DETECTION OF OBJECTS AND ACTIVITIES IN VIDEOS USING SPATIAL RELATIONS AND ONTOLOGY BASED APPROACH IN VIDEO DATABASE SYSTEM

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ABSTRACT
The psychovisual analysis and drilling in detail for extracting the content is key for understanding objects & activities in video. The goal to retrieve some desired content from video database in economical and semantic way is challenging one. Typical applications that needs modeling and extracting semantic video content are useful for systems like police investigation, video-on-demand systems, intrusion detection, border watching, sport events, criminal investigation systems etc. In current scenario most of the techniques are inefficient, subjective, costing in time & limiting the querying capabilities. So there is urgent need for effective method to bridge the degree of gap between low-level representative options and high-level linguistics content. This is achievable upto certain degree by specifically focusing on segmentation & classification aspect of video retrieval process. In each of this area an inclination is booted to emphasize the importance of understanding domain-specific characteristics. In segmentation, the thought of an estimable scene as a bit of visual data that exhibits semi-permanent characterization with visual properties connection establishment is done. Here, linguistics content extraction system that permits the user to question and retrieve objects, events, and concepts that are measured & extracted automatically is proposed. The classification & segmentation techniques that exploits domain-specific special & structural constraints in addition to temporal shift models is considered for jet coaching, auto-racing & train video for detection of objects & activities.

KEYWORDS: *Content Modelling, Semantic, Multicue Object, Spatio-Temporal Cue, Event Detection, Event Extraction.*

I. INTRODUCTION

Now a days in the era of digital age there is extreme need to build and apply effective strategies to store, retrieve and manipulate videos that are available in vast quantity. The strategies which can facilitate the users in simplistic and naturalistic way to manage their video libraries are most appreciated. There are of different methods/algorithm have been proposed in literature for video retrieval to reduce the semantic gap between low and high level features[27,9,15]. This can be effectively done through assortment of objects measure and linking through various levels of extraction for distinctive motion, shape, look and different audio text and visual effects. However most of extractions are predicated on solely low level features[10]. To unravel such downside, use of metaphysics, its techniques and spatio-temporal relations for linguistics content extraction is done.
The method starts with object extraction. Specific object based extraction approach is employed for abstract extraction and desired classification for this study. For every representative frame, objects and spatial relations between objects is extracted[17]. Then, objects extracted from consecutive representative frames are processed to extract temporal relations that are a very important step within the linguistics content extraction process [18]. Event extraction technique uses objects, abstract relations between objects and temporal relations between events. Similarly, object and event unites

are utilized in concept extraction technique. Since the object measure is used as the input for the extraction method, event identification associates similarity degree for extraction from video database. The searching of precise object & object identification comes through improvising the defined concept detection. Such a method of classification and identification would be seeking extra information from the video frames related to the detected object [14]. The objects form and size measure are basic parts used to construct metaphysics for a given domain. To outline some advanced scenario effective use of rule definitions which lower spatial computation cost is done. In short human distinguished inbuilt feature to classify the video frame sequence and extract the particular event knowledge is included through programming aspects.

1.1. Existing system

Automatic content mining methodology in most of the system is extracting the correct content which is putted together, permits the user to mine the required information from the videos [12]. Video contents levels are broadly categorized into raw video data, low level information and high level ideas. Association in elementary physical video unit like format, length and frame rate comes beneath unprocessed video information. Whereas sound, text messages and visual context like texture, colors distribution, shapes, and motion are characterized as low level information. Logical content contains high level ideas like objects, events &concepts instances. The fundamental level contents can't give user perceived information from the videos. Therefore probably it is not in complete sense what the user wants.

Semantic content extraction model is used in automatic linguistics content extraction framework. The video is given as input to the present framework. With this input video the key are going to be generated by exploiting the module key frame extraction. Once it is extracted the key frames are going to be noted. By selecting these frames, duration, format video is built internally which is extracted automatically. Besides, general philosophy models provides solutions for transmission structure representations [6]. In most of all recent studies, wide-domain applicable video content model to model the content in videos is not touched. Video data model can be a well-defined meta-ontology for constructing domain ontology's [12,8]. It's alternative to the rule-based and domain-dependent extraction ways. But constructing rules for extraction might be a tedious task and is not amendable. Also different domains can have different rules & syntax in addition to number of constraints. In handling such distinction, each rule structure resulted in distorted structure. Video data model provides excellent rule construction opportunity with the help of meta-ontology. It eases the rule construction process and makes its use on larger video information potential[24].Common discussion on video modeling and there variants are often found are referred and has been deliberately avoided for repetition and scope purpose.

