MUSCLE Network of Excellence
Multimedia Understanding through Semantics, Computation and Learning

Overview and Outcome

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Final Muscle Scientific Conference

Cannes

11 – 12 February 2008

Multimedia Understanding through Semantics, Computation and Learning

- **Strategic Objective:** Semantic-based Knowledge Systems (E2)

- **Consortium:** Partnership of 42 research labs and institutes

- **Duration:** March 2004 – Feb 2008

- **Budget:** 6.9 MEuro

- **Goal:** Efficient data mining of MMDB based on machine learning and multimedia understanding;

- **Approach:**

  - Improving effectiveness and robustness of **single** and **cross-modal** processing (speech, text, audio, video)

  - Harnessing **machine learning** to (semi) automate extraction manipulation and understanding of semantic metadata

Scientific WPs JPA1 and JPA2

Main activities: SOA, Scientific meetings, Fellowships,

- WP1A, 1B, 2: Coordination admin. & scientific, Virtual Lab

- WP3: Benchmarking

- WP4: Dissemination (Poster, flyer)

- WP 5: Content Based Description

- WP 6: Cross-Modal Integration

- WP 7: Computation Intensive Methods

- WP 8: Machine Learning for Multimedia Content

- WP 9: Representation and Communication of Data

- WP 10: HCI for Multimedia Retrieval

- WP 11: Integration Projects: Grand Challenges

JPA2: Integration Activities

Year 1 and Year2:

- **Fellowships**: 10 Internal Fellowships Program, selected through internal Calls for proposal & Internal evaluations.

  - Fellow is to spend two 9 months periods in two different MUSCLE partner institutes and working a a joint research agenda.

Year2

- **Launching of e-Teams activity** : virtual labs of teams working remotely

  - Grant for Mobility of researchers: for joint research leading to joint publications

Integration Activities - JPA3

- We reached last period of Muscle Lifetime!

- After more than 2 years research activities **=>** Need for different way of organisation toward more integration and more scientific dissemination of Muscle partners results

=> WPs reorganisation and new integration instruments

JPA3 New WPs Structuring

- **Fusion:**
  - WP 3 & 9 => new WP2; WP 6 & 10 => new WP6; WP 7 & 8 => new WP5

- **Split:**
  - WP5 in 2 WPs (visual and non-visual content: audio, speech and text) => new WP3, new WP4

- **Evolution of activity:**
  - WP11: Grand Challenges; WP4: Dissemination are now Showcasing and Dissemination => new WP7

- Vanishing of WP2 => webmaster recruitment by Ercim

JPA3/JPA4 WPs

- **WP1:** Coordination admin & scientific *(Patricia, Nozha)*

- **WP2:** Evaluation, Integration and Standards *(Allan, Emanuele)*

- **WP 3:** Visual Content Indexing *(Nicu)*

- **WP 4:** Content Description for Audio, Speech and Text *(Andi, Khalid, Gregory)*

- **WP 5:** Multimodal Processing and Interaction *(Petros, Alex)*

- **WP 6:** Machine Learning and Computation Applied to Multimedia Description *(Padraig, Simon)*

- **WP 7:** Showcases and Dissemination towards Industry *(Enis, Andi)*

Muscle JPA4 Objectives

2 main objectives for JPA4; consolidate our efforts in:

- Integration: Showcases (Software) and e-Teams (research)

  => Our WPs _deliverables_ are mainly focused on these achievements

  => No mobility grant outside these activities,

- Dissemination

  - Target Professional Exhibitions

  - Production of Showcase Videos (to run on Muscle web page, …)

  - Web portal: Disseminate Muscle achievements (software, data collections…), Collect all information with high impact for general public: press releases,

  - Brochure: Muscle activities, showcases and know-how

=> Address the sustainability issues

JPA4: Integration Activities

13 e-Teams: 15ke grant (20ke JPA3)

- Mobility of researchers: longer visits of students, joint workshops, joint publications …

- Total budget: 183 ke

- Strong JPA4 scientific production:

- 135 papers with 30% joint (660 overall)

- 2 books:

  - Book on Machine Learning Techniques for Multimedia Publication date: 27 February 2008 - Springer (WP6)

  - Book on Multimodal processing and interaction - Springer (to be published) (WP5)

e-Teams JPA4 List (15 =>13)

- **ET1**: Integration of structural and semantic models for multimedia metadata management

- **ET2**: Visual saliency

- **ET3**: Person detection and recognition, tracking and analysis

- **ET4**: Shape modeling

- **ET5**: Choosing Features for CBIR and Automated image annotation

- **ET6**: Dynamic Texture Analysis and Detection in Video **=> Showcase**

- **ET6**: Statistical analysis of visual processes

- **ET7**: Semantic from Audio and Genre Classification for Music
- **ET7**: Semantic from audio: features, perception and synthesis   **=> Semantic from audio**

