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Context-Aware Video Annotation Using Linked Data and Search Educational Video Resources for Supporting Distance Learning

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Abstract
Multimedia educational assets play an essential role in learning, especially for e-learning or distance learning situations. With the fast development of the multimedia web, substantial quantities of educational video resources are progressively being made available on web. It is significant to investigate, share, reuse, and join these educational resources for better e-learning encounters. The vast majority of the video assets are as of now explained in a non-semantic way, which implies that they need semantic associations. In this manner, giving the place of work to clarifying these video assets is much demanded. Embracing Linked Data innovation, this paper presents a feature annotation and program stage with two online strategies: Annomation and AnnoBrowser. Annomation empowers clients to semantically clarify feature assets utilizing vocabularies characterized as a part of the Linked Data cloud. AnnoBrowser permits clients to peruse semantically connected instructive feature assets with upgraded web data from diverse online assets.

Keywords
Semantic Web, linked data, Context-aware, Semantic Web Services, Distance learning, e-learning.

I. Introduction
In present world, e-learning exercises are fundamental for distance learning in advanced education. More than 5 million students have used or are using at the very least one online course in their studies, and the amount of online students is creating by 25 precent reliably [1]. The advanced video, as one sort of the multimedia educational asset, assumes a key part in distance learning situations [2]. With quickly developing quantities of advanced educational video assets being made, it is essential to precisely depict the video content and empower the seeking of potential videos in request to upgrade the quality and elements of e-learning contexts [3]. With the quick development of the multimedia web, an extensive number of free educational resources are also accessible on the web. In this manner, it is critical to pick up the ability to effectively look for all related dispersed instructive assets together to allow them to be utilized for improving the learning exercises. To this end, it has recognized the accompanying essential difficulties that, video assets have to be represented absolutely. It is hard to utilize only one general depiction to precisely recount the entire story of a video on the grounds that one segment of the video stream may have a lot of data (e.g., on recorded figures and concealed occasions in the information exchanges) but some of them may not identified with the principle purposes of the video when it was made. In this way, the ordinary passage based representation procedure is sufficiently bad to annotate videos exactly. A more exact representation component, in view of the course of events of the video stream, is needed. The representations of the educational video assets have to be precise and machine-understandable, to support related search functionalities. In spite of the fact that a unified and controlled wording can give precise and machine-understandable vocabularies, it is unusual to manufacture such a unified phrasing to fulfil distinctive representation prerequisites for diverse domains essentially language. It is important to connect video assets to the helpful information from the web. More information as well as scientific information is distributed on the web by diverse examination and educational associations like Linked Open Data [4]. Thus it is valuable to break the instructing asset limits between organizations and the Web environment to provide wealthier learning materials to both teachers and learners. It holds Semantic Web innovation, more decisively; the Linked Data deals with the situations to above mentioned challenges.

II. Background

A. Requirements for Enhancing Educational Video Assets to Assist in Distance Learning
Video resources are important educational assets that empower students to pick up all information more effectively and instinctively than text-based educational assets. Video assets play an important role in separation learning courses. For instance, a ten-minute long video of a dialogue may contain a lot of data. For example, time, location, related individuals and background information. On the other hand, normal educational video assets generally need labeled vocabularies and organized metadata. These disadvantages limit the convenience, reusability and efficiency of the educational video assets. To enhance e-learning results, educational video assets must to have exact annotations produced by domain specialists, course makers, and guides. It is critical that the annotation vocabularies are exact, identifiable, and sharable between different groups of individuals. Besides, if every piece of the annotation in the videos is point by point with additional data, this would help students to understand a learning point clearly. Case study [5] says that the learner's characteristics are important in distance learning environments. The enormous changes concerning the working environment that are challenging, also the difficulties set by the Information Society and by the globalization patterns, request new points of view for training, constant education and deep rooted learning. New techniques request new association choices thus, require new instructive arrangements and place in current suppositions of training itself. Distance Education is a test without anyone else's input. It puts new requests both to the learner, additionally to the facilitator. An arrangement of seven measurements for a distance or separation learning environment were distinguished, which absolutely affects the setting of learning encounters: (1) access gadgets; (2) innovation experience; (3) tendencies and study aptitudes; (4) human components and way of life; (5) objectives and rules; (6) learning preferences; (7) individual qualities. The learners, when gotten some information about their points, considering distinctive issues of their everyday, individual and expert life, accessible innovation assets, innovation aptitudes,