1.2. Related Work

Ontology provides several benefits and capabilities for content modeling. Majority of video content modeling studies proposes domain specific video models & hence limiting their use to a selected domain[21]. An ontology approach is used in biology to classify microorganisms. The study presented an integrated geographic information system (GIS)-ontology application for handling microbial genome data[3]. It also provides solutions for multimedia system structure representations[5]. During this study, we intend to propose a wide-domain applicable video content model so as to model the linguistics content in videos. Video Semantic model may be a well-defined metaphysics for constructing domain ontology[26]. It is alternative to the rule-based and domain-dependent extraction strategies. Constructing rules for extraction may be a tedious task and isn't ascendable[22]. With none commonplace on rule construction, totally different domains will have different rules with different syntax. Additionally to the complexness of handling such distinction, every rule structure will have weaknesses. Video data model provides rule construction ability with the assistance of its meta-ontology. It eases the rule construction method and makes its use on larger video knowledge attainable. The foundations that will be created via Video data model's metaphysics can creep most of the event definitions for a large style of domains[23,7]. However, there are often some exceptional things that the metaphysics definitions cannot creep. To handle such cases, Video data model provides an extra rule based modeling capability for empowering metaphysics model.

Hence, Video model provides an answer that's applicable on a large class of domain videos. Objects, events, concepts, abstraction and temporal relations forms from generic ontology-based model. Similar generic models like[13] that use objects and abstraction and temporal relations for linguistics content modeling neither use metaphysics in content illustration nor support automatic content extraction. To the best of our knowledge, there's no domain-independent video linguistics content model that uses such abstraction and temporal relations between objects and supports automatic linguistics content extraction. The place to begin is characterization of elements that video contains which used to model the video [25]. Key frames represent the elementary video units & are extracted by using video knowledge that best represent the content of shots in an abstract manner.

II. DISADVANTAGES

- Most commonly used techniques are based on raw video data and low-level features which are not sufficient to fulfill the user's need
- Users are mostly interested in querying and retrieving the video in terms of what the video contains which is not supported.
- Basic techniques of extraction didn't support intelligence methods which segments precise frames which result in formation of semantic content
- Direct semantic content relation establishment can't be supported from temporal sequence of frames
- Deeper understanding of the information at the user level is not supported in many video-based applications

III. PROPOSED SYSTEM

The proposed framework is accomplished through the development of philosophy based on semantic content model and semantic content extraction algorithms. It differs from different content extraction ways [1,2]. A gradable content-sensitive video object classifier is planned to shorten the semantic gap. An ontology based image retrieval framework from a corpus of natural scene images by imparting human cognition in the retrieval process[28] is refined in system development. The gradable tree structure of the semantics-sensitive video classifier is used from the domain-dependent hierarchy of video contents [27]. The proposed system leads to linguistics video modelling and linguistics content extraction in required areas. Metaphysics can be a formal or specific specification of domain information. It consists of ideas, thought properties, and relationships between ideas and is often drawn from victimising linguistic terms, and has been employed in several fields as information management. Each relation extraction is kept as a relation part instance that contains the frame range, object instances, type of relation, and a fuzzy membership of relation[4]. The meta-ontology is used to construct domain ontology. The transmission structure representations are provided by generic philosophy. To extract objects from video we tend to apply k-means agglomeration rule. By, that we tend to get the additional relevant objects associated with user query[10]. A content extraction system that permits the user to question and regain objects, events, and ideas are extracted automatically is planned. Automatic extraction methods, starts with object and outline category for every method in video data [11]. The aim of this system is to extract the linguistics content by modelling the core contents in videos. This framework supports wider choice in the form of input video, objects, events and output in the form of ranked result set. To construct the foundations for extraction methodology is difficult task. As different domains might have different rules with different syntax. Thus the rule structure can have weakness to handle the quality of such distinction. This complexness is avoided by meta ontology [13]. It'll support easier rule construction methodology on large video collection. The method is studied on object extraction from key frames & is followed by image segmentation. The image segmentation support intelligence methods which segments precise frames which result in formation of semantic content The proposed system architecture is depicted in Figure.1

