An Ontological approach towards retrieval of video semantically

Mr. Uday Kulkarni
Department Of ISE ,
B.V.B.C.E.T – Hubballi 31
uday_kulkarni@bvb.edu
Mr. Praveen M.D
Department Of ISE ,
B.V.B.C.E.T – Hubballi 31
praveen.md@bvb.edu
Mr. Somashekhar Patil
Department Of ISE ,
B.V.B.C.E.T – Hubballi 31
skpatil@bvb.edu

Mr. Mallikarjun Akki
Department Of ISE ,
B.V.B.C.E.T – Hubballi 31
mallikarjun.akki@bvb.edu
Mr. Anand S.Meti
Department Of ISE ,
B.V.B.C.E.T – Hubballi 31
anandsmeti@bvb.edu
Sunil V.G.
Department Of ISE ,
B.V.B.C.E.T – Hubballi 31
svgurlahosur@bvb.edu

***Abstract*—** Recent era there is an increase in the use of video-based applications which revealed the need for extracting the content in videos and how semantically they are interrelated. In this paper we propose a semantic content extraction system that allows users to query and retrieve objects, events, and concepts that are extracted automatically by building the ontology with respect to events and related interest. This paper discusses retrieval techniques of multimedia content using ontology semantically.

Keywords – Multimedia, Ontology, Text Retrieval, Image Retrieval, Video Retrieval, Semantic-based search

Introduction (*Heading 1*)

Today in this world there is a need of proficient procedures to semantically interpret video to retrieve, accumulate and supervise the information. Such methods provides a detailed steps not only managing the repository even user can easily query and retrieve the report in time by automated applications which will perform intricate jobs like video to store, build, update and reason with the data. The ultimate goal of any proficient method is to facilitate users to fetch some preferred content from massive amounts of video data in an efficient and semantically meaningful manner.

The history of artificial intelligence shows that knowledge is vital for intelligent systems. In many cases, better essentials can be more important for solve a task than enhanced algorithms. To have truly intelligent systems, knowledge needs to be captured, processed, reused, and communicated. Ontology's support all these tasks. Machine replicates some human function, like reading, dream. Optical character recognition (OCR) has become one of the most important and victorious applications of technology in the field of artificial intelligence and pattern recognition.

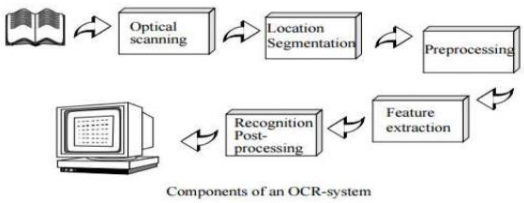


Figure -1 Components of OCR system.

The ontology widely used in various fields, such as WT, database integration, natural language processing, etc. The word "ontology" can designate different computer science objects depending on the context. For example, ontology can be:

1. A terminology in the field of information retrieval
2. A representation created using OWL for linked data
3. Context of databases using XML schema.

The term "ontology" can be defined as an explicit specification of conceptualization. Ontology captures the structure of the domain, i.e. conceptualization. This includes the model of the domain with possible restrictions. The conceptualization describes knowledge about the domain, not about the particular state of affairs in the domain.

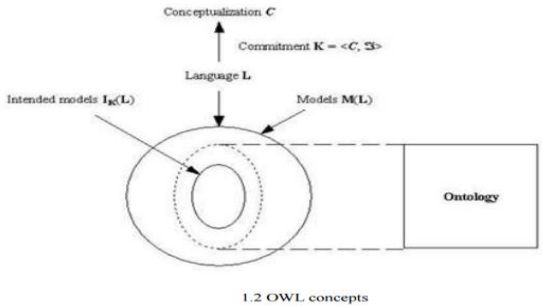


Figure 2. OWL Concepts

All rules are articulated in terms of OWL concepts such as classes, properties, individuals. To implement the OWL language we have used protégé tool developed by Stanford University. Which excepts input as OWL file (Ontology notations) and it will produce the hierarchy based results.Prepare Your PAPER BEFORE STYLING

A. Motivation

With the basic need of data mining that says we are in drowning in data but lacking in knowledge, In text related application it is enough to interpret the generic properties of the metadata and to carry out keyword search, but for videos content information becomes predictable, in this regard an significant step towards proficient exploitation and semantic information representation using the visual media. The study was conducted to check the search engines which will be involved in the significant development of IR systems using more sophisticated multimedia system For the multimedia retrieval still we emphasis more on the keywords search. To formulate the classification using ontology based search will help users in redeveloping query if to specific needs and also come to best decision. Moreover, an integrated indexing scheme for keywords and semantic summaries will smooth the progress of search engines to support users to discover the related topics. Implementation of ontology has become art by identifying and characterizing the dimensions in terms of building proper ontology.