and additionally inspiration and learning inclinations, give a data set that, if swing accessible to facilitators, permit to both actors (learners and facilitators). The systems that facilitate the selection of learning procedures, that upgrade the likelihood of a very much succeed learning background. To finish the exploration objectives, an empiric study was directed in the setting of a Distance Education (DE) organization, taking a specimen of 214 learners, with assorted attributes. The information examination permits the affirmation of the position legitimacy and demonstrates that it is conceivable to know ahead of time the separation learners more critical attributes and of the encompassing environment as intends to get to potential achievement and rate disappointment. In light of such information it is imaginable to build up a characterization of those attributes, proposing methodologies and advising to encourage choices and subsequently to enhance the separation learning. E-Learning approach utilizing semantic web gives applicable and significant data to the learner but human personality plans its own subjective structure of the data which is fuzzy and doubtful [6]. At the point when information structure of any space is extensive and all around joined then it is anything but difficult to learn and obtain semantically associated information. An E-Learning methodology is planned where the semantic web is made more significant by including human applied representation and thinking component to learn based upon the information, profile and experience of learner. The utilization of video lectures in separation learning includes the two noteworthy issues of search ability and dynamic client support [7]. The execution and utilization of an open instructive video annotation are useful to succeed these two difficulties. Distinctive use cases and necessities, and additionally points of interest by the learners are possible to clarify. At last, assessments as client tests and polls in a Massive Open Online Courses (MOOC) setting are available to show. The consequences of the assessment are promising, as they show that understudies see it as helpful, as well as that the learning viability increments. The mixture of individual lecture video annotations with a semantic theme guide was additionally assessed absolutely and will in this manner be examined further, as will the execution in a MOOC setting. The utilization of context is vital in interactive applications [8]. It is especially critical for applications where the client's context is changing quickly, for example, in both handheld and universal thinking. For better understanding of how to use context and facilitate the building of context-aware applications, it is need more to fully understand what constitutes a context-aware application and what context is. Current searching technologies can just bind the constantly expanding measure of multimedia information when adequate metadata exists [9]. A few explanations are as of now accessible, yet they from time to time cover all viewpoints. The era of extra metadata demonstrates expensive; therefore proficient multimedia recovery requires automated explanation strategies. Current feature extraction algorithms are restricted on the grounds that they don't consider context into account. The Linked Data can give information that is basic to make an interpretation context. Subsequently, advanced communications between algorithms, data and context will empower more advanced translation of multimedia information. This will reflect in better search conceivable outcomes down to the end user. Programmed era of metadata, encouraging the recovery of multimedia things, possibly spares a lot of manual work [10]. The high specialization level of highlight extraction algorithms makes them ignorant of the setting they work in, which contains valuable and frequently important data. Semantic Web Technologies gives a context that the algorithms can connect with it. It is possible to utilize generic problem-solving platform that uses Web services and various knowledge sources to find solutions to complex requests.

B. Semantic Web, Linked Data, and Web Services

The Semantic Web [11] is an evolving improvement of the Internet, in which the implications of data on the web is characterized; subsequently, it is workable for machines to process it. The fundamental thought of Semantic Web is to utilize ontological ideas and vocabularies to precisely represent substance in a machine-understandable manner. These ideas what's more, vocabularies can then be shared and recovered on the web. In the Semantic Web, every piece of the information is a triple, in view of Description Logic [12]. Accordingly, the certain associations and semantics inside of the representation pieces can be contemplated utilizing Description Logic hypothesis and ontological definitions. Prior exploration take a shot at the Semantic Web concentrated on characterizing domain particular ontologies also, thinking advancements. In this way, information are just significant in specific areas and are not associated with one another from the World Wide Web perspective, which positively restrains the commitments of Semantic Web for sharing and recovering substance inside of an appropriated environment. The Linked Data is possible to access and manipulate by using Semantic Data Services (SDS) i.e., information administrations based on Semantic Web advancements and adjusted to the REST building style [13]. SDS is a solid execution of the dynamic and semantic interfaces of the SEmantic RESTful INterface (SERIN) determination. To bolster it, SERIN was stretched out with the consideration of explanations for checking honesty imperatives, roused by the social information model. Giving systems to checking trustworthiness is vital to encourage information redesign by programming specialists holding fast to the standards of Linked Data. Linked Data [14] is the late progressive advancement of the Semantic Web. Linked Data make create joins between diverse information from different assets. From the specialized perspective, Linked Data intends to distribute information on the web in a manner that they are comprehensible by machines and their implications are unambiguously communicated. Linked Data changes the method for sorting out information based resources on the web by utilizing the following four standards [15]:

1. Data are distinguished by URIs,
2. The URIs can be dereferenced,
3. The dereferenced information contain more useful data about the information,
4. More data are easily discoverable on the web scale.