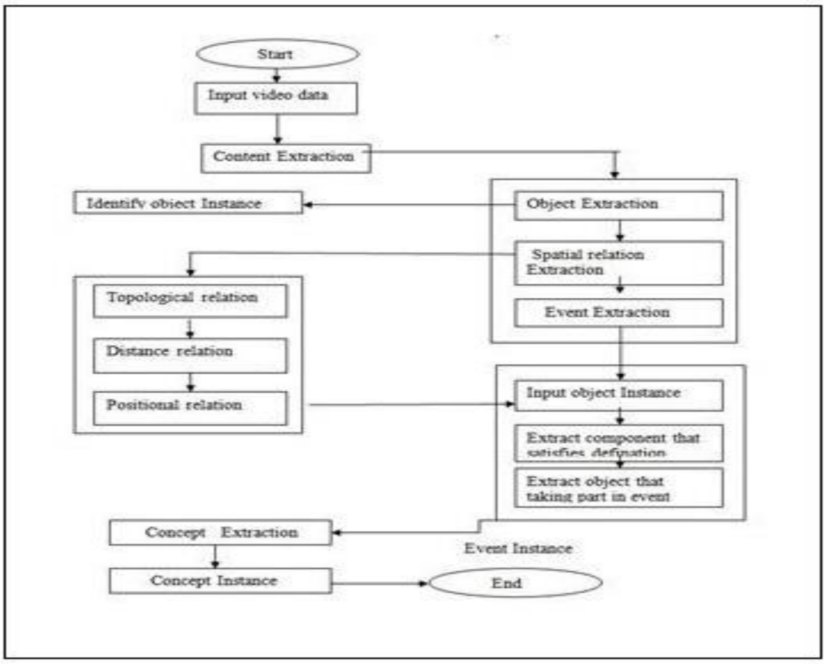

Figure 1. System Architecture

System Architecture Description

I. Input Video:

The user browses the video from the database and it will be given as input to the framework. By using the fuzzy ontology and semantic algorithm the content will be extracted.

II. Content extraction:

Once the video is selected the contents are extracted. Contents in terms of the objects in the given video, relation between different objects and the action or events they are performing is indexed.

III. Spatial Relation Extraction:

Features like the appearance, the distance from belonging objects and many other are calculated and indexed.

IV. Event Extraction:

Objects in detail analysis with respect to uniqueness, colour, shape, size & appearance is done. Hence event detection & extraction is achieved as object involvements & relations of the object are used.

V. Concept Extraction:

In the concept extraction process, concept component and its extracted object, event, and concept instances are used. Concept component individuals relate objects, events, and concepts. When an object or event that is used in the definition of a concept is extracted, the related concept instance is automatically extracted with the required relevance degree as given in definition.

IV. ADVANTAGES

- User can extract the semantic information from Video Database by query execution
- Ontology provides several services and capabilities for content modelling. It is adoptive to changes in video content modelling.
- In Special cases rules to existing framework is easily supported.
- The metaphysics model and semantic content extraction method is supportive to resolve ambiguity & uncertainty issue in natural language processing.[16]

V. ALGORITHMS

Key Frames and Feature Extraction
The process is studied as object extraction from images since videos are a set of images (key frames). Before starting with the image segmentation and object extraction from images, key frames are obtained by using a key frame extraction algorithm.

Algorithm: Key Frame Extraction.
Input: Video
Output: Key Frames
1. Select video file
2. Analyze video file (Extracting information in frames.)
3. For all available frames from specified video file
4. Extract frame from frame list.

Algorithm: Segmentation and Feature Extraction
Input: Key Frames
Output: Segments and its features
1. Analyze key frame
2. Extract low level information and segmentation information
3. Loop all available segmentation from the specified key frame
4. Extract first segmentation
5. Analyze segmentation
6. Extract all feature information about specific segmentation
7. Go to step 3
8. Analyze feature information specified by key frame segmentation (apply k-means)
9. Store to database
10. Go to next key frame.

