Grid Services to Support Media Production and Distribution







1. Overview of PRI SM. TJ Harmer Belfast e-Science Centre

2. Automated Metadata Mark Up Tanya Beech QinetiQ plc

The landscape...





PRISM



- A PRI SM infrastructure is a dynamic collection of services that interact to trade content and that belong to collections of organisations
- A PRI SM infrastructure is likely to be a hybrid with multiple organisational infrastructures and utility compute and storage.
- *PRI SM content moves in response to user demand, organisational requirements, organisational relationships, infrastructure requirements.*
- PRI SM content access requires organisation level and content level mechanisms.
- *PRI SM content is any digital media content that a content provider uses or a consumer requires.*

A Content Economy





Infrastructure ... Tested across the UK.



So...places to store content



- Lots of technologies for content storage
 - That's what big computer companies do...
- What is important is getting access to content
 - Having content transported to the point of use from the point of storage (whatever that storage is...)
 - Broker architecture where the right transport is selected for the content, the target, the security, network conditions, QoS required....
 - Being able to identify content uniquely
 - Cannot impose a solution
 - System uses a *namespace* and *an owner allocated identifier*.

How is content made available?



- The architecture assumes that each content owner publishes content availability?
 - Establishes that content is available outside of the organisation.
 - An organisational publication services
 - Defines who, what, why, how, cost for the access.
 - How it should be transported, replicated, shared
- Defines organisational control of content but provides a means that defines when it is available to others.

How is the Content Economy controlled?





Who makes the decisions?



- In a pervasive infrastructure most decisions must be made without human intervention
- Policies take the place of human decision making.
 - Who has access.
 - When they have access
 - How the access is effected
 - What DRM is used
 - What transport is employed
 - Where are things stored?
 - How many versions....

Many other...

Content architecture...





PRISM Video Tagging Techniques

Tanya Beech A presentation to: European Broadcasting Union Networks 2007 To IP and Beyond

Date 18th June 07





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01 Present Day Status





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01 Present Day Status

- Imagery repositories are continually growing and becoming increasing unmanageable
- This is true of the broadcast, security, military and police markets
- At present archive, search and retrieval based on content, is a wholly manual process thus time consuming, labour intensive and very costly



02 Why Tag Video?





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02 Why Tag Video?

- It is highly labour and time intensive to manage large volumes of untagged video
- The volume of video is ever increasing
 - The BBC creates 10 hours of TV content for every hour in the day
 - The 8 public service TV channels transmit approximately 1 Petabyte (10¹⁵) of data per year
 - The BBC typically shoot 20 to 30 times the transmission volume
- The migration from analogue to digital
- The increasing need for data needs to be managed effectively
 - Archived, Retrieved, Distributed, Re-used
- The requirement for increased knowledge of content



03 Examples of Tagging Information





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03 Examples of Tagging Information

Video Level Information

- Black and white
- Building
- Documentary
- Ground to Air
- Helicopter shots
- Date of film
- Film Maker



03 Further Examples of Tagging Information

- Tag a shot/scene
 - Ford selling off Jaguar/Land Rover
- Tag individual frames
 - George Clooney Image
- Tag clusters
 - Similar Frames all frames containing Bill Murray









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03 Tagging Examples

Example Search Criteria

- Search Title, Description, Keywords, GPS
- For Water, Car, David Beckham
- Genre Educational, Documentary, Historical, News
- DurationLess than 1 minute, 1 to 2 mins, 2 to 5 mins
- Format MPEG-1, MPEG-2
- Colour Colour, B&W, Either



04 How to add Tags to Video





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04 How to add Tags to Video

Two methods

- Both based on initial analysis of the video
 - To create 'keyframes'
 - To extract information
- Semi Automatic
- Manual Entry





04 How to add Tags to Video

Semi Automatic Creation Image Extraction

- Given an object... will find when the object appears again
- Can find objects even when partially obscured
- For each image key points are found (corners, edges, colour changes). There can be an unlimited number of descriptors, typically on a 576*720 frame 2000 key points will be found. Each key point is represented by a 128 vector
- Descriptors are invariant to invariant to image scale, rotation, and partially invariant to changing viewpoints, and change in illumination



04 How to add Tags to Video

Semi Automatic Creation Image Extraction Results







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04 How to add Tags to Video

Semi Automatic Creation Image Extraction Demo





04 How to add Tags to Video

Manual Entry Tagging Creation

- Ability to add Geographic location data to keyframes
- Keyframe views on the Tracks on Map Centric user interface
- Can add metadata at:
 - Video level
 - Keyframe level
 - Regional level
- Playback of video



04 How to add Tags to Video

Manual Entry Tagging Creation Demo





05 Use of Grid





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05 Use of Grid

- To create keyframes from the video ٠
- To calculate SIFT descriptors •
- To search for results ٠
- In-order to process activities faster •

Frame Number



06 Benefits of Tagging





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06 Benefits of Tagging

- Helps user understand data:
 - provides consistency in terminology
 - focuses on key elements of data
 - helps user determine the data's fitness for use
 - facilitates data transfer and interpretation by new users
- Protects investment in data:
 - mitigates effect of time including staff turnover and individual memory loss
 - sets the stage for data re-use
 - provides documentation of data sources and quality



06 Benefits of Tagging Continued

- Enables discovery
 - provides information to data catalogs
 - provides flexibility in searching to support interdisciplinary usage
 - Precise searches to location in video
 - Search by image capabilities
- Enables new revenue streams
 - Reduced labour costs
 - Time reductions for retrieval



07 Next Steps





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07 Next Steps

Video Clustering Tools

VCT allows people to browse a set of video files by finding those video sequences that "match" each other.



07 Next Steps

Video Clustering Tools

- Self-organising map (SOM)
 - Humans simply cannot visualize high dimensional data
 - Reduces the dimension of the input data
 - Clusters similar data together and displays just 1 key frame from each cluster



07 Next Steps

Video Clustering Tools

• Self-organising map (SOM)





07 Next Steps

Video Clustering Tools

- Sammon's Diagram
 - Provides a 2-D visual mapping of keyframes based on the colour within the keyframes
 - Enables human view of all keyframes
 - Mark-up generation assistance



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07 Next Steps

Video Clustering Tools

Sammon's Diagram





08 Summary





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08 Summary

The tagging of video for identifying like content will allow:

- Existing and new archives to be simply opened up to a wider audience, creating possibilities for many new revenue streams
- Provide easier retrieval of critical data to significantly reduce manpower costs and improve search timeliness
- Improve search accuracy allowing collected data to be used more effectively.







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