture the unique facets of African cultural contexts. This is particularly true for the joking kinship system in Burkina Faso, a complex social structure not adequately addressed by CIDOC CRM. Our ontology goes beyond, providing detailed modeling of cultural events, languages, arts, and social structures, with a specific emphasis on their manifestation in African societies. By doing so, we ensure a comprehensive and culturally relevant tool, not just for representing joking kinship, but for a holistic analysis and preservation of African cultural heritage.

Furthermore, Semantic Web technologies can be used to connect cultural heritage data with other types of data, such as geographical data or social network data, providing new perspectives and insights. For example, it would be possible to explore the influence of a particular cultural movement on the works of art created in different cities, or to analyze the social network of a group of artists to understand their collaborations and influences.

4 Modelling the Ontology of Culture

The ontology of culture we have constructed here is a comprehensive domain ontology that encapsulates various aspects of culture, including events, art, religion, mythology, folklore, cuisine, clothing, history, education, economy, politics, social structure, and locality. Each of these aspects is represented as a class in the ontology, and they are

interconnected through a set of properties that express their relationships and attributes. As a domain ontology, it specifically focuses on the domain of culture and is designed to facilitate the analysis and understanding of culture.

- **Culture:** The overarching class that encompasses all aspects of culture. It is associated with various properties such as *hasEvent*, *hasArt*, *hasReligion*, *hasMythologyAndFolklore*, *hasCuisine*, *hasClothing*, *hasHistory*, *hasEducation*, *hasEconomy*, *hasPolitics*, *hasSocialStructure*, and *hasLocality*. These properties link the Culture class to the respective subclasses, creating a comprehensive network of cultural elements.
- **Cultural Event:** This class includes sub-classes like *Festival*, *Exhibition*, *Concert*, *Dance*. Each of these subclasses can be linked to the Culture class through the *hasEvent* property.
- **Art:** This class is divided into sub-classes such as *Music*, *VisualArt*, *Literature*, and *PerformanceArt*. The *hasArt* property connects these subclasses to the Culture class.
- **Religion:** This class has a sub-class *Temple*, which can be linked to the Culture class through the *hasReligion* property.
- **Mythology and Folklore:** This class includes sub-classes like *Myths*, *Tales*, and *Legends*, which can be linked to the Culture class through the *hasMythologyAndFolklore* property.
- **Cuisine:** This class has sub-classes such as *TraditionalDish*, *TraditionalDrink*, and *Ingredients*. The *hasCuisine* property connects these subclasses to the Culture class.
- **Clothing:** This class includes sub-classes like *TraditionalClothing* and *Jewelry*, which can be linked to the Culture class through the *hasClothing* property.
- **History:** This class has sub-classes like *HistoricalEvent* and *HistoricalFigure*, which can be linked to the Culture class through the *hasHistory* property.
- **Education:** This class includes sub-classes like *TraditionalEducationalSystem* and *EducationalInstitution*, which can be linked to the Culture class through the *hasEducation* property.
- **Economy:** This class has sub-classes like *Trade*, *Agriculture*, and *Industry*, which can be linked to the Culture class through the *hasEconomy* property.
- **Politics:** This class includes sub-classes like *TraditionalPoliticalSystem* and *PoliticalLeader*, which can be linked to the Culture class through the *hasPolitics* property.
- **Social Structure:** This class has sub-classes like *Family*, *Community*, and *Society*, which can be linked to the Culture class through the *hasSocialStructure* property.
- **Locality:** This class includes sub-classes like *Region*, *City*, *Neighborhood*, *Street*, *Village*, which can be linked to the Culture class through the *hasLocality* property (Tables 1 and 2).

The primary objective of this culture ontology is to provide a structured and interconnected representation of the various aspects of culture. It aims to facilitate the analysis and understanding of culture, and to promote social cohesion and cultural preservation. The competency questions this ontology aims to answer include: What are the different aspects of culture? How are these aspects related to each other? What are the specific characteristics of each aspect of culture?

Table 1. Class and data properties

Class	Properties
Cultural Event	hasType, hasLanguage, takesPlaceIn, hasParticipant
Art	hasType, createdby, hasGenre, hasStyle
Religion	practicedAt, hasBelief, hasRitual, hasSymbol
Mythology and Folklore	hasType, associatedWith, hasCharacter, hasTheme
Cuisine	hasDish, hasDrink, usesIngredient
Clothing	hasItem, hasAccessory, associatedWith, wornFor
History	hasEvent, hasFigure, associatedWith
Education	hasSystem, hasInstitution, teaches, locatedIn
Economy	hasSector, associatedWith, locatedIn
Politics	hasSystem, hasLeader, associatedWith
Social Structure	hasUnit, associatedWith, locatedIn
Locality	hasPart