Algorithm: Object Extraction
Input: Segmented and feature extracted key frames
Output: Object
1. Extracting current frames
2. Analyze feature information available on all segmentation
3. Compare segmentation into key frames (pixel wise, color wise, shape/area)
4. Check for key frame annotation
5. Create segmentation for annotation
6. Specify annotation type
7. Compare new segmentation to current segmentation
8. Store to database

K-Means Clustering Algorithm:
Let X = {x1,x2,x3,……..,xn} be the set of data points and V = {v1,v2,…….,vc} be the set of centers.
1. Randomly select *'c'* cluster centers.
2. Calculate the distance between each data point and cluster centers.
3. Assign the data point to the cluster centers whose distance from the cluster centers is minimum of all the cluster centers.
4. Recalculate the new cluster centers.
Where, *'ci'* represents the number of data points in *ith* cluster.
5. Recalculate the distance between each data point and new obtained cluster centers. 6. If no data point was reassigned then stop, otherwise repeat from step 3.

Where, *'||xi - vj||'* is the Euclidean distance between *xi* and *vj*.
'ci' is the number of data points in *ith* cluster.
'c' is the number of cluster centers.

Algorithm: Event Extraction
Input: Domain Ontology, Object Instances
Output: Event Instances
1. Getting all object instances, which related to user input query
2. Find the spatial movement, relations and changes
3. Load all event definition, which is related to all available object instances
4. Apply the similarity measure (maximum related only)
5. Display result as the similar event instances.

Algorithm: Concept Extraction
Input: Domain Ontology, Object Instances Event Instances
Output: Event Instances, Concept Instances
1. Load all ontology and spatial, which related to object instances by user input query
2. Check for object or event instances that satisfy the individual definition
3 Extract the concept instances that satisfy the individual definition.
4. Use specified rule for the extracted concept and execute it.

VI. EXAMPLES

The case study is done on jet coaching, auto-racing & train video as proof of concept .The exact crash event from the army-jet coaching video is extracted as result. Whereas, in second case the target is to extract the event associated with the sport accident. Third case demonstrates the event extraction for train crossing. In all cases actual frames are captured in respective video result through the program run.

Figure 2. Crash Event extraction demonstration: Case-1

In initial case Fig.2, the event 'Crash' has definition supported with spatio-temporal conditions Where video frames are scanned in sequence to find the coincidental occurrences of the objects from pre-defined object category, jet and defined threshold distance. Wherein, the temporal relation among jets is being interpreted automatically by the Multicue Object detection. In this case simultaneous occurrence & Spatio-temporal relation among object 'first jet' and the object 'second jet ' for threshold distance range is interpreted as meet or crash event .Thus relative distance is reaching to zero and therefore object boxes are overlapping as shown in diagram. The system thereby extracts out the near range fames from upstream and downstream to compile the extraction footage.

Figure 3. Accident Event extraction demonstration: Case-2

In the second case Fig. 3, similar system model for the event describing auto-racing accident is outlined by spatio-temporal relation detection between objects, contestant, and the athletes. Thereby the multi-cue object does object categories for modelling. Once the accident happens, the Athletes collide to relate accident event in video. Fig. 3 demonstrates this with help from actual extracted frames with object identifiers. So the accidental event detected and extracted.

Figure 4. Train crossing Event extraction demonstration: Case-3

In case-3, similar system model for the event describing the train crossing is outlined by the spatio-temporal relation between the detected objects. Movement of 'Two head engines' in bifurcation is considered as crossing event as illustrated in fig 4.

VII. RESULT

We have implemented system in Matlab and used ontology framework Prote´ge [19] & Jena[20]. It associated object-based approach to support semantic video retrieval. Here aim is to extract event footage from the videos which contributes valuable research dimension in the area of video database system. This extraction is enhanced by segmentation, object detection & key frame extraction techniques.

After key frames extraction, extracted frames are used for segmentation. For that purpose, segmentation algorithm is used. Firstly, every frame obtained is scanned for an object in addition to related relations which are grouped as objects one class. All the class objects are mapped by the k-means based algorithm. After distinguishing objects, objects are extracted and compartmentalization is done .This can be done by object extraction rule logic. We have investigated the systematic use of specialized object detectors for generic concept detection. It hypotheses generic detection as high level options in concept detection system. Hence with connected object participation, detection results for more object categories are incorporated to get natural result. The prototype system performance is illustrated in the form of precision & recall measures as shown in Table 1.