The measure of information inside of the Linking Open Data (LOD) cloud is consistently expanding and takes after a rich wellspring of data [16]. Since Context-Aware Services (CAS) can profoundly profit by foundation data, e.g., about the earth of a client, it bodes well to influence that colossal measure of information officially introduce in the LOD cloud to improve the nature of these administrations. The materialness of the LOD cloud as supplier for logical data to enhance CAS is researched. For this reason, non-practical criteria of discoverability and accessibility are investigated, trailed by a presentation of a diagram of the diverse areas secured by the LOD cloud. To facilitate the procedure of finding a dataset that matches the data needs of a designer of a CAS, systems for recovering substance of LOD datasets are examined and diverse ways to deal with gather the dataset to its most critical ideas are appeared. Linked Data can be effortlessly queried through SQL-like languages (e.g., SPARQL Protocol and RDF Query Language (SPARQL) [17]). Resource Description Framework (RDF) is a general system for how to portray any Internet asset such as a web site and its content. The RDF description (such descriptions are often denoted to as metadata, or "data about data") can include the authors of the resource, date of creation or updating, the organization of the pages on a site (the sitemap), information that describes content in terms of audience or content rating, key words for search engine data collection, subject classifications, et cetera. SPARQL is an RDF query language, that is, a semantic query language for databases, able to retrieve and manipulate data stored in Resource Description Framework (RDF) format. SPARQL can be utilized to express inquiries crosswise over various information sources, whether the information is stored locally as RDF or saw as RDF through middleware. SPARQL contains capacities for questioning required and discretionary chart designs alongside their conjunctions and disjunctions. SPARQL likewise encourages extensible worth testing and compelling questions by source RDF graph. The results of SPARQL queries can be results sets or RDF graphs. Most by far of Web services on the Internet need unambiguous and adequate semantic data [18]. It is possible to use automatic way to deal with semantic explanation for Web services in view of the DBpedia information base. Through rich, open Linked Data assets, and exploiting the DBpedia Ontology, a predictable and cross-area philosophy, and its application DBpedia Spotlight can coordinate the suitable Linked Data ideas to the relating parameter ideas of Web services. The annotations on Web services contain the same semantic connections as those inside of their comparing Linked Data assets. The most encouraging data set of Linked Data is the Linked Open Data Cloud [4] (Fig. 2.1) that incorporates information in seven distinct ranges, for example: publication, government, media, user-generated content, geographic, life science, and cross domain. Linked Open Data is a way of publishing structured data that allows metadata to be connected and enriched, so that different representations of the same content can be found, and links made between related resources.

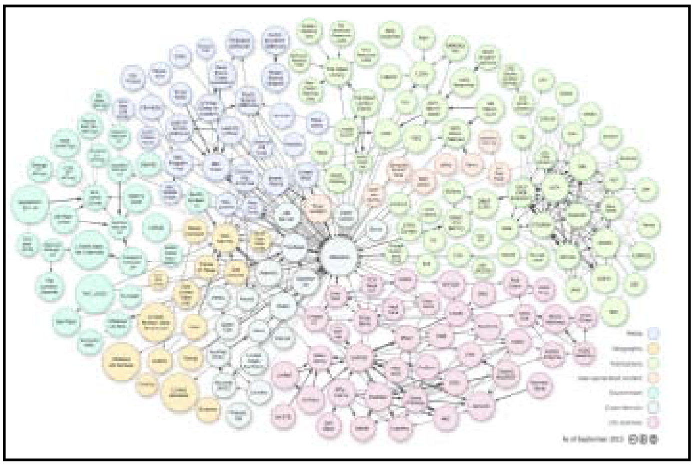

Fig. 1 : The Linked Open Data cloud diagram, by Richard Cyganiak and Anja Jentzsch. http://lod-cloud.net

Linked Data are distributed through web administrations all together to be gotten by different applications. Specifically, asset arranged RESTful web services [19] are actually coordinated to the attributes of distributed the Linked Data assets [20] into SPARQL endpoints. RESTful Web Services are REpresentational State Transfer (REST) architecture based web services. REST is web standards based design and uses HTTP protocol for information correspondence. It revolves around asset where every segment is an asset and an asset is accessed by a common interface using HTTP standard methods. In REST architecture, a REST server just gives access to resources and REST client gets to and presents the resources. Here each resource is identified by Uniform Resource Identifier (URI). A SPARQL endpoint empowers clients (human or other) to query information base by means of the SPARQL language. Results are commonly returned in one or more machine-processable configurations. Subsequently, a SPARQL endpoint is generally conceived as a machine-friendly interface towards a knowledge base. Both the formulation of the queries and the human-readable presentation of the outcomes ought to regularly be implemented by the calling software, and not be done manually by human users. The accompanying compresses four most imperative focal points of utilizing Linked Data to make video annotations for the educational area.

- Every video annotation is unique and explicitly distinguished. Every piece of Linked Data is distinguished by a Uniform Resource Identifier (URI) that connections to web-based especially a Resource Description Framework (RDF) web-based content that displays unambiguous semantics of the information. The semantics resolve the dialect ambiguities and permit machines to precisely handle the implications of video annotations.
- Data is connected to the enormous knowledge net. Linked Data are characterized with relations to ontology-based dialects, for example, Resource Description Framework Schema (RDFS) and Web Ontology Language (OWL) that represent relations among distinctive ontological ideas and among existing ontology properties, for example, Friend-of-a-Friend (FOAF) [21], Dublin Core [22], and DBpedia [18]. These properties represent relations between individuals, learning items, and RDF asset occurrences. FOAF is a computer language defining a dictionary of people-related terms that can be used in structured data e.g. RDF. The Dublin Core Schema is a small set of vocabulary terms that can be used to describe web assets (images, web pages, video, etc.), as well as physical resources such as books or CDs, and objects like artworks. DBpedia is a crowd-sourced public effort to extract structured data from Wikipedia and make this information accessible on the Web. DBpedia permits to inquire sophisticated queries against Wikipedia, and to link the different data sets on the web to Wikipedia data. It will make easier for the huge amount of information in Wikipedia to be used in some new interesting ways. Furthermore, it might encourage new mechanisms for linking, improving, and navigating the encyclopedia itself.
- Videos are connected to one another. By utilizing Linked Data to represent videos, the relations among videos are made powerfully and specifically. These relations enhance the sharing, reusing, and searching tools in e-learning systems.