Table 2. Object properties with description

Object Property	Description
isPartOf	For hierarchical relationships
isAssociatedWith	For general associations
isLocatedIn	For spatial relationships
hasParticipant	For events
practices	For religious or cultural practices
speaks	For languages
creates	For artistic creation
wears	For clothing
participatesIn	For social structures
isJokingKinshipWith	For the joking kinship relationship in West African cultures
canRequestMediation	Represents the ability to request mediation or intervention in conflict resolution or dispute settlement

These object properties can be used to establish relationships between different instances of the classes in the ontology. For example, the “isJokingKinshipWith” property can be used to establish a joking kinship relationship between two individuals in the “Community” class.

This ontology provides a robust and flexible framework for representing, analyzing, and understanding culture. It can be used to capture the richness and diversity of cultural practices, traditions, and artifacts, and to promote social cohesion and cultural preservation. The ontology is designed to be extensible, allowing for the addition of new classes and properties as new cultural phenomena are discovered and documented (Figs. 1, 2 and 3).



Fig. 1. Ontology implementation with protégé

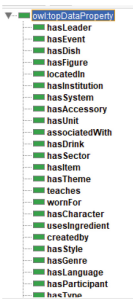


Fig. 2. Data properties

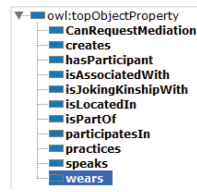


Fig. 3. Object properties

5 Rules and Reasoning Capabilities

Our ontology leverages SWRL to formulate rules that enhance reasoning capabilities and enable the inference of new knowledge from existing data. SWRL provides a formal syntax for expressing these rules, facilitating their integration and execution within the ontology. Below are illustrative examples:

Example 1: Joking Kinship.

Community(?x) ^ Community(?y) isJokingKinshipWith(?x, ?y) -> PermitsJoking(?x, ?y).

This SWRL rule expresses that if two individuals belong to communities and are connected by a joking kinship, then they are allowed to tease each other.

Example 2: Languages and Communication.

Language(?x) ^ isSpokenIn(?x, ?y) ^ Community(?y) - > FacilitatesCommunication(?x, ?y).

This rule stipulates that if a language is spoken within a community, it facilitates communication within that community.

Example 3: Mediation in Case of Conflict.

ConflictBetween(?x, ?y) ^ isJokingKinshipWith(?y, ?z) - > CanRequestMediation(?x, ?z).

This rule models the cultural practice whereby a community in conflict with another can request mediation from a third community linked by a joking kinship.

By integrating these SWRL rules into our ontology, we enhance its ability to model complex relationships and infer specific cultural knowledge, contributing to a richer understanding and more effective preservation of African cultural heritage.

6 Utilizing the Ontology: Use Cases and SPARQL Queries

In this section, we demonstrate the practical application of our ontology through two distinct use cases. These use cases illustrate how the ontology can be used to query and extract meaningful information related to African culture, particularly in the context of joking kinship and cultural events. We use SPARQL, a semantic query language for databases, to retrieve and manipulate data stored in our ontology.

Use Case 1: Joking Kinship Relationships Among Communities in Burkina Faso

In Burkina Faso, the practice of “joking kinship” or “parenté à plaisanterie” is a common cultural tradition among various communities. This tradition allows for friendly teasing and banter between members of different communities, fostering social cohesion and mutual respect.

Consider the communities of “Bobo”, “Peulh”, “Dafin”, “Dagara”, “Goulmanché”, “Mossi”, “Samo”, “Bissa”, “Yarcé”, “Yadga”, “Lobi”, “Birifor”, “Foulssé”, “Bawba”, “Tchèfo”, “Gourmantché”, and “Gourounsi”. These communities are diverse in their languages, customs, and traditions, yet they are bound by the joking kinship relationships. These relationships allow members of these communities to joke with each other, often in ways that would be considered disrespectful or offensive outside of this context. However, within the context of the joking kinship, these interactions are not only accepted but are also expected and appreciated.

For instance, a member of the “Bobo” community might tease a member of the “Peulh” community about a particular custom or tradition. The “Peulh” member would then respond with a similar jest about the “Bobo” community. This exchange, while seemingly contentious, actually serves to strengthen the bond between the two communities. It allows them to acknowledge and celebrate their differences, rather than allowing these differences to divide them.

This practice extends to all the mentioned communities, creating a complex web of relationships and interactions that serve to promote unity and understanding among the diverse communities of Burkina Faso. Through the joking kinship, these communities are able to maintain their unique identities while also fostering a sense of shared identity and mutual respect [14].