B. **Case Study :** Soccer domain.

Objectives

- Annotation using the Text present in the Soccer video.
- Annotation using the Faces present in the Soccer video.
- Mapping Low Level Features to Ontology.
- Ontology Parser.
- Retrieve Videos based on Query given.

System Model

System model, as shown below it takes video as input and then converts it into frames from which features such (face recognition and text through OCR techniques) are extracted and mapped to ontology. The user enters the query using SQLLITE to get the ranked results.

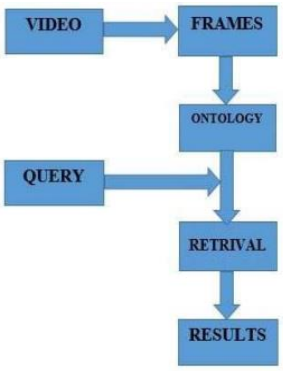


Figure 3. System model

Architecture Design

In Architecture design, we have designed an ontological structure for the Football domain. Further using an annotizer, features are extracted from the videos and are mapped to ontology. Finally videos are retrieved based on the query given by the usersDeletion

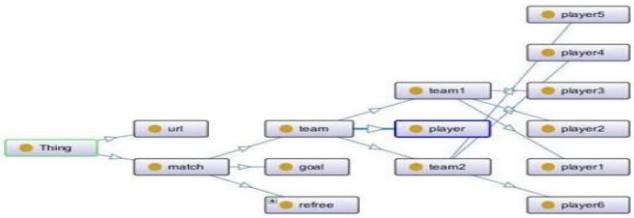


Figure4. Architectural design

Functions Means Tree :

The Function-Means Tree (FMT) is a tool for record the primary functions of a design and various means of achieving those declared functionality. It is a method for functional decomposition and concept generation. At the top level main functions are identified. Under each function, a means (or solution element) is attached. Alternative solution elements can also be attached. Each means is in turn decomposed into functions with means attached to each of them. Major Functionality of FMT is:

- Determine the primary functions that are required.
- List various methods by which each function may be implemented.
- Determine alternative solutions functions that would result from implementing each of the means.
- The FMT cross verifies the alternative solutions to means and functions until you reach a reasonable execution point.

Our projects have 3 phases,

1. Text Extraction

There are 2 approaches for text extraction, OCR based extraction and segment based extraction.

2. Face detection and face recognition

For face detection we have, Haar cascade classification and Euclidian distance classification.

For face recognition we have, Fischer face and Euclidian face.

3. Ontology design

We have written relation using ontology web language (OWL). Once the OWL is ready we can query the system either by DL query or SPARQL.

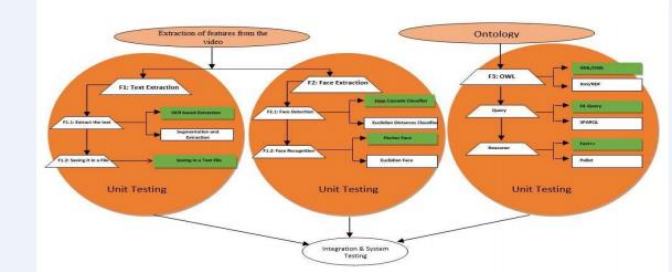


Figure**5. FMT**

Optical character recognition

Optical character recognition (OCR) is the automatic or electronic conversion of images of type written or printed text into machine-encoded text. It is widely used as a form of data entry from printed paper data records, ex. passport documents, invoices, business cards, mail, printouts of static-data, or any suitable documentation. It is a common method so that it can be electronically edited, searched, stored more compactly, displayed on-line and used in machine processes such as machine translation, text-to-speech, key data and text mining. In this project we use the OCR in extracting the names of the players, goals scored by the teams, who scored the goal, fouls (red and yellow card).

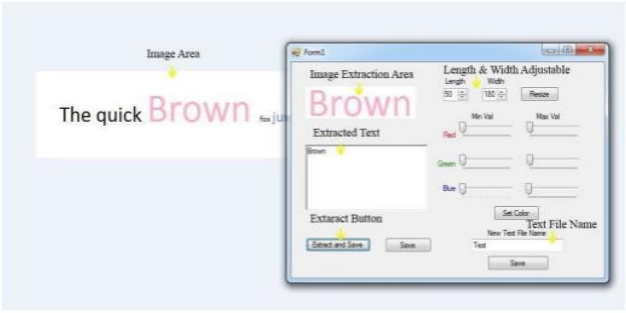
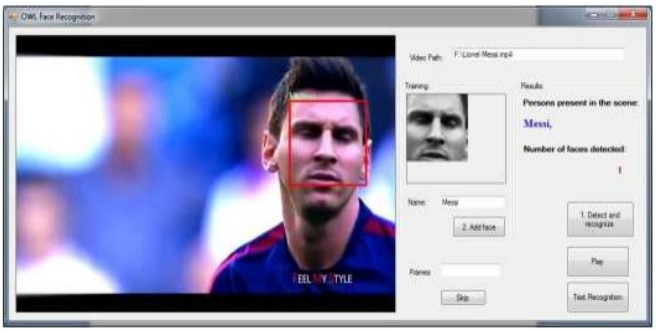


