# Semantic-Based Workflow Composition for Video Processing in the Grid

Gayathri Nadarajan,
Yun-Heh Chen-Burger, James Malone

Artificial Intelligence Applications Institute (AIAI)
Centre for Intelligent Systems and their Applications
School of Informatics
University of Edinburgh

# Introduction – Ecological Motivation

- Collaboration between National Centre for High-Performance Computing (NCHC), Taiwan and AIAI, Edinburgh on workflow enactment for EcoGrid.
- Problem:
  - Valuable and continuous real-time data collected over 3 years, unanalysed.
  - Manual processing is time-consuming.

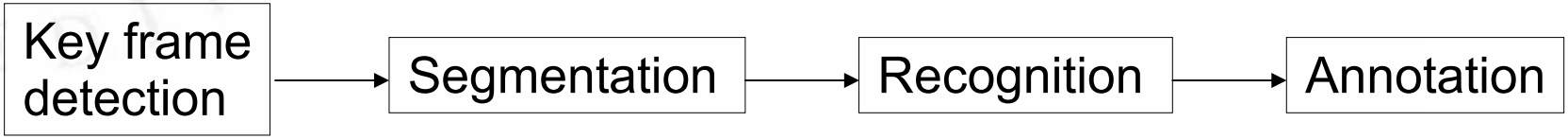
  1 minute's clip will take 15 minutes to analyse, thus 1 year's recording will cost human experts 15 years' effort x 3 under water cameras = 45 years.
- Impractical situation and more appropriate automation methods must be deployed.
- Semi-automated and automated way to speed up this process.

# The Semantic Grid

- The Grid is aimed at enabling resource sharing and coordinated problem-solving between computers and people in a distributed and heterogeneous manner.
- The Semantic Grid is an extension of current Grid whereby information and services are given well-defined and explicitly represented meaning.
- Requires means for composing and executing complex workflows.
- Improvement of Grid workflow systems with the incorporation of semantic capabilities.

# Requirements

- Video Annotation example:

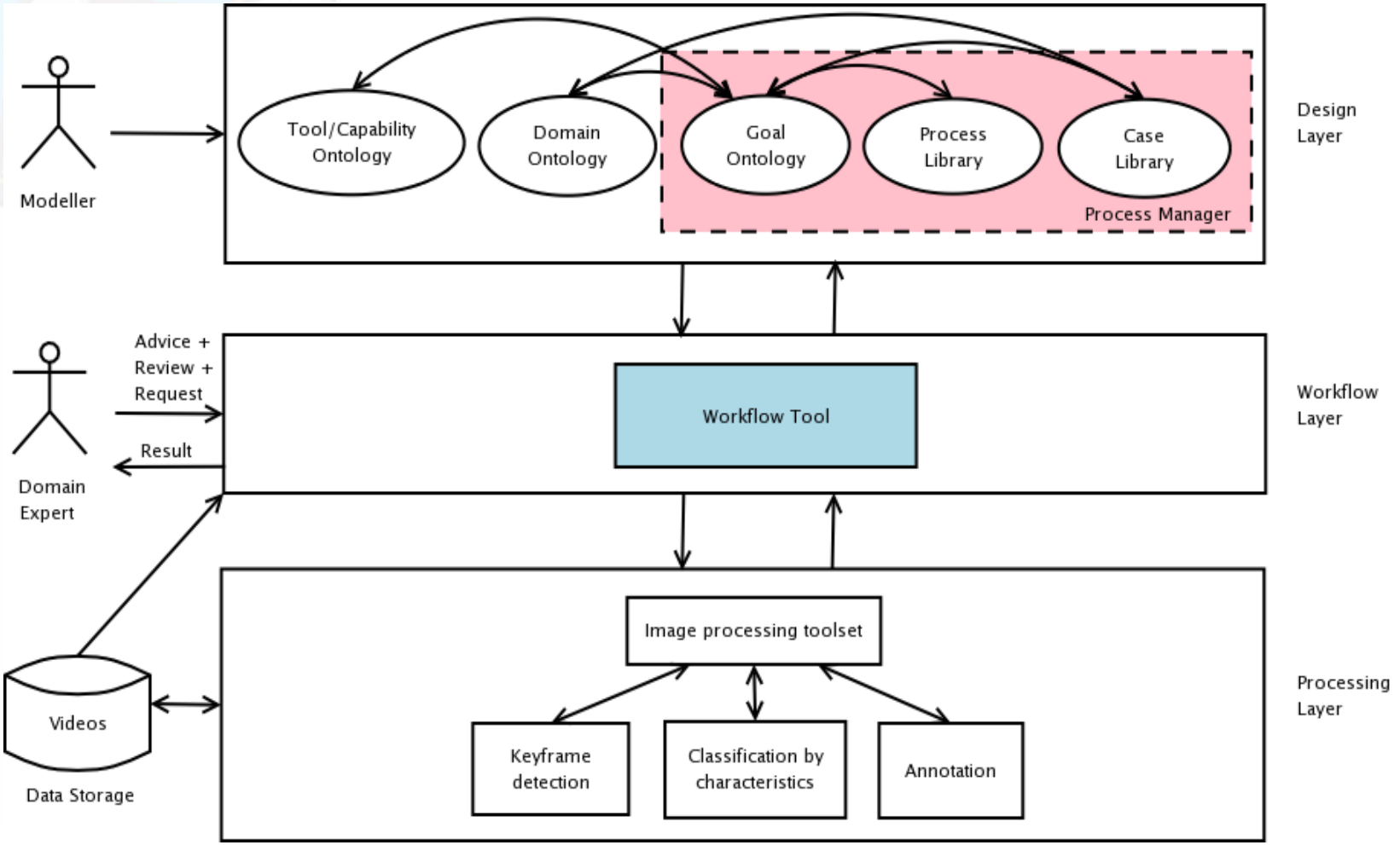



- Performance-Based Selection.
- Iterative Processing.
- Adaptive, Flexible and Generic Architecture.
- Semantic-Based Compatibility.

# Related Work

- Existing Grid workflow systems:
  - Pegasus
  - Triana
  - Taverna
  - Kepler
- Limitations of current solutions

# Proposed Framework – Hybrid Method



# Proposed Framework – Design Layer

- Process Manager is responsible for composing sequence of processes to be executed based on available tools.
  - Planning component
  - CBR component
- Ontologies give meaning to process and keep goals separate from capabilities.
  - Goal
  - Domain
  - Tool/Capability

# Proposed Framework – Workflow Layer

- Main interface between design and processing layers.
- Workflow enactor acts as interpreter of events that occur within system.
- Scenario.

# Proposed Framework – Processing Layer

- Consists of a set of image and video processing tools.
- Functions of tools represented in capability ontology in Design Layer.
- Once a workflow has been established, tools may work directly on videos.
- Depending on quality of video and task at hand, each tool will work on varying level of accuracy.
- Feedback from domain expert would be useful.
- Use of ML techniques to assist with performance measure predictions for image and video processing tools.

# Discussion

- Work in progress
  - Understand image processing tools available.
  - How to utilise workflow technology to best use image processing tools in accordance with the requirements for the EcoGrid problem domain.

- Implementation issues
  - develop a video processing layer on top of an existing Grid workflow system.
  - deploy a workflow enactor on existing process modelling tool.

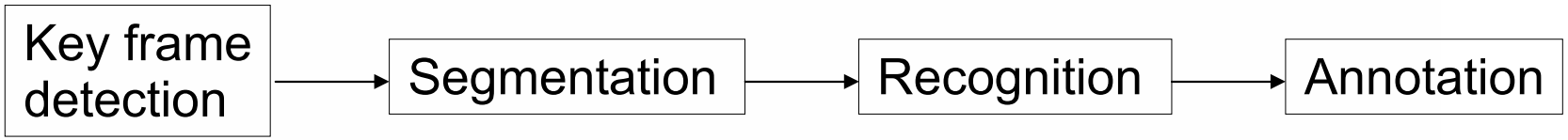
# Tools

- Open Computer Vision Library (OpenCV)

  - Library of programming functions mainly aimed at real time computer vision.

  - Applications include Object Identification, Segmentation and Recognition, Motion Tracking.

- Process model for annotation




- Other tools?


# End of Slides
# Thank you!

Contact: Gaya Nadarajan

G.Nadarajan@sms.ed.ac.uk

# References


- EcoGrid, National Centre for High Performance, Taiwan, 2006. http://ecogrid.nchc.org.tw/
- Workflow enactment in the EcoGrid, AIAI, University of Edinburgh, 2006. http://www.aiai.ed.ac.uk/~jessicac/project/NCHC
- Y-H Chen-Burger, F-P Lin. “A Semantic Based Workflow Choreography for Integrated Sensing and Processing”. In *Procs. CNNA* 2005.
- D. D. O’Roure, N. R. Jennings, N. R. Shaldbolt. “The Semantic Grid: Past, Present and Future”. In *Procs. the IEEE Vol. 93, Issue 3,* 2005.
- J. Yu, R. Buyya. “A Taxonomy of Workflow Systems for Grid Computing”. *Journal of Grid Computing,* 2006.
- OpenCV. http://sourceforge.net/projects/opencvlibrary