MULTI MODEL ANTHROPOLOGICAL BASED INFROMATION RETREIVAL SYSTEM

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ABSTRACT

Knowledge is Wealth; one can acquaint knowledge from internet as trillions of information is available on internet repository. If these knowledge on internet is available anthropologically then information acquisition system would be an effective Knowledge center, but those information available are not semantically organized. So, in this paper we provide an Ontology based Multi- Agent Conceptual model for a group of sports. These sports are organized anthropologically in both textual and image concept. So, the user can provide either image or textual keyword as input to acquire the need information. This model can be integrated to a Semantic based information retrieval System.

Key words: Semantic Web, Ontology, Conceptual model, Machine Learning, OWL, RDFS, SIFT, SVM.

I. INTRODUCTION

Information is poured all over the internet but when we search for particular, the result would be again trillion of information; again we need a refine search manually. This can be overcome by Semantic approach (8). In this paper we proposed ontology based anthropological approach for information retrieval system named as Intelligent Semantic Information Retrieval System. The specific domain taken in Sports domain where the event concentrated are Cricket, Croquet, Tennis and Volleyball in short we called as CCTV Sports Conceptual model.

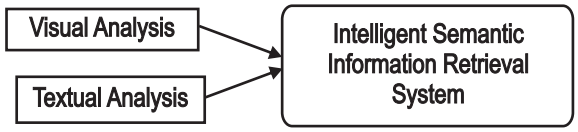

Fig. 1. Overview of the Proposal

As shown in Fig.1 this proposal has three major Phases: Image classification and analysis using SIFT and SVM is done in Visual Analysis (1, 4, 5). Textual analysis from Html document is done in Textual Analysis (2, 3) and combination of these analysis phases and retrieval procedure is done in Intelligent Semantic Information Retrieval System. The former two phases are explain in detailed in (1-5). So, in this paper we concentrate more on the information retrieval system.

A. Related Works

In (16, 17) most of the proposed works, either the author concentrates on visual or textual query analysis. Here in our work we are fusing both indifferent formats of queries as the user can give textual keyword or image as an input query.

In (10) the author takes account on the manual annotation of the images to determine the action of the still image of the players, in our work we uses the low level features of the image for action classification for that we use SIFT and SVM classifier.

In (19) the author uses Olympic game ontology by fusing both textual and visual information but for ontology the author uses only the anthropological structure of the Olympic game event, where in our work we also interpolate the image feature in those ontology creations.

The paper is organized in such a way that, as shown in Fig 1. The visual and textual agent is elaborated them the concept behind the intelligent semantic information retrieval system is explained in detail.

II. VISUAL ANALYSIS AGENT

An image can be analyzed by using either its high level or low level features. An effective way of analyzing it is by using both the feature and try to fill the semantic gap between both these features. In our approach we use the concept of SIFT (21) to determine the invariant key point of an image and classify the image classes using SVM classifier. The concept of using SIFT and SVM as shown in Fig. 2 is been explained in my former paper (1, 4, 5) so, in this paper we concentrate on the CCTV domain.

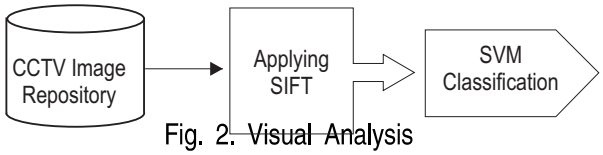

Fig. 2. Visual Analysis

In this domain CCTV, we consider images of Cricket, Croquet, tennis and Volleyball. In these event the object we are considering is tabulated below:

Table 1: CCTV event and objects

Event	Object
Cricket	Batting ball, Batting Stump, Batting bat, Bowling ball and Bowling stump
Croquet	Croquet ball, Croquet stump, Croquet hoop and Croquet mallet
Tennis	Forehand ball, Forehand racquet, Serve ball and Serve racquet
Volleyball	Smash ball and Smash net