More helpful information is collected from the web. By scattered Linked Data-based video clarifications on the web, the video assets turn into a piece of the Linked Data Cloud. Along these lines, not just are videos themselves connected to one another, additionally all related Connected Data cases are associated with the videos. In along these lines, discrete educational assets can be effortlessly assembled and connected to one another.

III. Existing System

The earlier work on video annotation tools can be summarized as either fat-client software as opposed to web browser based, or non-Linked Data annotations, an imperative early system was Vannotea [23] which depended on a committed customer application to empower community annotation, yet the annotations were not in a Semantic Web style. M-OntoMat-Annotizer [24] used semantic web annotations, connecting them to annotations installed utilizing MPEG-7 [25]. OntoMat-Annotizer is a comprehensible collaborative webpage annotation tool. It supports to the manipulator with the task of generating and maintaining ontology-based OWL-markups i.e. creating of OWL-instances, attributes and relationships. It contains an ontology browser for the investigation of the ontology and instances and a HTML browser that will display the interpreted parts of the text. It is Java-based and makes available a plugin interface for extensions. The intended user is the distinct annotator i.e., people that want to improve their web pages with OWL-meta data. Instead of manually annotating the page with a text editor, say, emacs, OntoMat allows the annotator to highlight related portions of the web page and form new instances via drag-and-drop interactions. It supports the meta-data formation stage of the development. On the other hand, MPEG-7 is at first composed taking into account non-semantic XML description language. It concentrates on video content, presentation models, pictures, representation, sound volumes, furthermore, searching matrix with identifying to data about the video [26]. Subsequently, semantic upgrades of MPEG-7 are always fat-client. Different studies [27] utilize a domain ontology that represents the videos to characterize annotations. On the other hand, the domain ontology-based annotations cannot clarify data from outside of their domain, and it is unlikely that learners are keen on taking in these in request to search videos. Videos are generally searched by syntactic matching systems (e.g., [28]). As of late, with more videos being clarified or labeled in the Linked Data way, scientists have started to search videos in a more Semantic-Web oriented style. The two noteworthy procedures are the semantic indexing procedure and the natural language analysis procedure, where indexing procedure expects that the video annotations are produced using a settled arrangement of vocabularies that change occasionally (e.g., [29]). Despite the fact that this procedure can be effective, the settled arrangement of vocabulary may present a hole between client's learning and ordered annotations, particularly in the educational environment, in which videos are frequently clarified by diverse gatherings of educators or students, who may apply distinctive annotation terms to the identical video in the connection of various courses and key focuses. The normal dialect examination procedure concentrates more on adding semantic labels to the client's pursuit inputs (e.g., [30]). On the other hand, the majority of these methodologies oblige machine learning systems to help powerfully including labels. Subsequently, they limit their applications to little and closed domain of discourse. Web Services Description Language (WSDL) [31] is a standout amongst the most well-known methods for portraying web benefits linguistically. However it doesn't have procurement for semantic depiction of web service. Semantic Technologies are picking up notoriety in persistent changing web life systems that offers ascend to the web3.0. And additionally Web service innovation likewise picking up prevalence, offer ascent to web services with semantic explanation which can be prepared by machines. Semantic comment when made in connection of particular space makes the web service semantic depiction questionable to other setting. The Web service depictions those utilizing DBPedia which are Cross Domain Public Ontology in view of WikiPedia. Estimation of the comment is gotten from Cross Domain Ontology which make web benefit more summed up past space. DBpedia [32] is these days considered one of the principle ventures in the World Wide Web that concentrates and enhances Wikipedia information in an organized structure. Additionally, it is viewed as the focal center point for the Linked Open Data. For query to DBpedia utilizing huge information methodologies, for example, Hive-QL is viewed as one of the new systems to explain the inadequacies of SPARQL; the principle inquiry dialect of DBpedia and the Semantic Web. All things considered, notwithstanding the pace of Hive-QL contrasted with SPARQL, it has a strength issue. The other design and execution for query to DBpedia utilizing Shark inquiry dialect as a part of expansion to Hive-QL. As a consequence of this, noticeable that the reducing in execution time, and additionally, an expansion in the level of firmness possible to achieve. A center target for linked information is the consistent combination of data from various information sources that serve information in a simple to-convey, flexible way [33]. The emphasis on the simplicity of serving information, notwithstanding, puts critical weight on the consumer of connected open information. Specifically, the client service must oversee (i) information source disclosure, (ii) information access, (iii) information source accessibility and (iv) information model and construction. In principle, querying, i.e. either combined querying of SPARQL 1.1 endpoints or connection traversal-based querying, should give a layer of deliberation to encourage information utilization. Such querying is extremely helpful, however utilizing measures, for example, SPARQL 1.1 is far from illuminating use case needs of information coordination from linked information. This incorporates powerful and proficient abilities for querying and programming against linked information sources indexing information in different courses, querying for articles spoke to in connected information and taking into consideration programming with them. Numerous OWL ontologies for the learning and instruction area have been accounted for in the writing. The preparatory examination of those ontologies demonstrates that they utilize comparable constructors and adages however they don't appear to be taking after a specific or normal section (profile) of the OWL dialect. A corpus of 10 agent learning and instructive ontologies are used to recognize the utilization examples of OWL constructors in those ontologies [34]. The way that OWL is superseded by OWL 2, a profile of OWL 2 that is sufficiently expressive for determining each one of those ontologies in corpus with minor changes. This profile can offer direction on selecting fitting constructors for adding to an OWL 2 cosmology for the learning and training space. A novel methodology [35] for extricating hidden semantic from semi-organized information assets and changed to RDF triples, to be queried through semantic inquiry dialects. Not at all like existing methodologies that just investigate the structure or utilize ontologies, we exhibit that a framework that permits us to use all accessible data. The methodology builds semantically related information from XML spoke to in RDF by means of "semantic system". This information could be queried by SPARQL to perform a semantic search on an arrangement of sight and sound news assets. The issue of predicting SPARQL query execution is studied [36]. The utilization of machine learning systems is possible to take in SPARQL query execution from already executed inquiries. Customary methodologies for assessing SPARQL query expense depend on measurements about the basic information. In any case, in numerous utilization cases including querying Linked Data, insights about the hidden information are frequently absent. This study does not require any measurements about the basic RDF information, which makes it perfect for the Linked Data situation. As the quantity of RDF triples on the Linking Open Data (LOD) Cloud has been exponentially expanded, the troubles of data inquiry have been expanded [37]. To inquiry data on the LOD Cloud, the clients need to have a few capacities for creating SPARQL query and definite information for web assets with RDF, for example, URI, DB title, and name of things. Notwithstanding, it is practically difficult to require the capacities and/or information to the clients who are familiar with tags look. Along these lines, completely automatic keyword based SPARQL query era framework is used. In the framework [37], the clients can inquiry data on the LOD Cloud without having capacities about organized question dialect and having former learning of web assets with RDF. The clients ought to sort an arrangement of catchphrases into the framework. To do as such, the property-based way discovering calculation and a mechanized SPARQL query era that can be utilized to give inquiry suggestions to the clients. Overall population highly utilizes keyword queries to satisfy their data needs on the Web [38]. Semantic web goes for changing the Web to an arrangement which is machine comprehensible. RDF is the regular organization utilized as a part of the Semantic Web to store information. SPARQL queries are equipped for recovering more pertinent results than general keyword directing on RDF information. RDF organizations are fit for associating different heterogeneous information sources. Alliances permit us to recover more finish results than questioning a solitary source. Hence a methodology is used [38] which can change keyword inquiries to SPARQL on a league of heterogeneous sources. It uses a philosophy arrangement approach for determining vocabulary level heterogeneity. A keyword list was utilized to match keywords to information components on the alliance while a Path Index based methodology used to recognize suitable sub-charts which can associate keyword components.