- **ET8**: Audio-Visual Speech Analysis & Recognition

- **ET9**: Multimodal Processing and Multimedia Understanding

- **ET10**: Multimodal Interfaces

- **ET11**: Dynamic Kernels

- **ET12**: Active and Semi-Supervised Learning

- **ET13**: Unsupervised image segmentation

JPA4: Integration Activities

11 Showcases: ~ 25 ke grant (50 ke JPA3)

- Finalization of currently running showcases, software integration between teams working on "highly visible" results

- Joint demonstrators during professional exhibitions and on-line videos (Sample: Video Copy Retrieval)

=> Target audience: professional users, industry, large public

Total budget: 284 ke

Showcases – JPA4 List (12 =>11)

1- Articulatory talking head driven by automatic speech recognition,

2- Real-Time Audio-Visual Automatic Speech Recognition Demonstrator,

3- Augmented assembly using a multimodal interface,

4- Dynamic Texture Detection in Video,

5- Movie Summarization and Skimming Demonstrator

6- Real-Time Detector For Unusual Behavior,

7- Content-Based Copy Detection,

8- ACADI: Automatic Character (in Audiovisual Document) Indexing,

9- CASEWP : Content analysis and Segmentation Evaluation Web Portal,

9- Image retrieval Evaluation showcase,   => Evaluation showcase

10- Object recognition showcase,

11- Beyond: The virtual Muscle Experience,

Beyond MUSCLE Showcase (WP4)

- ## MUSCLE island in SecondLife presenting

  – Partners

  – Showcases

  – eTeams

Dissemination Achievements

Scientific Events:

- 4 special issues in Journals, (Co) Chairing Workshops/Conferences, Several special sessions,

- Final Muscle Conference – open participation to scientific community at large: presentation of Muscle results (showcases & e-teams)

Professional Exhibitions (WP7):

- IBC September 07 in Amsterdam, joint stand with 2 other EU projects hosted by NEM (3DTV, MUSCLE, …)

- CEBIT-Hannover, CEBIT-Istanbul

- INTERSEC (Jan 2008)

Muscle Brochure

Dissemination Achievements

- ACM International Conference on Image and Video Retrieval, 9-11 July 2007

- 8th International Conference on Music Information Retrieval, 23-27 September 2007

- 9th ACM SIGMM International Workshop on Multimedia Information Retrieval, 28-29 September 2007 in conjunction with ACM Multimedia 2007

- 5th International Symposium on Image and Signal Processing and Analysis, 27-29 September 2007

- International Workshop on the Many Faces of Multimedia Semantics, 28 September 2007 in conjunction with ACM Multimedia 2007

- International workshop on Multimedia Signal Processing, 1-3 October 2007

- International workshop on Human Computer Interaction in conjunction with ICCV, 20 October 2007

- International conference on Mass-Data Analysis of Images and Signals 2007

- International Workshop on Visual and Multimedia Digital Libraries- joint DELOS-MUSCLE workshop, 13, 14 September 2007

- Workshop on Adaptive Multimedia Retrieval, 5-6 July 2007

- CIS Coin competition 2007, …

- Several tutorials, …

Dissemination Achievements (Benchmark WP2)

- Third MUSCLE / ImageCLEF Workshop on Image and Video Retrieval Evaluation

- Launch of a Special Issue of *Computer Vision and Image Understanding (CVIU)* on the **Evaluation of Image and Video Retrieval** (to appear mid-2009)

Thijs Westerveld, INEX Multimedia organiser
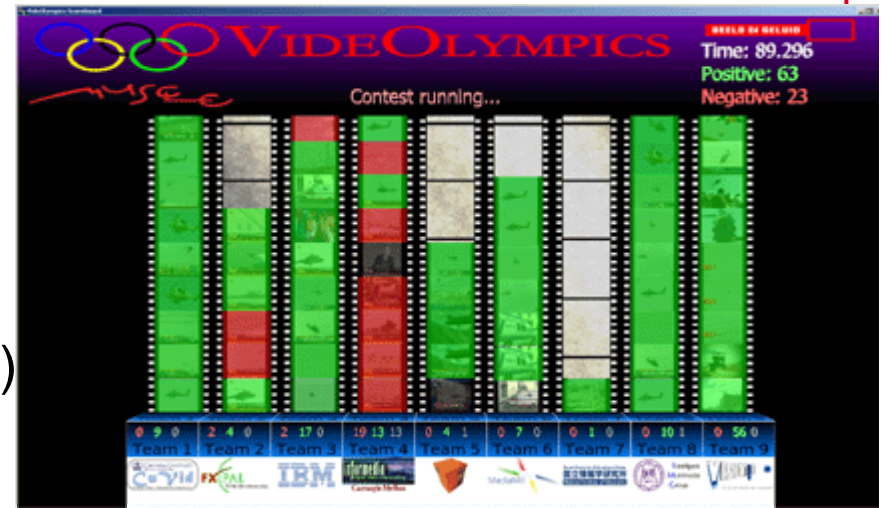