Figure 6: Optical character recognition

Face Recognition

The Module Face Recognition is used to detect and recognize the faces in the soccer video to map to ontology. We used the haar-cascade to detect the faces as it is efficient. After training the video we will save the detected faces in Text File. Once we get Faces Database we then go for ontology mapping that is which player belongs to which team and his statistics in overall match etc. We divide it with classes and sub-classes. And then we parse the Ontology using Ontology Parser. We then retrieve by querying using DL Queries and we get the result in web page as we have designed a web page to view the Result.



Face recognition

Here initially we train the faces by providing appropriate names to the players. Once the data is trained it will be used further.

Mapping low level features to Ontology

Mapping module maps the feature extracted in the previous modules i.e. features extracted by the face recognition and text extraction modules. The extracted features are present in the form of text and this module assign each individual entity to its respective class. It also maps features to multiple classes. For example Player belongs to player class as well as his respective team. Mapping module maps to both classes by providing option to map to their respective class.

```
_____Instructions_____
Step 1 : Add both teams
Step 2 : Add Players or Refrees
Step 3 : if player then select the team which the player is belongs
Enter file path : name.txt
Name : team1

Select the class
1 - Team
2 - Player
3 - Refree
4 - Url
5 - Goal
6 - Skip

6 - Skip
1
Name : player1

Select the class
1 - Team
2 - Player
3 - Refree
4 - Url
5 - Goal
6 - Skip
2
Press 1 for team1
Press 2 for team2
1
Name : player2

Select the class
1 - Team
2 - Player
3 - Refree
4 - Url
5 - Goal
6 - Skip
```

Figure 7: Mapping low level features to Ontology

4.4 Parser

Parser module parses through the ontology and provides the output according to the input provided and retrieves if the input keyword present in multiple ontologies. This module also provides subclasses, super classes, individuals etc. Most

importantly it retrieves the URL of the video, which is actual output of the module and is represented in browser.

```
-------------------------------------------------------------------------------
-------
QUERY:    Player
-------------------------------------------------------------------------------
-------
SuperClasses.....................................
      Team

EquivalentClasses................................
      [NONE]

SubClasses.......................................
      Nothing

Instances........................................
      [NONE]


-------------------------------------------------------------------------------
-------
QUERY:    Player
-------------------------------------------------------------------------------
-------
SuperClasses.....................................
      Team

EquivalentClasses................................
      [NONE]

SubClasses.......................................
      Nothing

Instances........................................
      XYZ
      ABC
```

Figure 8: Parser

RESULTS AND DISCUSSION

Phase 1. Optical character recognition: Here individual team players names are trained and team wise the data is stored in the separate file. Later each individual file is combined to form a single file.

Figure9. Optical character Recognition

Phase 2: Face Recognition Here the faces of all the team members will be trained and stored in the same file where texts about players are stored.

Figure10. Face recognition

Image	Identified	Completely identified	Partially identified
	ENZO PEREZ	YES	-
	MESUT OEZIL	-	YES
	LUCAS BIGLIA	YES	-
	MATS HUEMELS	YES	-
	MESUT OEZIL	YES	-

Figure11. Face recognition(Contd..)

Phase 3: Implementation of Parser Mapping module maps the feature extracted in the previous modules i.e. features extracted by the face recognition and text extraction modules. The extracted features are present in the form of text and this module assigns each individual entity to its respective class. It also maps features to multiple classes. For example Player belongs to player class as well as his respective team. Mapping module maps to both classes by providing option to map to their respective class. Parser module parses through the ontology and provides the output according to the input provided and retrieves if the input keyword present in multiple ontologies. This module also provides subclasses, super classes, individuals etc. Most importantly it retrieves the URL of the video, which is actual output of the module and is represented in browser.

