

Computer-based Analysis and Visualization of Collaborative Learning Activities (CAViCoLA)

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CAViCoLA ERT



Cavicola ERT composition

■ ERT Leader

- Andreas Harrer, University Duisburg-Essen - DE

■ Steering committee

- Andreas Harrer, University Duisburg-Essen - DE
- Nikolaos Avouris, University Patras - GR
- Yannis Dimitriadis/Alejandra Martinez, University Valladolid - E
- Nikol Rummel/Hans Spada, University Freiburg- DE

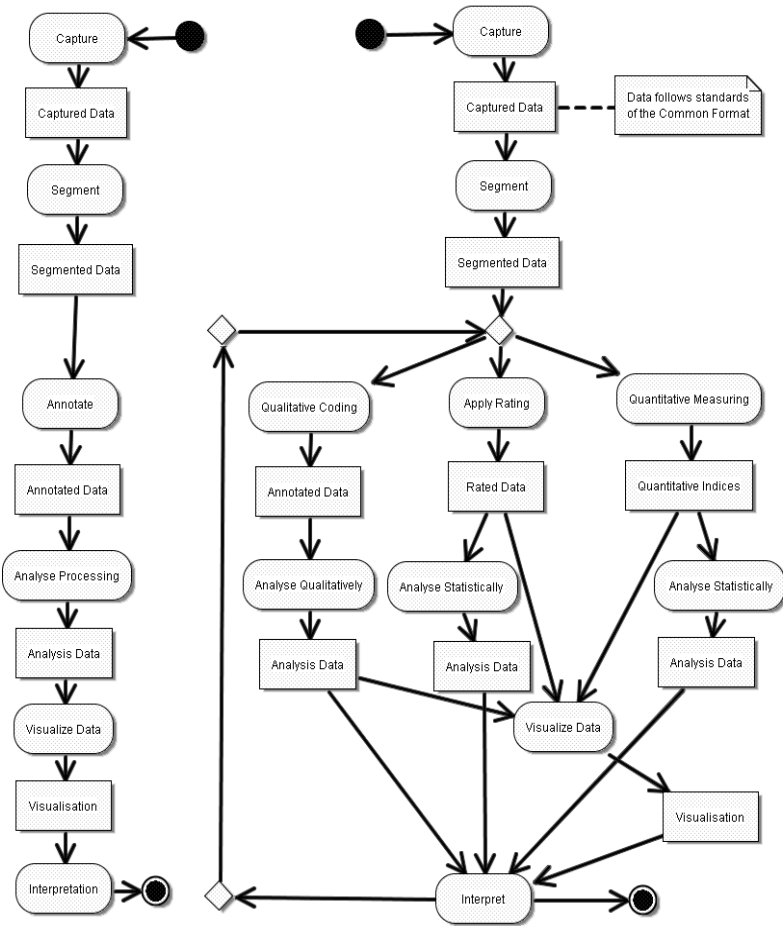
■ Consortium

- *University Duisburg-Essen - DE*
- *University Patras - GR*
- *University Valladolid - E*
- *University Freiburg - DE*

Background and objectives

- Reinforce existing strong bonds to previous and current projects (JEIRP) within Kaleidoscope
 - E.g. Duisburg and Valladolid teams participated in IA, ICALTS (and CCI-IA)
- Establish and consolidate existing common and complementary work among ERT teams
- Create and disseminate knowledge within the Kaleidoscope and TEL communities
 - Proposal of a new integrated process model for IA
 - Setup of new single-site and cross-site case studies
 - Creation of visualization techniques and tools
 - Cross analysis of IA data using coding schemes, common data format and tools

CAViCoLa process model



Cross-site studies (Freiburg-Patras I)

- **Adaptation of rating scheme**
 - rating tool originally developed by Freiburg team (Meier, Rummel, & Spada, 2007) successfully adapted to fit the data from the Patras team's studies with Synergo (Avouris, Margaritis, Komis, 2004)
 - result: new rating handbook, illustrated with examples from Patras case studies; collaboration quality assessed on six dimensions
- **Joint experiment**
 - goal: use rating tool as the basis for giving adaptive feedback to students with the help of a feedback scheme
 - adaptive feedback implemented in students' regular courses, in the framework of a joint experiment (currently run in Patras)