Marcel Worring, IAPR-TC12 co-chair

Dissemination Achievements
Benchmark WP2

- Evaluation Showcase events (CIVR'07)

  - VideOlympics

  - Image Retrieval event

  - Video Copy Detection event

    => New TrecVid Task (2008)

- Organisation

  - Part of the ImageCLEF 2007 evaluation campaign

  - CIS 2007 Competition

  - Contributed to organisation of the ImagEVAL evaluation campaign

Sustainability Structure and Plans

- The current WG on Image and Video Understanding: topic will be broaden to handle MUSCLE subjects including all multimedia content issues. Hence the title of the working group will become: ERCIM-MUSCLE working group

  - ERCIM support financially the WG Chair up to €15,000

  - ERCIM will give access to its internal fellowship programme

- Web Maintenance: Portal for spreading Muscle Know-How and achievements in the area of Multimedia understanding including :

  - Publication database,

  - Tests and benchmarking database,

  - Software list/repository (different status: open, web-services, proprietary)

  - Form to coordinate industry/users contacts for the uptake of Muscle results

- The **Virtual MUSCLE experience** is maintained online in 2008. After 2008, ERCIM-MUSCLE working group will take charge of the « Virtual Muscle » environment.

Information Society
Technologies

● Software Resources

Below is a list of software that has been developed with the MUSCLE project. It is sorted by type of software and by whether it is proprietary or available under a GNU or similar license. For proprietary software, please contact the person listed on the linked webpage about the terms of obtaining and using the software.

Video and Image

Software available under a GNU or similar license

- RAVL: Recognition and Vision Library - on SourceForge, Terms of Use (CVSSP, Univ of Surrey)
- 2D Motion Estimation (IRISA)
- Real-time Human Frontal Face Detection in Video -Terms of Use (Bilkent University)
- Offline Eye Localization -Terms of Use (Bilkent University, UPC)
- Character Location Identification in Images -Terms of Use (Bilkent University)

Webservice

- Prague Texture Segmentation Data Generator and Benchmark (Institute of Information Theory and Automation, Prague)

Proprietary software

- Fire and Smoke Detection Software - Terms of Use (Bilkent University)
- BilVideo - a video database management system (Bilkent University)
- eMotion - Emotion Recognition Software (University of Amsterdam)
- BTF Compression and Synthesis Toolbox (Institute of Information Theory and Automation, Prague)
- Roller - fast sampling-based texture synthesis algorithm (Institute of Information Theory and Automation, Prague)
- Fast Synthesis of Dynamic Colour Textures (Institute of Information Theory and Automation, Prague)
- Image Copy Retrieval System and Video Copy Viewer (INRIA IMEDIA)

Music

See this page for some MUSCLE research software.

Software available under a GNU or similar license

- RP_extract Music Feature Extractor (TU Vienna - IFS)
- GenChords - Automatic Chord Detection (TU Vienna - IFS)
- Music Audio Segmentation Tool (TU Vienna - IFS)
- Bayesian Extensions to Non-negative Matrix Factorisation for Audio Signal Modelling (University of Cambridge)
- Multi-Object Tracking of Sinusoidal Components in Audio (University of Cambridge)
- Sound description Toolbox (Aristotle University of Thessaloniki)

Webservice

- Audio Feature Extraction Web Service (TU Vienna - IFS)

Proprietary software

- Aria - dynamics enhancement (CNR-ISTI)
- WinSnoori Speech Analysis Software (INRIA-Parole)

Text

Showcase sessions

- *Thursday Morning session*:

  - Real-Time Audio-Visual Automatic Speech Recognition Demonstrator (Alex)

  - Augmented assembly using a multimodal interface (Sanni)

  - Articulatory talking head driven by automatic speech recognition (Petros)

  - Dynamic Texture Detection in Video (Enis)

  - Evaluation showcase (Nicu)

- *Thursday Afternoon session*:

  - Movie Summarization and Skimming Demonstrator (Petros)

  - BEYOND: the Virtual MUSCLE Experience (Andreas)

  - Object recognition (Allan)

  - Content-Based Copy Detection (Nozha)

  - Real-Time Detector For Unusual Behaviour (Enis)

  - ACADI: Automatic Character (in Audiovisual Document) Indexing