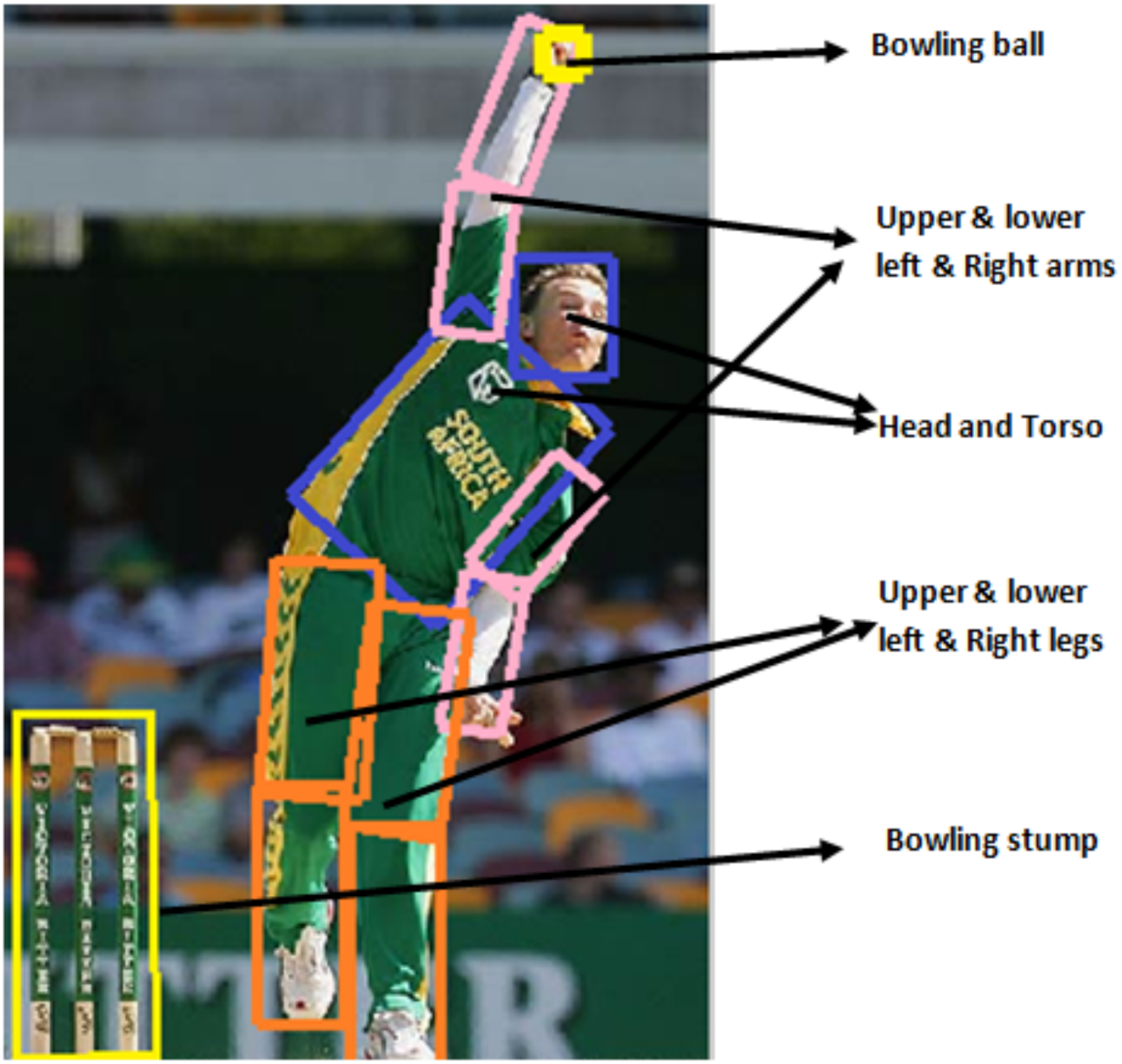

Fig. 3. Human action

In training phase each event image is been trained using SIFT concept and bag of word for each object is been determined. Once this object is identified, then the human parts are also determined so it would be used to classify the kind of event using classifier. The parts to be considered are head, torso, upper left arm, upper left leg, lower left arm, lower left leg, upper right arm, upper right leg, lower right arm and lower right leg.