IV. Architecture

Figure 2 shows System Architecture, different components and structure of proposed system.

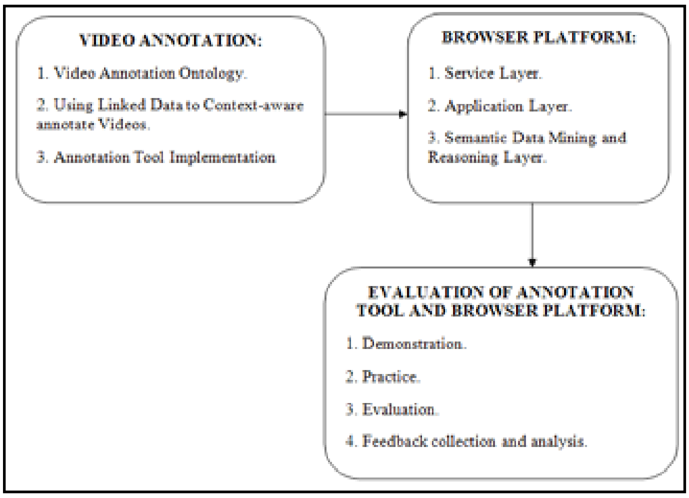

Fig. 2 : Architecture of System

To implement the system, different semantic and non-semantic web services are utilized. First phase of the system is video annotation. In video annotation step user login to annotation tool and selects video file for annotation. Then by using semantic and non-semantic web services user annotates video. Second phase of the system is browser platform. In browser platform step browser interface is used by the user to search videos which are related to search topic. Third phase of the system is evaluation of annotation tool and browser platform. In evaluation step both annotation tool and browser platform are used by the users for analysis. Then by providing questionnaires to the users both annotation tool and browser platform are evaluated.