Table 1. System Performance

	Event –plane Crash		*Event – Accident*		*Event – train crossing*	
	Precision	*Recall*	*Precision*	*Recall*	*Precision*	*Recall*
Video 1	0.8847	0.8225	0.9568	0.8870	0.9369	0.8671
Video 2	0.9269	0.8865	0.9416	0.8511	0.9217	0.8312
Video 3	0.8644	0.7915	0.9931	0.9248	0.9932	0.9249
Average	**0.892%**	**0.8335%**	**0.963%**	**0.887%**	**0.950%**	**0.874%**

PERFORMANCE EVALUATION

1. Plane crash

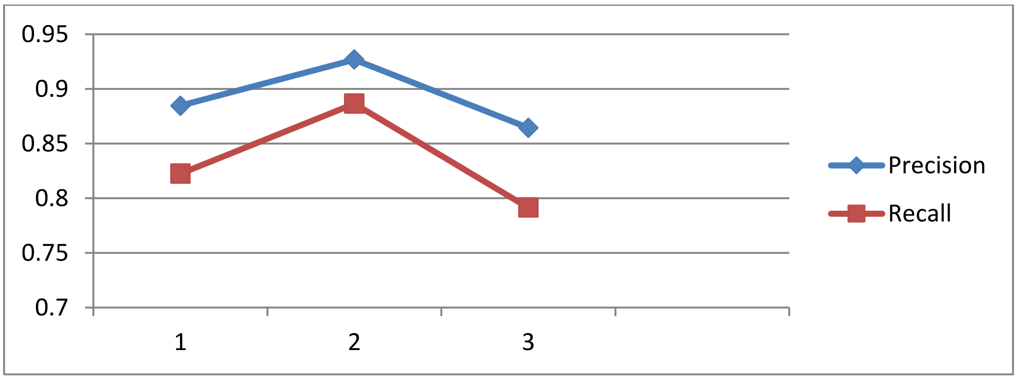