As shown in Fig. 3 the action and object is determined and trained for all the four sports events.

III. TEXTUAL ANALYSIS AGENT

As we search for knowledge from a resource where tremendous amount of intelligent information available we need to design an intelligent system such that it would provide you with only the needed information for this Syntactic to Semantic conversion is needed. Fig. 4 shows the proposed framework, which was published (3) where the collection of Syntactic web pages are collected via a Web crawler as the output of an web crawler is list of URL we required a genius system to filter out the unwanted URL. Then with the available list of URL of input the XML is created with that entity concern XML a conversion of XML to OWL is implemented and the crated ontology is collected in repository which can be used for Intelligent Semantic Information Retrieval System .Those concept of conversion is explained in by prior work, so in this paper we concentrate on how the information is been retrieved intelligently.

IV. INTELLIGENT SEMANTIC INFORMATION RETRIEVAL SYSTEM

In any information retrieval system the search would be effective only if the search content is organized in some way and only the efficiency depends on how the search take place. An human can acquire an knowledge only if he knows what he is searching for likewise a system can provide intelligent information only it knows the semantic of the content it searching for. Thus in all of our work we try to provide semantic information visually and textually to our intelligent system. In visual and textual analysis only the content is been analyzed. To organize these visual and textual content we are going to use ontology technique as (17) how an human analyze his day to day event is as similar as concept organized in an ontology.

Fig. 5 shows the overall framework designed for information retrieval using ontology concepts. In forthcoming session explained the ontology created for CCTV sports event, Ontology learning technique and the OWL query processing.

A. Overview of CCTV Ontology

For building ontology there are number of framework available (22) among them Protégé (23) is the which provide most advance facilities. Using this framework we have created an ontology for our CCTV sports ontology.

Fig. 6 shows the ontology visualization of CCTV ontology created using protégé

Fig 7. Shows the class hierarchy. The main classes are CCTV, CCTV_Equipment and Human_Action. The type of sport events are subclass

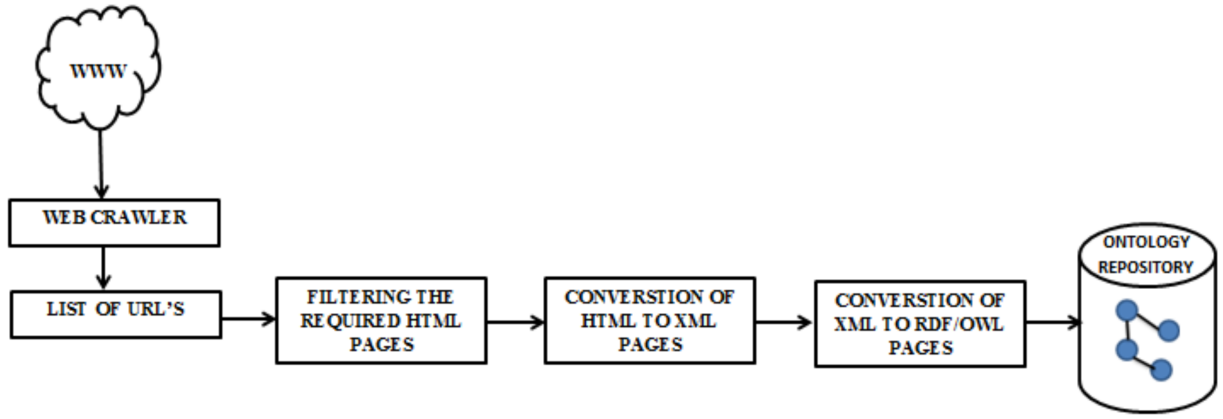

Fig. 4. Web Intelligent Framework (3)