V. Annomation

"Annomation" is a web application that permits clients to see a feature in a synergistic manner, delay it, and include Linked Information annotations to moments or spans on the feature course of events (see Fig. 3). The "Domain Specialists" who have authorities to recognize things in the video for specific courses as well as who are accountable for characterizing the syllabus and showing arrangements for specific courses. Domain Specialist also execute the syllabus and instructing arrangements to make the point by point showing materials and give support for students inside of the distance learning environment. The video resource is selected for annotation from the list of videos and annotated by the domain specialist. It is further divided into three steps as video annotation ontology; using linked data to context-aware annotate videos and annotation tool implementation. "Annomation" is a video annotation tool that permits domain specialists to clarify videos utilizing vocabularies from the Linked Open Data Cloud [4] for video annotation. The utilization of Linked Data makes annotations precise, visible, and unique.

A. Video Annotation Ontology

Ontology is a formal naming and definition of the interrelationships, properties, and types of the entities that really or fundamentally exist for a particular domain of discourse. The video annotation Ontology and annotation examples are put away in a Sesame RDF [39] quad store, and the Ontology reuses various RDF vocabularies. These vocabularies include: the Timeline ontology [40] for distinguishing fleeting moments and lengths of time on the video course of events. The Timeline ontology, extending some OWL-Time concepts, allows addressing the time points and works, scores, video, performances, intervals on multiple timelines, backing signals, etc. For example, using this ontology, you can express "from 1 minute and 21 seconds to 1 minutes and 55 seconds on this signal". Dublin Core, for metadata, such as a video's title, the creator and creation time of every annotation is in its RDFS forms. The Dublin Core Schema is a small set of vocabulary terms that can be used to describe web resources like video, images and web pages, as well as physical resources such as CDs or books, and artworks.

B. Using Linked Data toContext-Aware Annotate Videos

Conventional video annotations utilizing free-text keywords or predefined vocabularies are lacking for a collaborative furthermore, multilingual environment. They don't acceptably handle the annotation issues, for example, exactness, disambiguation, fulfilment, and multilingualism. For instance, free-text keywords annotation effectively comes up short on exactness issues as they may contain spelling mistakes or be ambiguous. Linked Data [4] is used to handle the above issues in video annotations. It brings the accompanying advantages. Every vocabulary is controlled and precisely characterized in the Linked Open Data Cloud. It claims that one of a kind URI to recognize it from different vocabularies, so there are no conflicts between diverse vocabularies and meanings. The Linked Open Data Cloud, which has the most complete information sets to represent the present world, serves to locate a decent number of related educational assets. One non-semantic and three semantic web services are as of now utilized as a founding to explain and annotate the video resources, these services are used in "Annomation" to encourage the annotation process. More administrations can be effortlessly included into the system by adding a tab choice to demonstrate the inquiry consequences of the new administration when needed.

The semantic web services are:

- DeweyDecimal: The top level Dewey Decimal Characterization (covering the initial three digits of a Dewey number) has been distributed in RDF structure by the Online Computer Library Centre, and the coming about scientific classification is represented to the annotator as a brows-able tree.
- Library of Congress classifications: The Library of Congress has distributed its whole order system in RDF, yet this is much too huge to display specifically to the client. Rather, Annomation gives an interface to the Library of Congress watchword inquiry administration, which returns suitable RDF documents for the client to browse.
- Zemanta [41]: An administration which gives examination of common talk content to recognize different ideas what's more, named elements giving back their URIs to Linked Information, for example, DBpedia.

The non-semantic web service is:

- GeoNames [42]: The GeoNames API is utilized to distinguish named areas using an essential word search for, then again to perform reverse lookup to discover named areas in a region. The outcomes give the position and the class data with URI identifiers.

C. Annomation Implemetation

The Annotation Tool "Annomation" implemented, which is partitioned into four segments: a video player; a list of video resources to annotate; controls for the video player, and for entering new annotations and an arrangement of panels to help the client to discover new Linked Data URLs. Video player implemented to play a video file. The list of video resources is made available for annotations so domain specialist selects one of the video from this list and starts to annotate it. Domain specialist annotates the selected video by required information as: starting time of video content and duration in annotation, mood as audio or video and type as person, place, event or concept. The base panel gives access of semantic web services to the domain specialist for video resource annotation. The semantic web services are labeled as: Dewey, Library of Congress, suggestions and Geographic. These labels help to the domain specialist for choosing particular service to annotate the video resource.