Figure 5. (Event Plane crash) Graph for precision and recall

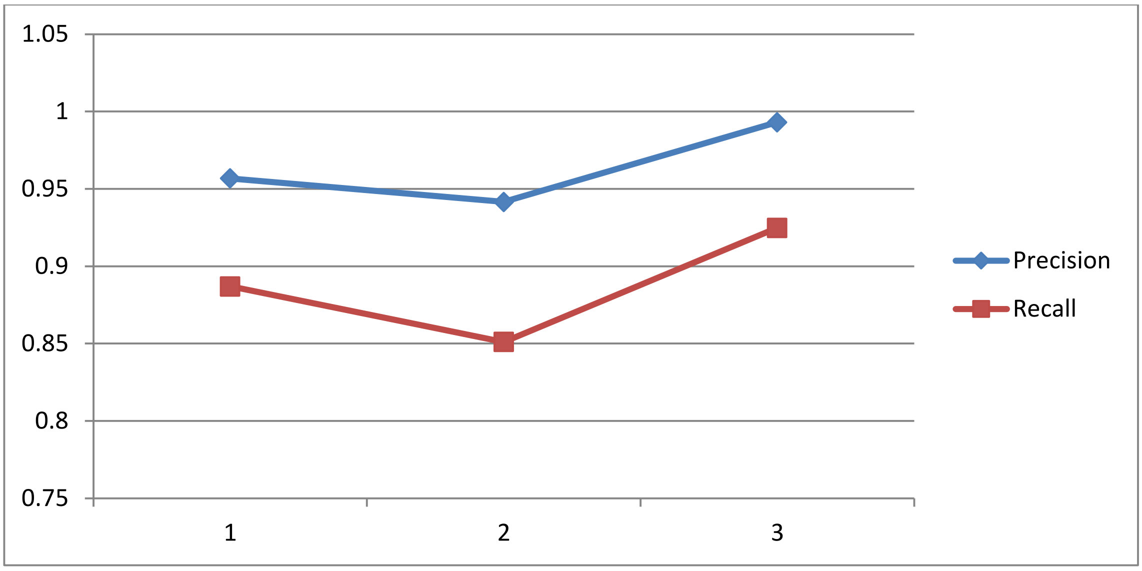

Figure 6. (Event Accident) Graph for precision and recall

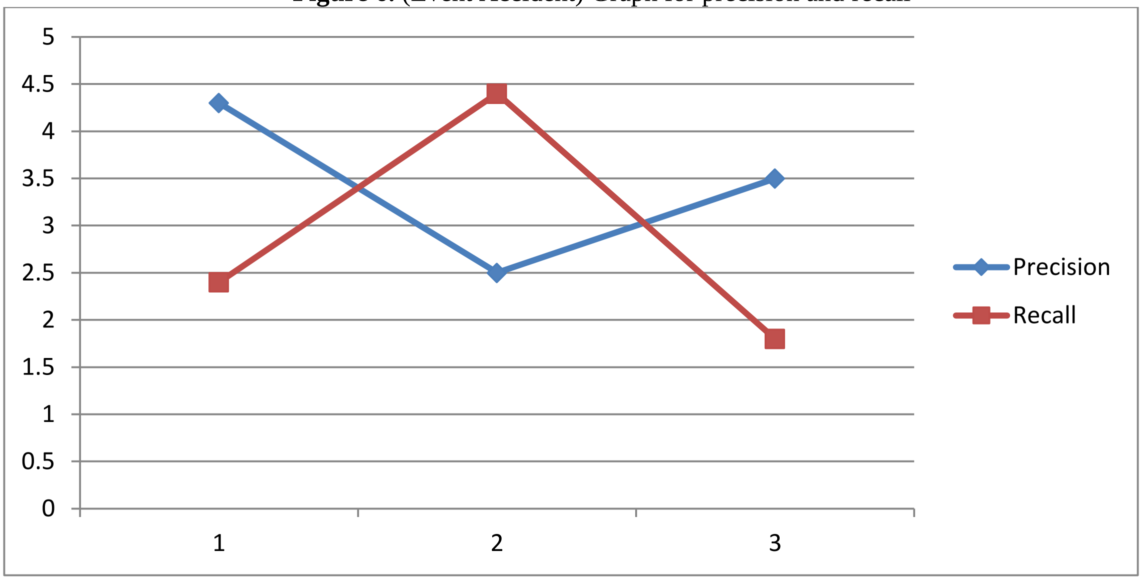

Figure 7. (Event Train crossing) Graph for precision and recall

Table 2. Table for most matched, retrieved and available video

Input Query	Most matched	Total Retrieved by the System	Similar available in the database
1.mp4	3	9	6
2.mp4	3	11	8
3.mp4	3	8	5