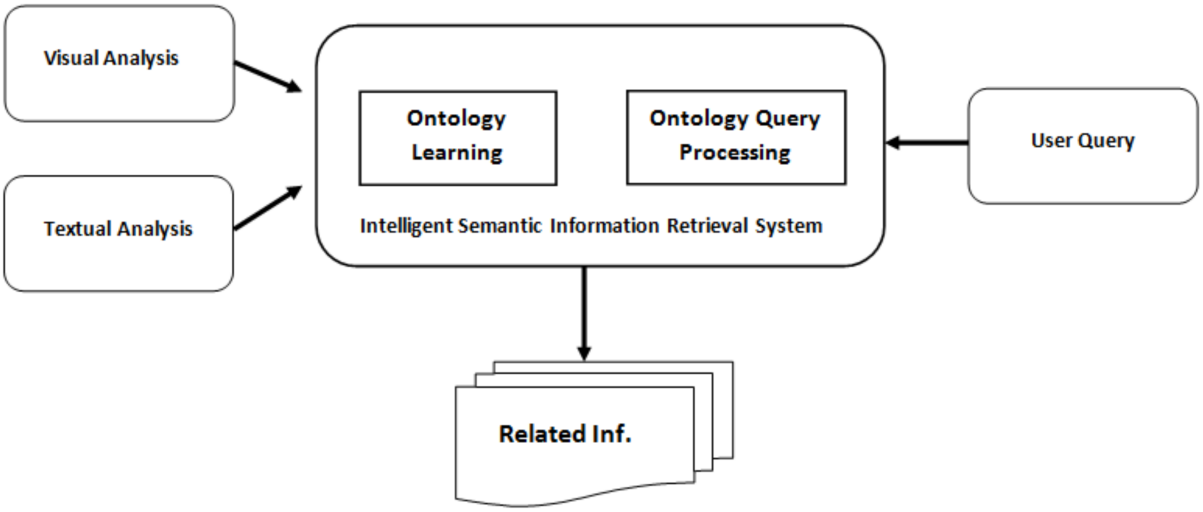

Fig. 5. Proposed Information Retrieval Framework

of CCTV. The general equipment used in categories below CCTV_Equipment class as ball, bat and stump are common to all sport events and the accessories are the object which is not common such as volleyball net so on., In Human_Action class arms, legs and Torso are the main sub classes. Where the lower and upper left and right are categories below the arm and leg subclasses.