Phase 4: Ontology

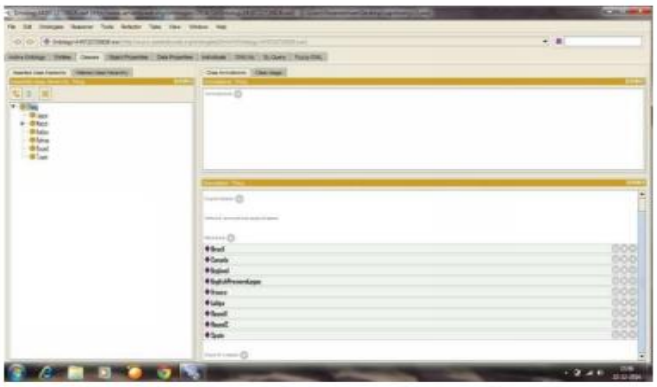


Figure 12.Ontology classes

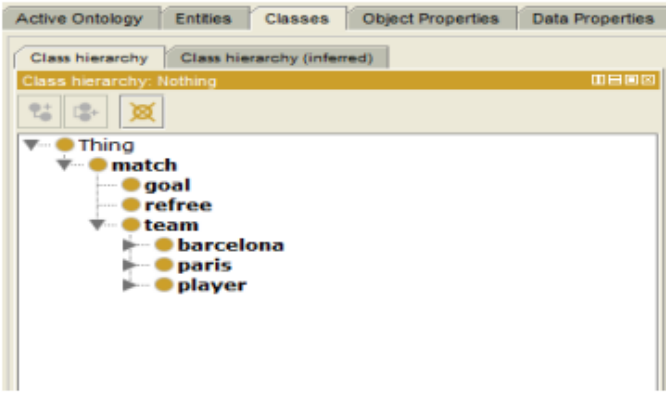


Figure 13. Class hierarchy

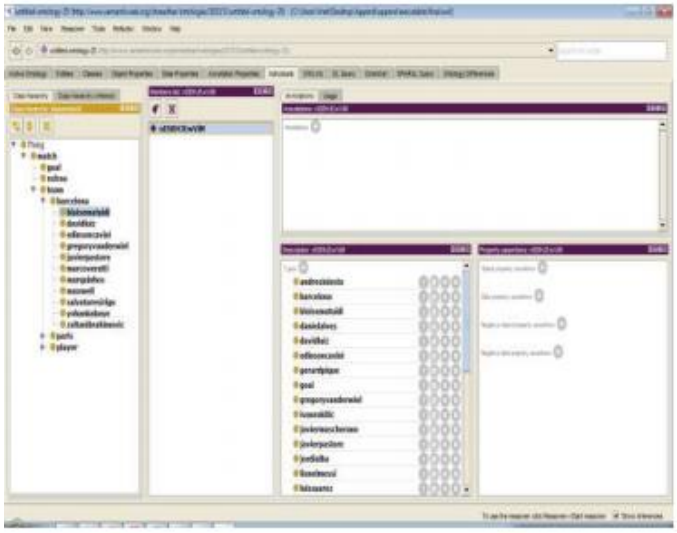


Figure 14. Individual player relation

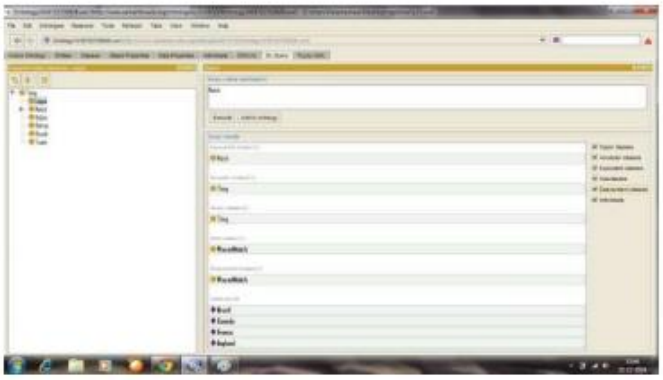


Figure 15.DL Query

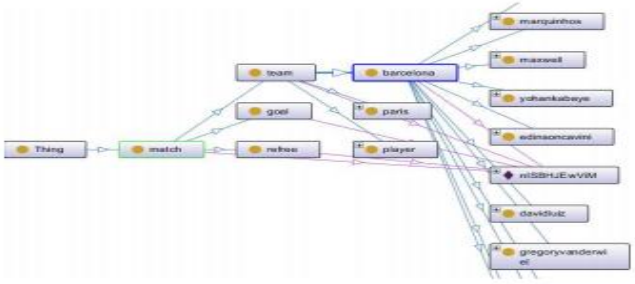


Figure 16. Final Output

APPLICATIONS

Applications of OWL based Rule Writing systems are as follows:

- Ease the integration of information from mixed sources.
- By reducing the information overload we can improve the information retrieval.
- Domain Understanding (Identifying relevant information).
- Accurate decision making support with respect to domain.

CONCLUSION

This section of the report concludes our application, " An Ontological approach towards retrieval of video semantically". We conclude the project and its scope, the requirements for the application and the methods used to ensure that each requirement is satisfactorily achieved have also been discussed. It encapsulates all the characteristics and features expected from the application.

FUTURE WORK

Future work would involve research along two directions: Increase the efficiency of text recognition and face recognition

- Add more features to ontology for a class creation.
- Apply Fuzzy logic on ontology and Ranked Retrievals of the results.
- Query should be extended to Natural language queries, instead of Manchester syntax i.e Boolean query.

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