In Fig. 4 we present an example of how the ontology is populated, along with a SPARQL query that can be used to retrieve communities that have a joking kinship relationship with the Peulh community.

The screenshot displays the Protégé interface with the following components:

- Class hierarchy:** A tree view on the left showing the ontology structure. The 'Community' class is highlighted under 'Social_Structure'.
- SPARQL query:** A text area containing the following 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 ex: <http://www.semanticweb.org/Kindo/ontologies/2023/6/culture#>
SELECT ?community
WHERE {
  ex:Peulh ex:isJokingKinshipWith ?community .
}
```
- Usage: Peulh:** A list of instances for the 'Peulh' class: Vigué, Yarcé, Bambara, Marancé, Dioussambé, Bwaba, Bobo.
- Direct instances: Peulh:** A list of instances for the 'Peulh' class, including Birfor, Bissa, Boso, Dwaba, Dafing, Dagara, Djan, Dogon, Fulsé, Goin, Guermatché, Gourounsi, Jula, Lobi, Marka, Mossi, and Peulh.
- Property assertions: Peulh:** A list of assertions for the 'Peulh' class, including:
 - isJokingKinshipWith Yarcé
 - isJokingKinshipWith Dioussambé
 - isJokingKinshipWith Marancé
 - isJokingKinshipWith Bobo
 - isJokingKinshipWith Bwaba
 - isJokingKinshipWith Bambara
 - isJokingKinshipWith Vigué

Fig. 4. Populating and query example in Protégé

This query will return all communities that have a joking kinship relationship with the Bobo community. The prefix `ex:` is used to denote the namespace of the ontology, and `isJokingKinshipWith` is the object property that represents the joking kinship relationship.

Use Case 2: Cultural Event Management

In African societies, cultural events serve as a vibrant showcase of the rich diversity and heritage, fostering community engagement and cultural preservation. Our ontology facilitates efficient organization, access, and dissemination of information related to these events. For example, to retrieve comprehensive details of all cultural events occurring in a specific location, such as BoboDioulasso, the following SPARQL query can be employed:

```
SELECT ?event ?eventName ?eventLocation ?eventDate
WHERE {
  ?event rdf:type ex:Cultural_Event.
  ?event ex:takesPlaceIn ex:BoboDioulasso.
  ?event ex:eventName ?eventName.
  ?event ex:eventLocation ?eventLocation.
  ?event ex:eventDate ?eventDate.
}
```

This SPARQL query retrieves a list of cultural events happening in Bobo-Dioulasso, including details about their types, locations, and scheduled dates and times, based on the ontology. This data can be extremely useful for cultural event management and the promotion of cultural heritage in Bobo-Dioulasso a city of Burkina Faso.

7 Conclusion

In this paper, we have presented an ontology dedicated to modeling cultural concepts, with a particular focus on African cultures and the unique social practice of joking kinship. The ontology provides a comprehensive framework for representing, analyzing, and understanding culture, encompassing a variety of aspects such as art, religion, mythology, cuisine, history, education, economy, social structure, and locality.

Designed to integrate with Semantic Web technologies, the ontology facilitates the development of applications in the fields of cultural event management, cultural heritage preservation, and tourism. It also serves as a solid foundation for in-depth studies on specific cultural practices and phenomena, such as the system of joking kinship in Burkina Faso.

Beyond these practical applications, our work significantly contributes to the preservation of African cultural heritage. By codifying and making accessible the wealth of our traditions and history, the ontology acts as a guardian of our cultural legacy, ensuring its transmission to future generations. In a constantly evolving world, where cultures are under increasing pressure, this tool proves indispensable for maintaining our connection to our roots and strengthening cohesion within our communities. Ultimately, it represents a crucial step towards safeguarding our cultural identity and promoting a more united and resilient society.

8 Future Work

Looking forward, there are several directions for future work. First, the ontology could be expanded and enriched further to cover additional cultural practices and phenomena, both within Africa and in other parts of the world. This would involve conducting more fieldwork and ethnographic studies to gather detailed information about these practices and phenomena, and then incorporating this information into the ontology.

Second, more work could be done to develop and refine the rules and reasoning capabilities of the ontology. This would involve defining more specific rules for inferring new knowledge based on existing relationships and developing more sophisticated reasoning algorithms to process these rules.

Third, more work could be done to develop applications that make use of the ontology. This could involve developing more advanced event management systems, cultural heritage preservation tools, and tourism platforms that leverage the ontology to provide more rich and nuanced representations of culture.

Finally, more work could be done to evaluate the effectiveness of the ontology in supporting these applications. This could involve conducting user studies to assess the usability and usefulness of the applications and conducting empirical studies to assess the accuracy and completeness of the ontology.

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