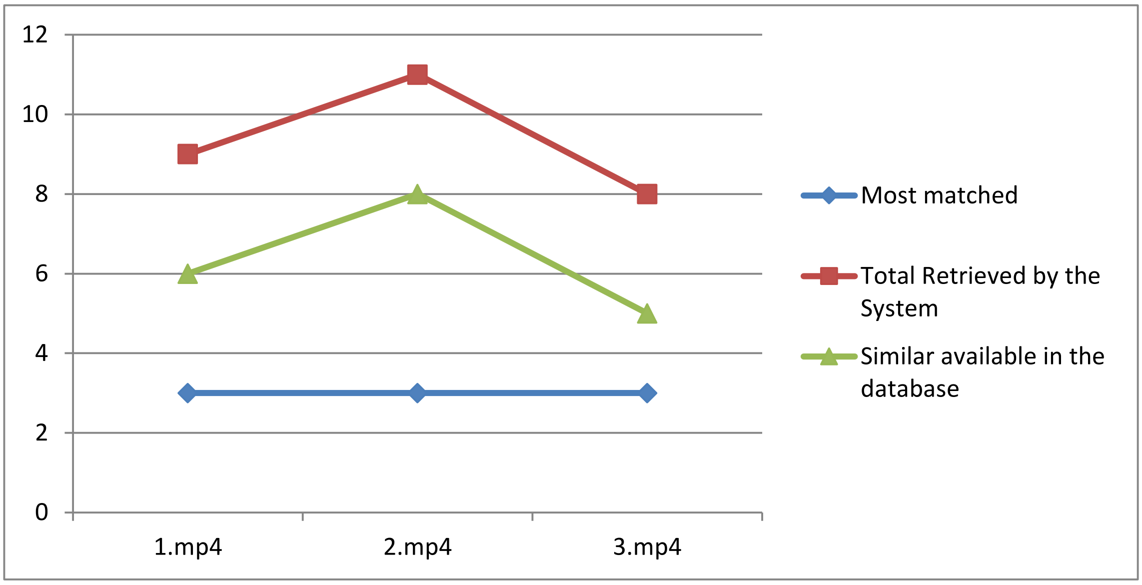

Fig 8: Graph of available, most matched and retrieved video

VIII. Conclusion and Future Work

This system can be employed in various fields like inspections, sport and informative video applications. Here techniques on a meta-ontology model and specific rule based is used. The advantage of the system is to extract the content automatically and efficiently. The novel arranges here is to utilize domain ontology generated with a domain-independent metaphysics-based content model and special rule definitions. Automatic Content Extraction Framework contributes in some ways to video modelling and content extraction analysis areas. First of all, the content extraction technique is automatic. We have introduced the concept of scene as chunk of visual knowledge which will be computed from low-level options .The experimentation on object-based options has improved the performance of system & it directly corresponds to object detectors with additional connected information.

Future work on the extension of the system can be with audio visual and special relation co-occurrence features among frames. The challenge is to have some ideas of natural language processing present in query systems. Hence user orientation in the system can be brought by modelling dialogue between the user and the system by detecting the presence of negations, disjunctions or conjunctions in the query.

References

[1] J. Fan, W. Aref, A. Elmagarmid, M. Hacid, M. Marzouk, and X.Zhu, "Multiview: Multilevel Video Content Representation and Retrieval," J. Electronic Imaging, vol. 10, no. 4, pp. 895-908, 2001.

[2] Sudha D, Priyadarshini J. Reducing Semantic Gap in Video Retrieval with Fusion: A Survey. Procedia Computer Science. 2015 Dec 31;50:496-502.

[3] Jelokhani-Niaraki S, Tahmoorespur M, Minuchehr Z, Nassiri MR. An Ontology-Based GIS for Genomic Data Management of Rumen Microbes. Genomics & Informatics. 2015;13(1):7-14. doi:10.5808/GI.2015.13.1.7.

[4] R. Nevatia and P. Natarajan, "EDF: A Framework for Semantic Annotation of Video," Proc. 10th IEEE Int'l Conf. Computer Vision Workshops (ICCVW '05), p. 1876, 2005.

[5] A.D. Bagdanov, M. Bertini, A. Del Bimbo, C. Torniai, and G. Serra, "Semantic Annotation and Retrieval of Video Events Using Multimedia Ontologies," Proc. IEEE Int'l Conf. Semantic Computing(ICSC), Sept. 2007.

[6] R. Nevatia, J. Hobbs, and B. Bolles, "An Ontology for Video Event Representation," Proc.Conf. Computer Vision and Pattern Recognition Workshop, p. 119,http://ieeexplore.ieee.org/xpls/abs_all.jsp?Arnumber=1384914, 2004.

[7] U. Akdemir, P.K. Turaga, and R. Chellappa, "An Ontology Based Approach for Activity Recognition from Video," Proc. ACM Int'l Conf. Multimedia, A. El-Saddik, S. Vuong, C. Griwodz, A.D. Bimbo,K.S. Candan, and A. Jaimes, eds., pp. 709-712, http://dblp.unitrier. De/db/conf/mm/mm2008.html#akdemirtc08, 2008.