Algorithm building activity using Synergo

The screenshot displays the Synergo software interface. The main workspace contains a flowchart with several nodes and decision diamonds. Annotations in Greek are present, such as "Από το αρχικό σημείο (0) αρχίζουμε να κινούμαστε προς τα δεξιά" and "Επιλέγουμε την κίνηση που μας οδηγεί στην κατάσταση που θέλουμε". A chat dialog on the right side shows a conversation in Greek, including the text "Από το αρχικό σημείο (0) αρχίζουμε να κινούμαστε προς τα δεξιά" and "Επιλέγουμε την κίνηση που μας οδηγεί στην κατάσταση που θέλουμε". The bottom status bar shows the action "Change Concept Entity test" and attributes "Decision (71), min = max, $\forall A[position] = K$ ".

Cross-site studies (Freiburg-Patras II)

- application of ActivityLens (Avouris et al., 2007) to analyze data from Algebra project (Diziol et al., 2007)
 - development of a rating scheme that evaluates students' collaboration in mathematics from two different perspectives
 - restructuring of activities' dataset and modifications to ActivityLens tool enabling the integration of the rating scheme
- outcome
 - ActivityLens was successfully adapted to be used for interaction analyses based on a rating scheme
 - as the interaction analysis of 10 dyads shows, the developed rating scheme reliably assesses students' interaction

Screenshot of analysis with ActivityLens

The screenshot displays the ActivityLens application window titled "ActivityLens - aristotle_ab_1" with the user "Algebra". The interface includes a menu bar (File, View, Print, Help) and a toolbar with icons for New, Open, Save, Print, Export, Views, Tasks, Close, and Exit. The main workspace is divided into three vertical panels: Level1, Level2, and Level3.

Level1 Table:

A...	Relative T...	Actor	Action
<input type="checkbox"/>	00:00:00		START
<input type="checkbox"/>	00:01:33		R1C2
<input type="checkbox"/>	00:01:46		R2C2
<input type="checkbox"/>	00:01:55		R2C2
<input type="checkbox"/>	00:01:58	TUT...	R3C2
<input type="checkbox"/>	00:02:28		R1C3
<input type="checkbox"/>	00:02:34		R2C3
<input type="checkbox"/>	00:02:36	TUT...	R3C3
<input type="checkbox"/>	00:02:59		R1C1
<input type="checkbox"/>	00:03:03		R3C1
<input type="checkbox"/>	00:03:55		R3C2
<input type="checkbox"/>	00:04:43		R3C3
<input type="checkbox"/>	00:05:29		R3C3
<input type="checkbox"/>	00:05:29	TUT...	R3C3
<input type="checkbox"/>	00:05:39	TUT...	GeneralHelpGoalNode
<input type="checkbox"/>	00:05:57		R3C3
<input type="checkbox"/>	00:06:12		R4C2
<input type="checkbox"/>	00:06:19		R4C3
<input type="checkbox"/>	00:06:32		R4C1
<input type="checkbox"/>	00:06:50		R5C1
<input type="checkbox"/>	00:07:11		R7C3
<input type="checkbox"/>	00:07:52		ValidEquations
<input type="checkbox"/>	00:07:53		ValidEquations
<input type="checkbox"/>	00:08:06		500+0.35M = 1342.5
<input type="checkbox"/>	00:08:20		0.35M = 842.5
<input type="checkbox"/>	00:08:25		R7C1
<input type="checkbox"/>	00:08:31	TUT...	R7C2
<input type="checkbox"/>	00:08:45		R7C1
<input type="checkbox"/>	00:09:02	TUT...	GeneralHelpGoalNode
<input type="checkbox"/>	00:09:26	TUT...	GeneralHelpGoalNode
<input type="checkbox"/>	00:09:34		ValidEquations
<input type="checkbox"/>	00:10:12	TUT...	ValidEquations
<input type="checkbox"/>	00:10:27		500+0.35M = 1342.5
<input type="checkbox"/>	00:10:38		0.35M = 842.5
<input type="checkbox"/>	00:10:55		R7C1
<input type="checkbox"/>	00:11:05		R7C2
<input type="checkbox"/>	00:11:12	TUT...	R7C1
<input type="checkbox"/>	00:11:16	TUT...	GeneralHelpGoalNode
<input type="checkbox"/>	00:11:24	TUT...	GeneralHelpGoalNode
<input type="checkbox"/>	00:11:47		ValidEquations
<input type="checkbox"/>	00:11:48		ValidEquations
<input type="checkbox"/>	00:11:55		2.5M = 1342.5
<input type="checkbox"/>	00:12:01		R7C1
<input type="checkbox"/>	00:12:16		XLabel
<input type="checkbox"/>	00:12:28	TUT...	YLabel
<input type="checkbox"/>	00:12:41		YLabel
<input type="checkbox"/>	00:13:26		yMin
<input type="checkbox"/>	00:13:40		yMax
<input type="checkbox"/>	00:13:50		yMax