Fig. 3 : Annomation

VI. Annobrowser

"AnnoBrowser" is produced to encourage the utilization of the instructive feature assets that are clarified by Annomation. The "Students" are the learners in the distance learning environment courses. Students are accountable for searching an educational video resource that is related to course learning topic (see Fig. 4).

A. Service Layer

In addition to the semantic web services that are implemented into "Annomation" process, some other non-semantic web service is utilized as a part of "AnnoBrowser". The non-semantic web service is YouTube data service which discovers the videos by means of a keyword-based search. This service provides list of video resources related to search by keywords. The domain specialists and students select one of the video from list for learning.

B. Application Layer

The "AnnoBrowser" functionalities are partitioned into three groups as: search videos by concept keyword, advanced search by geo-location and related tools, websites and help. The search videos by concept keyword divide the ideas into "Person," "Event," "Place," and "Concept". The advanced search supports searching videos pointing to locations on the map- Google Maps service is used. The related tools, websites and help supports for browsing and searching educational information to learn from web.

C. Semantic Data Mining and Reasoning Layer

There are four distinct sorts of mining and reasoning procedures as: syntax parsing, document analysis, geographic mapping, and annotation supposition.

1. Syntax Parsing

In this basic reasoning process syntax-based keywords are matched to a URI from the Linked Open Data Cloud.

2. Document Analysis

It is used to analyze a document that is utilized to guide the study topic. The analysis results are key learning points, knowledge, and concepts with their URI identifiers from the Linked Open Data Cloud.

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3. Geographic Mapping

The geographic mapping procedure utilizes the Google map API to give students a geographical image as well as to permit them for better understanding the learning subject.

4. Annotation supposition

The annotation supposition procedure utilizes the tree-structure points of interest of the ontology based semantic annotations. By utilizing the annotation thinking process, the seeking results are more precise and broadly covered.

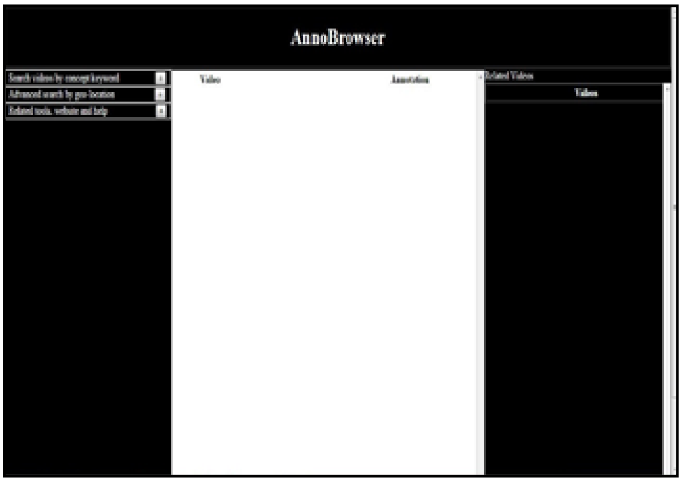

Fig. 4 : AnnoBrowser

VII. Results and Discussion

Expert Evaluation Group (EEG) is formed for analysis and evaluation of "Annomation". An EEG is formed of 15 members. Student Evaluation Group (SEG) is formed for evaluation of "AnnoBrowser". The SEG is formed of 25 members.

The Fig. 5 shows quality of interface design simplicity is found from the feedback as: 10 users say "Very good", 4 users say "Average Good" and only one user say "Fairly Good". The feedback tells that GUI design of Annomation is very simple to understand so, more than 90% of users are agreeing for quality.

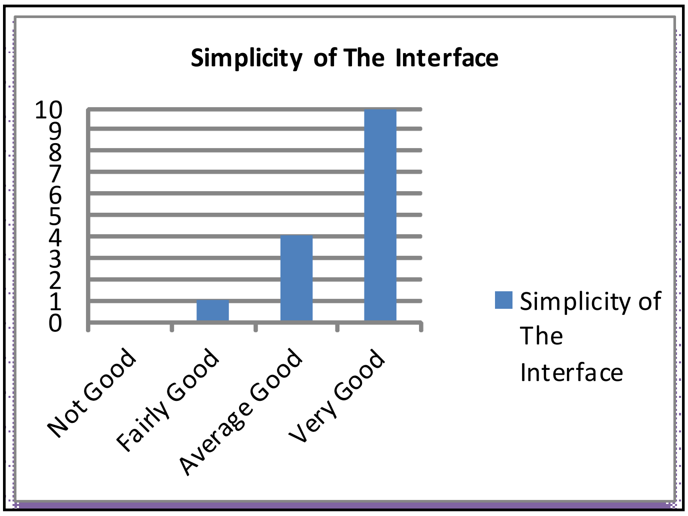

Fig. 5 : Simplicity of The Interface

The Fig. 6 shows usability of Annomation is found from the feedback as: 11 users say "Very good", 2 users say "Average Good", 1 user say "Fairly Good" and only one user say "Not Good". The feedback tells that context-aware video annotation by Annomation is very easy so, more than 85% of users are agreeing for usability.