[8] Y. Yildirim, "Automatic Semantic Content Extraction in Video Using a Spatio-Temporal Ontology Model," phd dissertation, Computer Eng. Dept., METU, Turkey, 2009.
[9] T. Yilmaz, "Object Extraction from Images/Videos Using a Genetic Algorithm Based Approach," master's thesis, Computer Eng. Dept., METU, Turkey, 2008.
[10] Y. Yildirim and A. Yazici, "Ontology-Supported Video Modeling and Retrieval," Proc. Fourth Int'l Conf. Adaptive Multimedia Retrieval: User, Context, and Feedback (AMR), pp. 28-41, 2006.
[11] Y. Yildirim, T. Yilmaz, and A. Yazici, "Ontology-Supported Object and Event Extraction with a Genetic Algorithms Approach for Object Classification," Proc. Sixth ACM Int'l Conf. Image and Video Retrieval (CIVR '07), pp. 202-209, 2007.
[12] V. Mezaris, I. Kompatsiaris, N.V. Boulgouris, and M.G. Strintzis, "Real-Time Compressed-Domain Spatiotemporal Segmentation and Ontologies for Video Indexing and Retrieval," IEEE Trans. Circuits Systems Video Technology, vol. 14, no. 5, pp. 606-621,May 2004.
[13] D. Song, H.T. Liu, M. Cho, H. Kim, and P. Kim, "Domain Knowledge Ontology Building for Semantic Video Event Description, "Proc. Int'l Conf. Image and Video Retrieval (CIVR), pp. 267-275,2005.
[14] W. Chen and D.S. Warren, "C-logic of Complex Objects," PODS'89: Proc. Eighth ACM SIGACT-SIGMOD-SIGART Symp. Principles of Database Systems, pp. 369-378, 1989.
[15] M.J. Egenhofer and J.R. Herring, "A Mathematical Framework for the Definition of Topological Relationships," Proc. Fourth Int'l Symp. Spatial Data Handling, pp. 803-813, 1990.
[16] M. Vazirgiannis, "Uncertainty Handling in Spatial Relationships, "SAC '00: Proc. ACM Symp. Applied Computing, pp. 494-500, 2000.
[17] P.-W. Huang and C.-H. Lee, "Image Database Design Based on9d-SPA Representation for Spatial Relations," IEEE Trans. Knowledge and Data Eng., vol. 16, no. 12, pp. 1486-1496, Dec. 2004.
[18] I. Horrocks, P.F. Patel-Schneider, H. Boley, S. Tabet, B. Grosof, and M. Dean, "Swrl: A Semantic Web Rule Language," technical report, W3C, http://www.w3.org/Submission/SWRL/, 2004.
[19] "Prote´ge´ Ontology Editor," http://protege.stanford.edu/, 2012.
[20] "Jena: A Semantic Web Framework," http://www.hpl.hp.com/semweb/, 2012.
[21] IEEE 2011 International Conference on Information Science and Applications (ICISA 2011) - Jeju Island (2011.04.26-2011.04.29)] 2011 International Conference on Information Science and Applications - Semantic Interaction TV Based on Spatial Relations and Ontology.
[22] Changsheng Xu, Yi-Fan Zhang, Guangyu Zhu, Yong Rui, Hanqing Lu and Qingming Huang, 2008, "Using Webcast Text for Semantic Event Detection in Broadcast Sports Video", International Journal of Advanced Computational Engineering and Networking, ISSN: 2320-2106, Volume-3, Issue-4, April-2015.
[23] Noboru Babaguchi, Yoshihi koKawai, and Tadahiro Kitahashi, 2002, "Event Based Indexing of Broadcasted Sports Video by Intermodal Collaboration", IEEE Transactions on Multimedia, Vol.4, No.1, pp.68-75.
[24] Yoshitaka A., Hosoda Y., Hirakawa M., and Ichikawa T., 1998, "Content-Based Retrieval of Video Data Based on Spatio temporal Correlation of Objects", in Proceedings IEEE Multimedia Computing and Systems, pp.208-213.
[25] A. Hoss, D. Carver, "Weaving ontologies to support digital forensic analysis", Intelligence and Security Informatics 2009. ISI '09. IEEE International Conference on, pp. 203-205, June 2009.
[26] L. Bai, S.Y. Lao, G. Jones, and A.F. Smeaton, "Video Semantic Content Analysis Based on Ontology," IMVIP '07: Proc. 11th Int'l Machine Vision and Image Processing Conf., pp. 117-124, 2007.
[27] J. Fan, A.K. Elmagarmid, X. Zhu, W.G. Aref, and L. Wu,"Classview: Hierarchical Video Shot Classification, Indexing and Accessing," IEEE Trans. Multimedia, vol. 6, no. 1, pp. 70-86,Feb. 2004.
[28] Sarwar, Sohail, Zia Ul Qayyum, and Saqib Majeed. "Ontology based image retrieval framework using qualitative semantic image descriptions." Procedia Computer Science 22, 2013: 285-294.

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