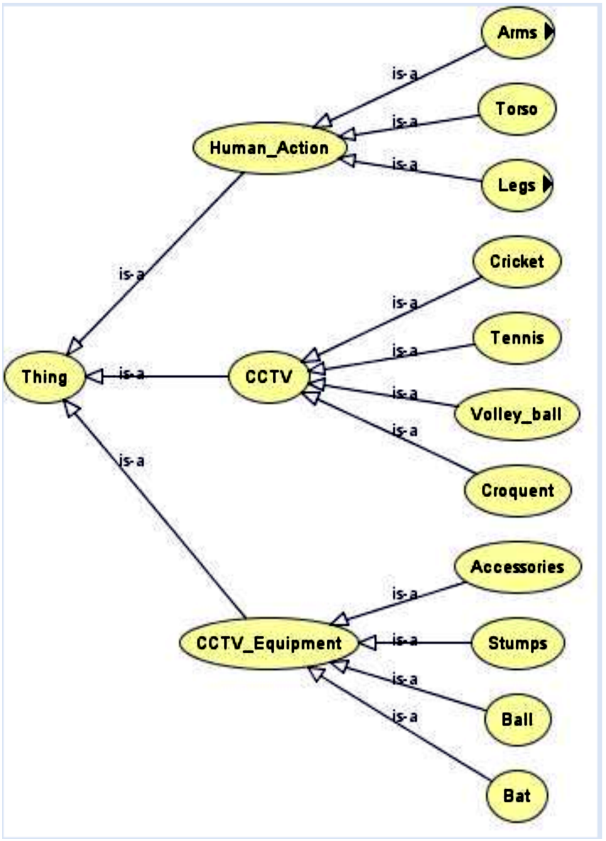

Fig. 6. CCTV Ontology

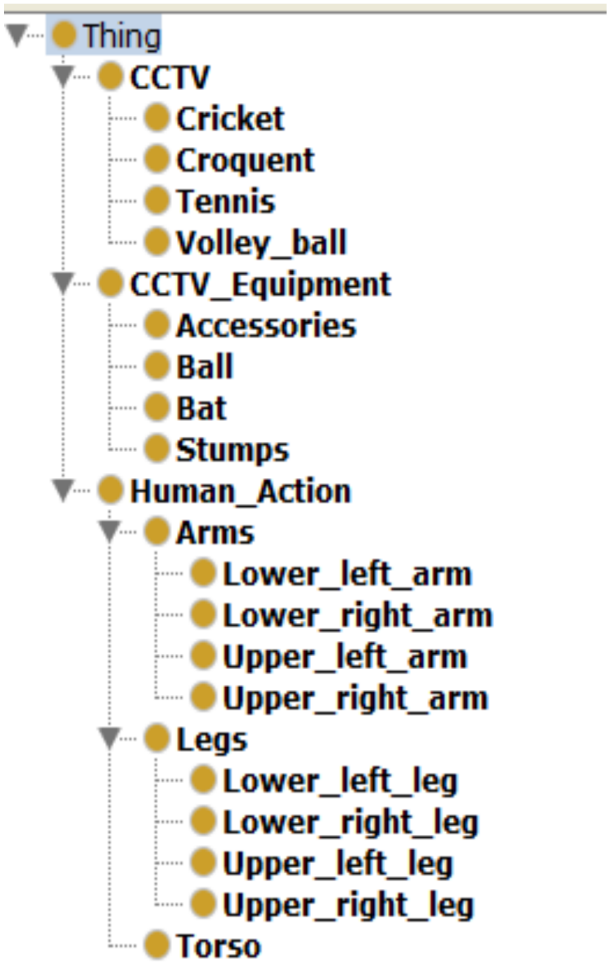

Fig. 7. CCTV class hierarchy

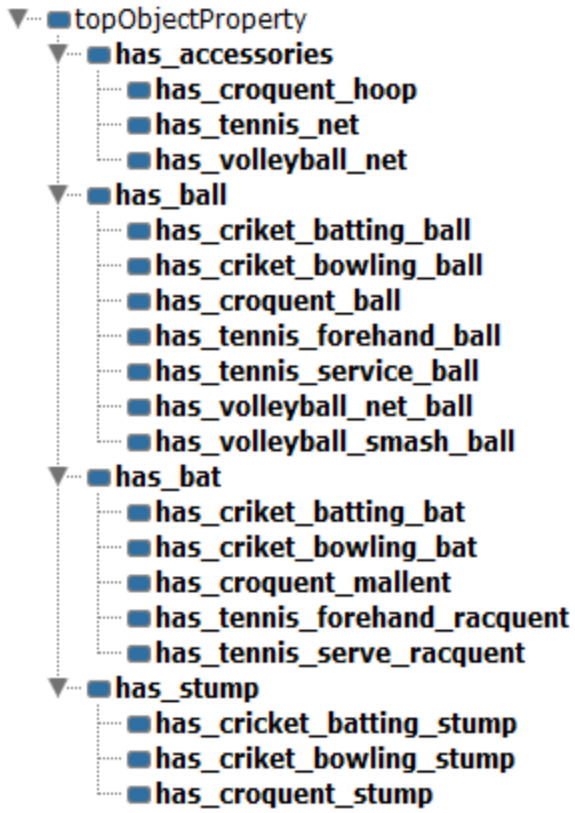

Fig. 8. Object properties of CCTV

Once the classes are defined the properties of the classes as to be defined. As in ontology the concepts are organized in such a way that the relationship between two classes as to be defined to provide better semantic relationship between them. There are different types of properties available they are object properties, data type properties and annotation properties. Where the object properties scores more as here we specify the object of the class by referring the range and domain of the object, also we can define the functionality of the object whether they have any cardinality.