Level2 Table:

Entry Name	Entry Typology	Actor	Tool
preparation	none		
expression_mu	mathematical un...		2
expression_sor	capitalization so...		3
expression_syr	capitalization sy...		3
expression_ds	dyad's strategy		4
simplequestions	none		
intersection_mu	mathematical un...		
intersection_sor	capitalization so...		
intersection_syr	capitalization sy...		
intersection_ds	dyad's strategy		
graph	none		

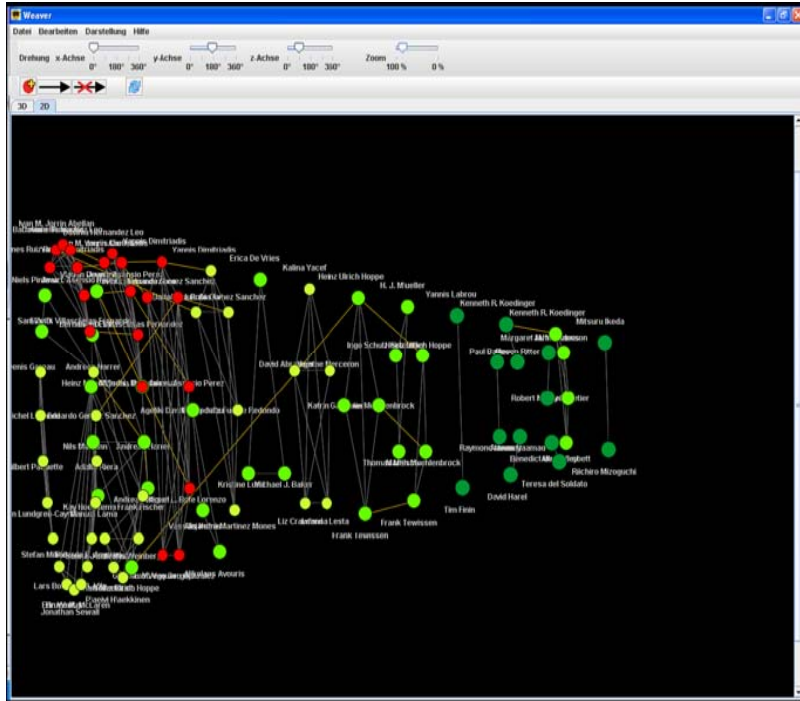
Level3 Table:

Entry Name	Entry Typology	Acto
preparation_cf	communication flow	
preparation_me	mathematical elaboration	
preparation_eh	elaborating on hint	
preparation_dm	dyad's motivation	
simplequestion...	communication flow	
simplequestion...	mathematical elaboration	
simplequestion...	elaborating on hint	
simplequestion...	dyad's motivation	
intersection_cf	communication flow	
intersection_me	mathematical elaboration	
intersection_eh	elaborating on hint	
intersection_dm	dyad's motivation	
graph_cf	communication flow	
graph_me	mathematical elaboration	
graph_eh	elaborating on hint	
graph_dm	dyad's motivation	

Callouts in the image point to specific features:

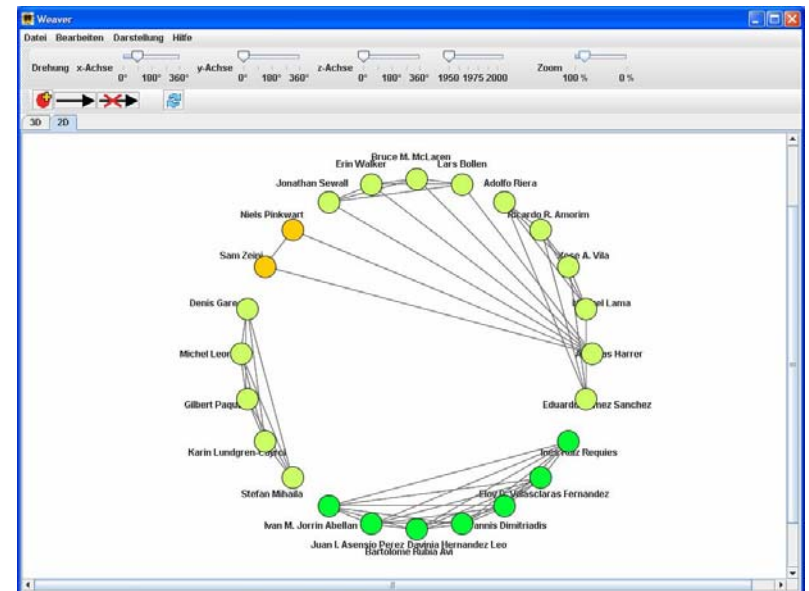
- video (screen capture):** Points to the video player interface at the bottom left.
- logfiles:** Points to the Level1 activity log table.
- rating 1st perspective:** Points to the Level2 table.
- rating 2nd perspective:** Points to the Level3 table.

Visualization techniques and tools (Weaver: community and time info)



The authoring network in a timeline

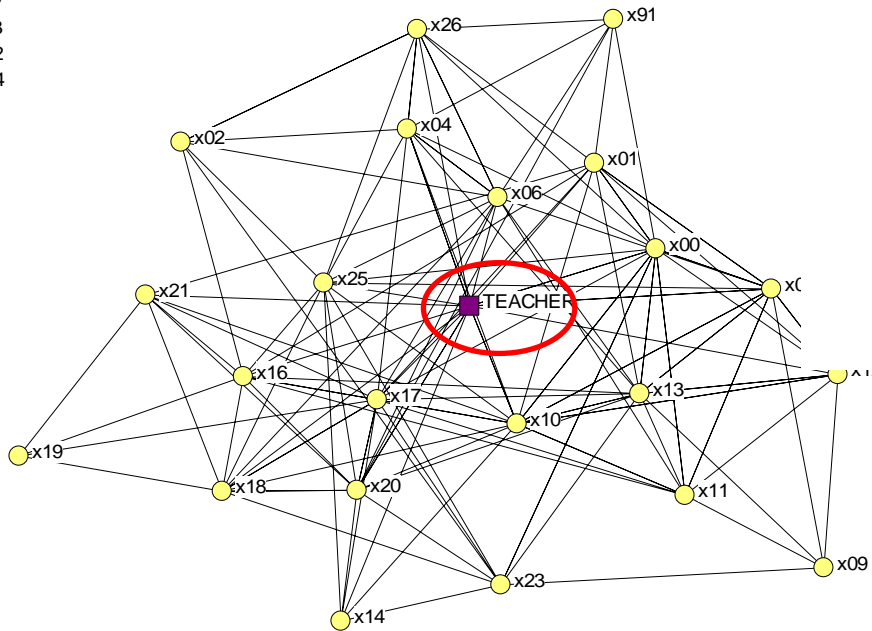
Projection into one time-slice using a filter