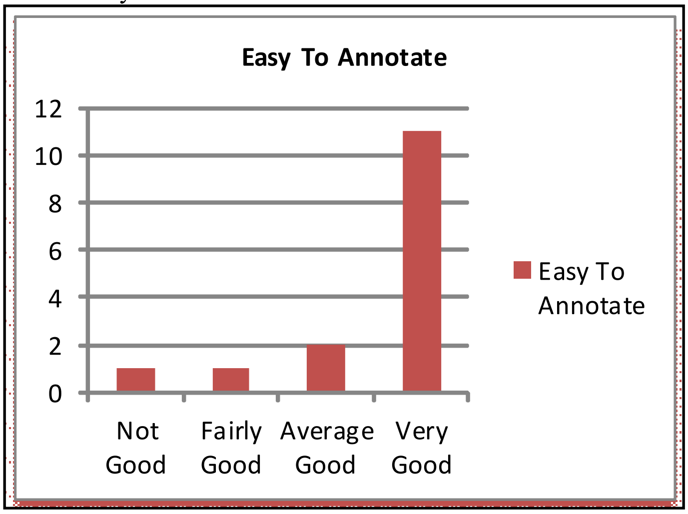

Fig. 6 : Easy To Annotate

The Fig. 7 shows "AnnoBrowser" functionalities that are useful to search videos for learning the topic are found as: 18 users are agree for Basic Search method, 6 users are agree for Advance Search method and 1 user is agree for Website Search method. More than 95% of users are agreed on useful functionalities in browser tool for learning topic search.

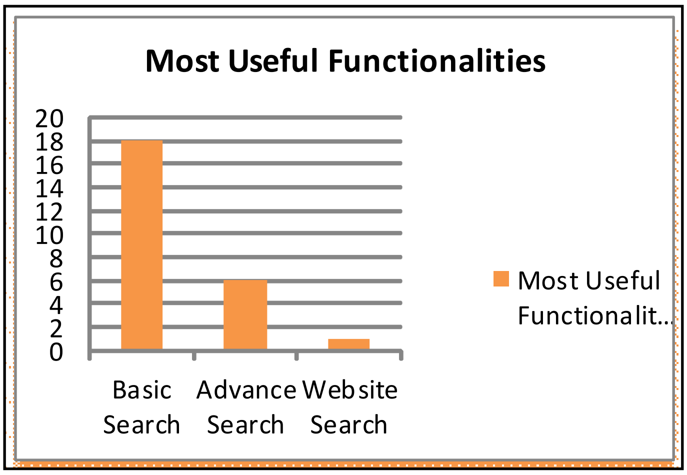

Fig. 7 : Most Useful Functionalities

The Fig.8 shows most useful data for study, which are found as: 20 users say Annotated Data is useful, 4 users say YouTube Data is useful and only 1 user say Website Data is useful. More than 95% of users are agreed on most useful data for study as annotated and related video resources. So, it is possible to the students to learn course-topics using these videos for their study in better way.

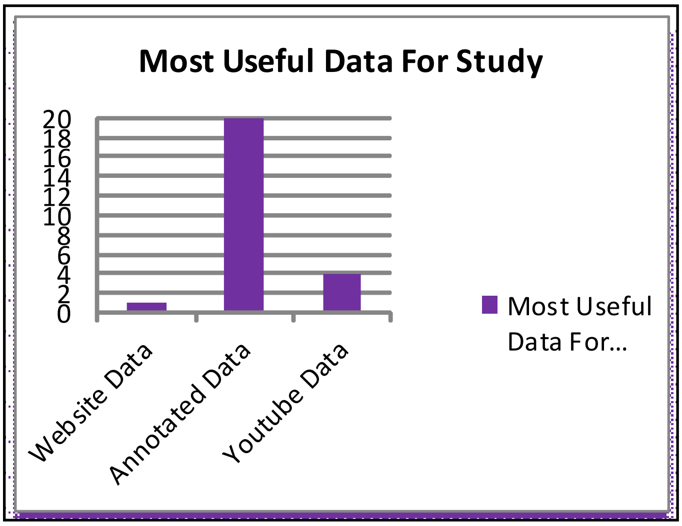

Fig. 8 : Most Useful data for study

VIII. Conclusion

In this paper, an approach is presented, built on Linked Data technologies to semantically annotate and search educational video resources. The approach consists of utilizing Linked Data and Non-linked Data services for context aware video annotation and searching annotated and related video resources. In annotation process, Linked Data and Non-linked Data services are used by system user for context aware video annotation. In searching process, user of the system can search videos which are related to their learning topics. The system presents "Annomation", a video annotation tool for the users to semantically annotate video resources and "AnnoBrowser", a browser platform for the users to search annotated and related video resources which can support distance learning. The system is evaluated by providing questionnaires to and feedback from system users. Results indicate that the proposed system can provide valuable help for distance learning.

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