Fig. 8 shows the object property created for CCTV sports ontology. Here the property to be consider is the equipment used as they are common to all. So the equipment is been deliberately defined as shown in stump it would be an cricket batting or cricket bowling or croquet stump. Here cricket batting and bowling is been categories as both have different view point of images and body action.

Once the object is define we have to specify the domain and range of each object, say for has_croquent_hoop object the domain is the Croquet

```
<SubObjectPropertyOf>
    <ObjectProperty IRI="#has_cricket_batting_stump"/>
    <ObjectProperty IRI="#has_stump"/>
</SubObjectPropertyOf>
<SubObjectPropertyOf>
    <ObjectProperty IRI="#has_criket_batting_ball"/>
    <ObjectProperty IRI="#has_ball"/>
</SubObjectPropertyOf>
<SubObjectPropertyOf>
    <ObjectProperty IRI="#has_criket_batting_bat"/>
    <ObjectProperty IRI="#has_bat"/>
</SubObjectPropertyOf>
<SubObjectPropertyOf>
    <ObjectProperty IRI="#has_criket_bowling_ball"/>
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</SubObjectPropertyOf>
<SubObjectPropertyOf>
    <ObjectProperty IRI="#has_croquent_ball"/>
    <ObjectProperty IRI="#has_ball"/>
</SubObjectPropertyOf>
<SubObjectPropertyOf>
    <ObjectProperty IRI="#has_croquent_hoop"/>
    <ObjectProperty IRI="#has_accessories"/>
</SubObjectPropertyOf>
<SubObjectPropertyOf>
    <ObjectProperty IRI="#has_croquent_mallent"/>
    <ObjectProperty IRI="#has_bat"/>
</SubObjectPropertyOf>
```

Fig. 9. Generated OWL

class and the range is also the same class has croquet hoop is available only in that sport event likewise the each properties domain and range has to be specified. Once creating all this structure the mere output would be a XML based OWL web ontology language with owl extension. Below shows the code snippet of the generated CCTV ontology.

Fig. 9 shows the code part of object property of has_Stump. Once an fully well formed ontology is been created we can provide instance for each class. Here the instance of the human_action and cctv_equipment would be the SIFT feature value from the code book generated for each sports event.

B. Ontology Learning

The scope of our work is that the way a human acquire knowledge should be equivalent to an computer machine so that knowledge acquisition from a machine would be a efficient way. In last session explain how we have designed CCTV sports ontology. In this session we will discuss how this ontology acquires its knowledge through ontology learning technique.

Ontology learning is a concept where we can provide knowledgeable information regarding the domain to the build ontology (26). This technique is used to prune and refine the build ontology via domain knowledge and resource knowledge (25). To refine our anthropological ontology we have to extract the terms,

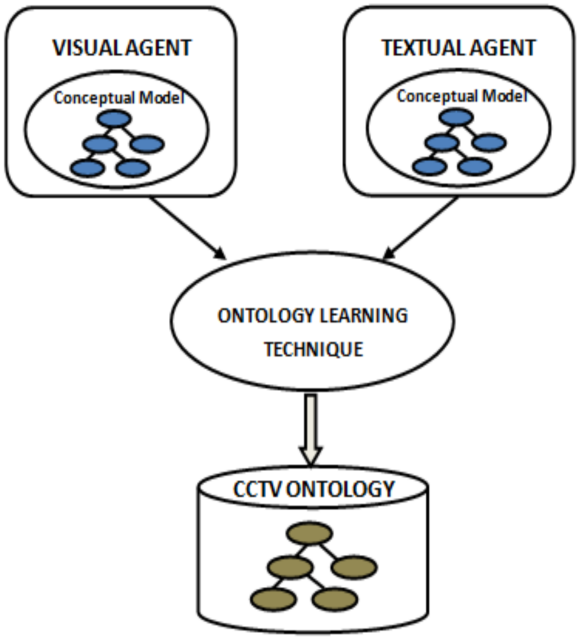

Fig. 10. Ontology Learning

concepts and relations between the provide domain or knowledge ontology with that we can analyze its synonyms and further refine the rules of the ontology. There are so many intelligent technique available to learn these ontology such as Statistical based, Rule based and Hybrid based technique among that here we are using Rule based technique.

