LINDO
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Speeding access to distributed video and multimedia details

The ITEA 2 LINDO project has demonstrated an effective open system for indexing and retrieving specific objects in very large distributed multimedia archives with remote selection and processing. A few seconds of critical video can be retrieved from thousands of hours of recordings based on any type of criteria. The system offers an integrated solution optimised for video over Internet, implementation of a practical querying mechanism and standardised data formats. Applications include improved usability of video surveillance, knowledge management and government archiving.

There is a continually growing volume of multimedia data resulting from numerous activities – such as personal videos and websites, medical files, TV news, video surveillance and company archives. Until now, access to specific clips has required transfer of massive amounts of bandwidth-hungry data files from local storage to central facilities for processing.

LINDO addressed how to limit unnecessary transfer of video and multimedia information, especially when the intention is only to perform smart search activity on the contents. The problem that it was trying to solve is even more important now than when the project started as ever greater amounts of video and multimedia data is travelling over networks. Recent figures from telecommunications operators in Europe indicate such transfers now account for over 50% of their traffic and are forecast to grow to 75 or 80% in the near future.

The original idea for the project came some five or six years ago when two SMEs – Enertec and Hi-Stor Technologies – saw a real market need in the broadcast industry, at the time the main provider of video content. Visiting the NAB Show in the USA, they were surprised to see that video archiving was very crude. An informal brainstorming came up with the idea of distributing storage and intelligence – resulting in an ITEA 2 project.

There are two options for performing actions such as contents analysis or subject recognition on locally produced or stored video:

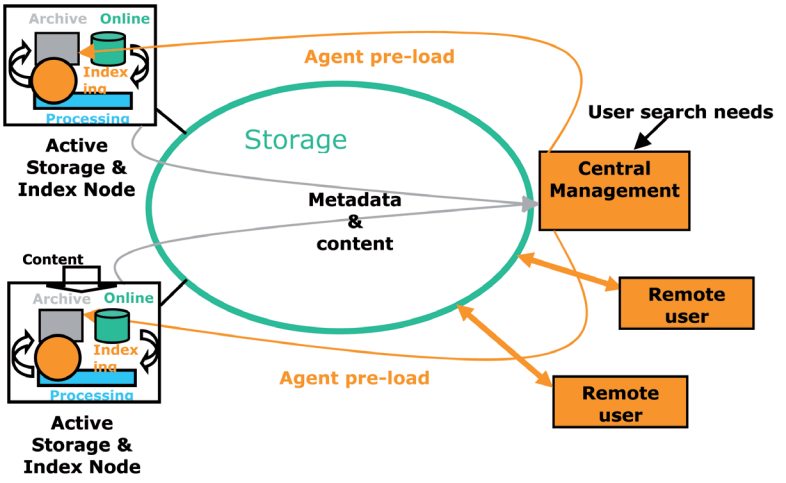
1. Send it to some central facility which has this processing capability; or
2. Send the analytical tool to the local node where the information resides and transfer back only relevant data – a huge benefit in terms of the quantity of information that has to be transferred and processing parallelisation.

It is the latter that LINDO set out to develop. As a result, a central processing facility is no longer required but rather the action involves activating processing capabilities at the local nodes or, if the right tools are not installed at all relevant local nodes, setting up tools as required to answer a query.

The principal objectives were to: optimise data flow by co-location of acquisition, storage and search functions, limiting data transfer to pertinent information with remote deletion of out-of-date archives; and improve archive exploitation through standardising indexation at the input, assisting in exploitation and quality control.

WELL-STRUCTURED ARCHITECTURE

The whole concept was quite new and involved development of the necessary architecture. This is designed in such a way that even in a single node it is possible to have processing tools that run under Linux and Windows simultaneously on the same content all managed by a single central facility.



For maximum flexibility, this required very strict and well structured interface specifications allowing the design of both generic and application-specific modules which in all cases are a really integral part of this concept. Use of split modules ensures proper communications to accommodate different types of worlds.

While smart indexing and clever algorithms were necessary, the object was not to make advances in these individual areas as such, but rather to use them to demonstrate the architecture. The innovation lies in the ability to master the interface between the modules – and, specifically when looking at video surveillance, agreement on a common data format.

NATIONAL AND GLOBAL STANDARDISATION

This latter work involved activities with the French AFNOR standards organisation, supported by French ministries. There are similar needs globally and this activity is now at ISO level with the LINDO co-ordinator also the convenor of ISO 223 WG5 – the interoperability standard for video surveillance which will probably be submitted in early 2011.

At a more modest level, there has been active support of this project in knowledge management for space application in Belgium. This involved Topics Maps (also an ISO standard) which provide a model and grammar for representing the structure of information resources used to define topics, and the relationships between topics.

LINDO implements topic maps in the querying process and as a representation of semantic metadata. Academic entities in Belgium, France and Spain were involved in developing semantic ways of querying information in a system.

NUMEROUS APPLICATIONS

Applications are ubiquitous and the ITEA 2 project looked at:

- The broadcast and multimedia industry which produces information in very high quality requiring huge bandwidths. However, most of the time it is only necessary to know whether something is available and where it is for transfer for example to DVD;
- All archival organisations – including government agencies and large companies; and
- Video surveillance with large IP-based systems involving hundreds of cameras that generally store information locally.

As an example of video surveillance, one city has equipped all its buses with multiple video cameras; their output is not broadcast in real time but stored on the vehicle. If a child was kidnapped and police want to see if the child has been on a bus, it would no longer be necessary to recall the buses, extract the videos and check them, but rather to send a search software agent to each bus with a photo and have a return saying seen or not seen. Crucial information can also be gathered from street cameras and by monitoring TV news.

This same principle can be applied to a growing number of industrial applications using video, such as flight tests or crash tests in the automotive industry, where only a few seconds of data are critical.

Obvious extensions include: dynamic medical imaging – again involving huge amounts of information – and searching on public websites. Imagine looking for something on YouTube or Dailymotion that is not indexed but the name of a person is for example in a closed caption with an image. The LINDO approach would make it possible to send an algorithm to the images and find the right information and, once it has been found, return the data. This requires very limited information and very limited bandwidth until the name is found.

COMMERCIAL IMPLEMENTATION IN PROGRESS

Commercial implementation has already started. The flexibility of the architecture has enabled each partner to implement the results at modular level. Typically Thales has already installed this architecture even if not in a full system. And it has another programme in view for government agencies to find videos in systems – a key interface makes it possible to use any commercial algorithm in a storage node.

Full turnkey systems will come with applications – such as the bus/kidnapped child scenario – being discussed with big operators. Some of the partners are already active worldwide – such as Infoglobal and Telefonica in Spain as well as Thales – and are really pushing this technology for their export markets.

MORE INFORMATION:

http://lindo-itea.eu