Fig. 10 shows the general outline of the Ontology learning used in our work. Here as we use multi mode input strategies such as visual and textual, we use both different environment variable thus these multi agent conceptual ontology model is been integrated in this ontology learning technique to provide an refined CCTV ontology. Fig. 11 shows the actual Rule based Ontology learning technique used in our proposed framework.

For reasoning in a uncertain domain knowledge we go for probability reasoning technique (27).

Probability Deductive Reasoning

Probability reasoning is used to handle uncertainty by using the basics of Mathematical induction concepts. Where it provide knowledge for a given conceptual model via some logical reasoning technique. There are so many reasoning techniques available such as Deductive reasoning, Inductive reasoning, Abductive reasoning, Analogical reasoning

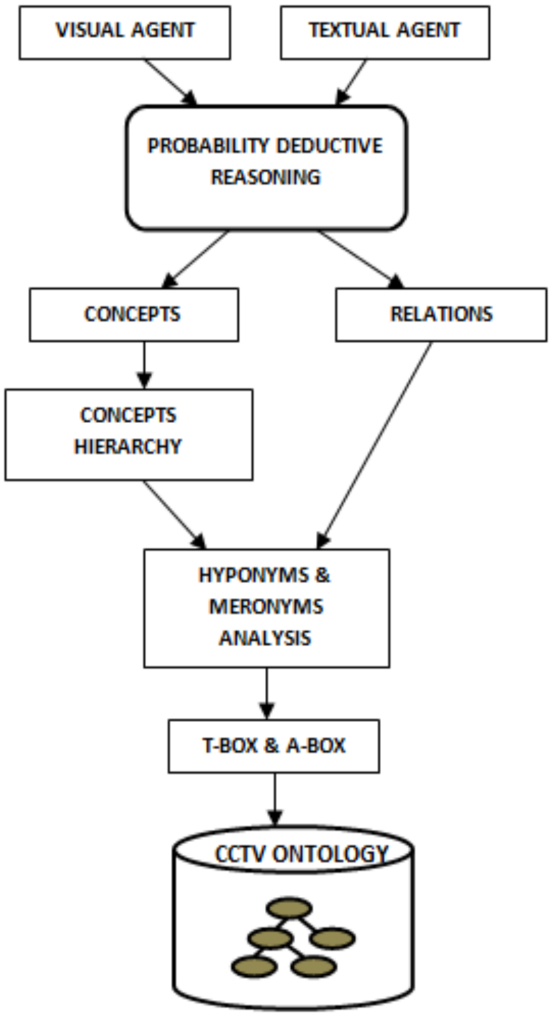

Fig. 11. Rule based Onto Learning Technique

and Fallacious reasoning. Among them to handle uncertainty we go for deductive reasoning logic. In deductive reasoning, knowledge acquisitions can be done by using one or more domain conceptual model. In our work we are using the visual and textual domain conceptual model as the input to the probability deductive reasoner.

Through the Reasoner the terms, concepts and the relationship between the concepts are determined from the visual and textual domain conceptual model. The concept such as cricket,ball, bat etc., and there object properties like has_ball, has_bat etc., is been extracted from the domain model. From these the hyponyms and meronyms are analyzed. Where hyponyms of a concepts are, semantically related concepts. Thus it provide a semantic relationship “is-a” between two related concepts or terms. For example

has_cricket_batting_ball and has_cricket_bowling_ball are semantically related. Meronyms provides the "part-of" relationship between the concepts or terms for example has_croqent_hoop is a part of has_croquent_mallent. Likewise the "part-of" and "is-a" relationship between all the classes and object properties is been analyzed over here thus to provide an semantic knowledge to the intelligent semantic search system.

T box and A box

One of the main components of Semantic web architecture layer is Logic and rules (9). The mere idea of Logic introduced in semantic web is that to provide a logical agent vise decision making when comes to semantic oriented approach. So, in our work we need some logical representation to provide an efficient information retrieval system. These logical can be derived from the descriptive logical notation which has the mere similarity with ontology.

The concept in Description logic is knows as classes in ontology, likewise Role as property and individual as object. With this we can introduce Rule-based ontology reasoning A-box and T-box. These are the facts associate with the visual and textual domain concept, relation and object to the knowledge base conceptual model. A T-box provides the associate classes and property whereas and A-box provides the instance of those classes.

The semantics of this domain can be defined by the interpreting concept i.e. represent one conceptual model agent with the another conceptual model thus the semantic between visual and textual agent is describe using interpreting description logic.

Where interpreting I,

I = (domain ,{classes, property and object})

Thus for an T-box

$$I \models C \subseteq D$$

Where C = classes

D = domain

For A-box

$$I \models a{:}C$$

Where a is the class instant of C and

$$I \models (a, b){:}R$$

Where a is class instance of R related to b an instance

Using this reasoning technique the CCTV ontology can be pruned and refined using the multi agent domain conceptual model.

C. Ontology Query processing

Searching the ontology is done by SPRQL or OWL-QL language (28) . as seen in former session logical descriptive language is one of the strong foundation of ontology. These query language is basically used to search an ontology for relevant result of each classes in the ontology is represented by a specific URI. But in our work as we are dealing with both textual and image query an framework as shown in Fig.12 is need to analyze both type of queries.

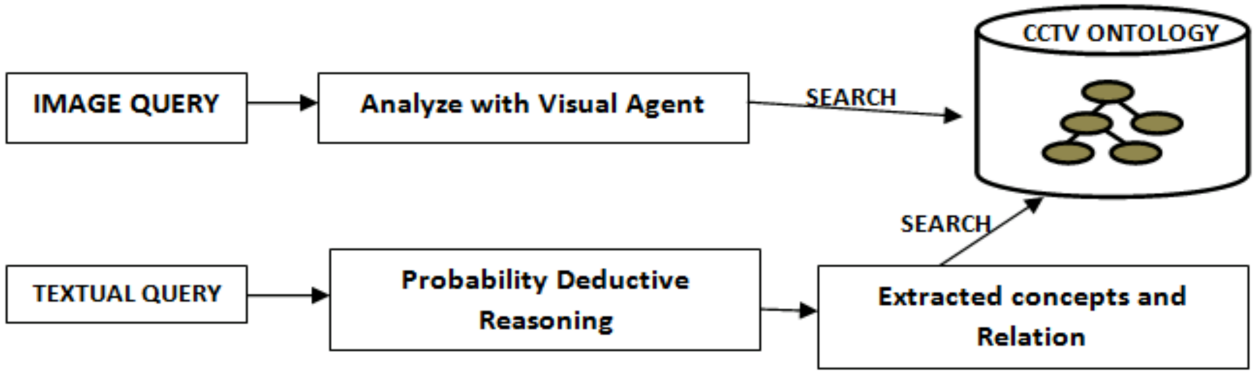

Fig. 12. Multi-Model query processing

If the query is an related sport event image, the image is analyze as explained in session II, the SIFT feature of the image is extracted and the object in the image is identified using the trained bag of word images through SVM classifies. With that the SIFT feature as instance the corresponding relevance is search in the CCTV ontology.

If the query is a textual keywords or an sentence the probability reasoning concept is used to analyze the query to extract the main concepts, relation words form the query with that , we can search the CCTV ontology.

IV CONCLUSION

Knowledge acquisition from the internet is one of the active research area, as there are trillions of knowledgeable and also useless information available on internet, for that we are in need of an intelligent system which provide the needed information in a effective way to the user. In this paper we proposed a framework that would try to provide efficient result, as this system would think and act as human. A human try to retrieve his collective information from his memory. As human use to gain his knowledge anthropologically such approach is been used in our system. If we use ontology we are limited to certain domain, thus in our work we concentrate only on CCTV sports domain, in our future work we would like increase the domain.

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