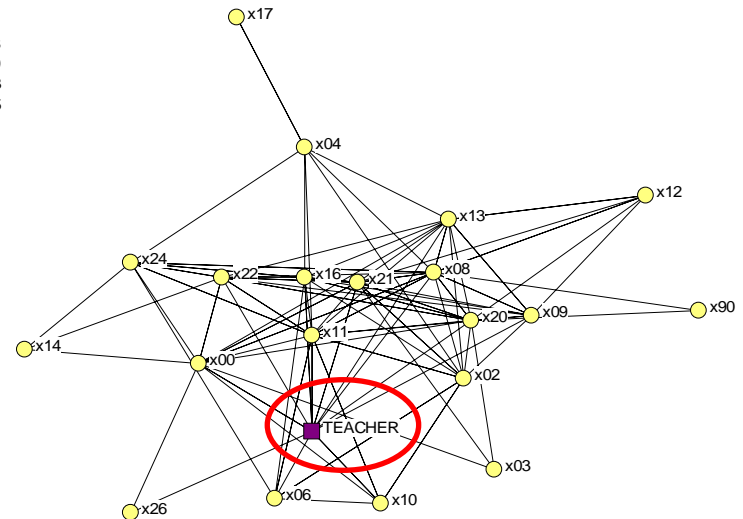
Visualization techniques and tools (Samsa: Role detection)

Teacher-guide

- x90
- x03
- x22
- x24

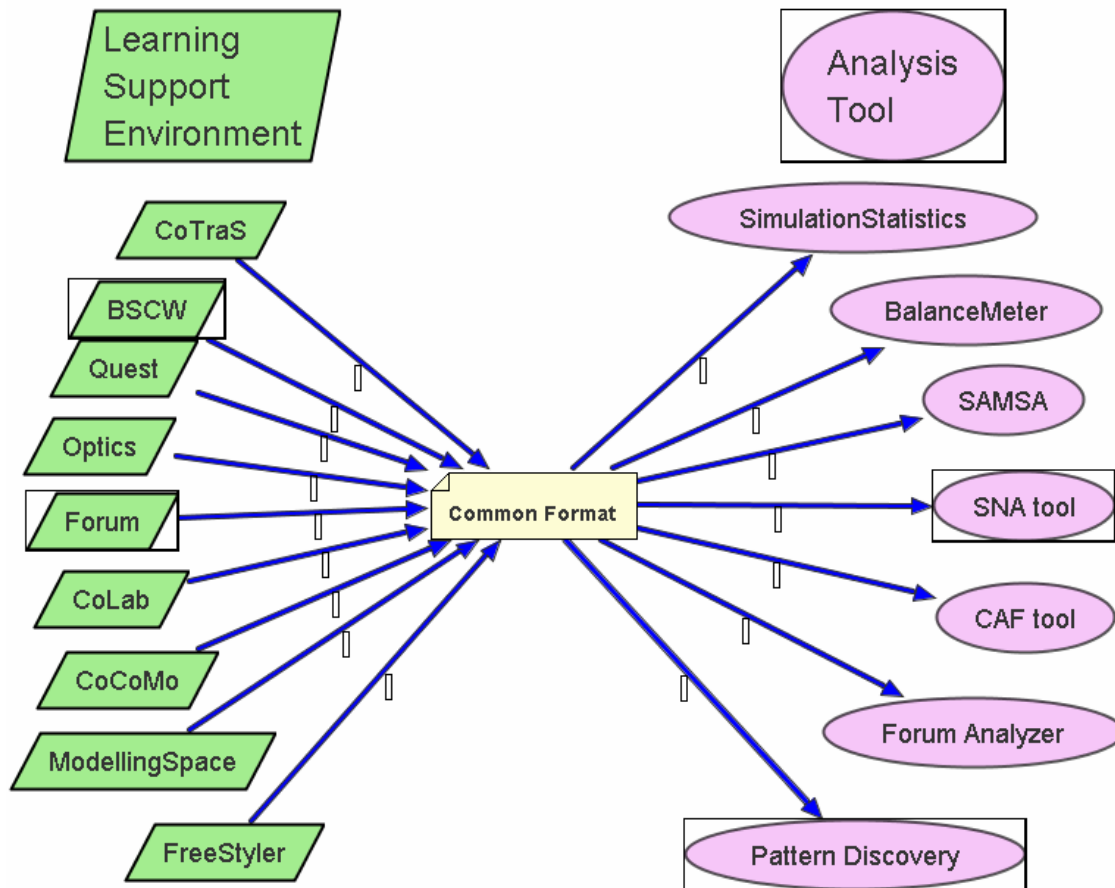


- x91
- x01
- x18
- x19
- x23
- x25

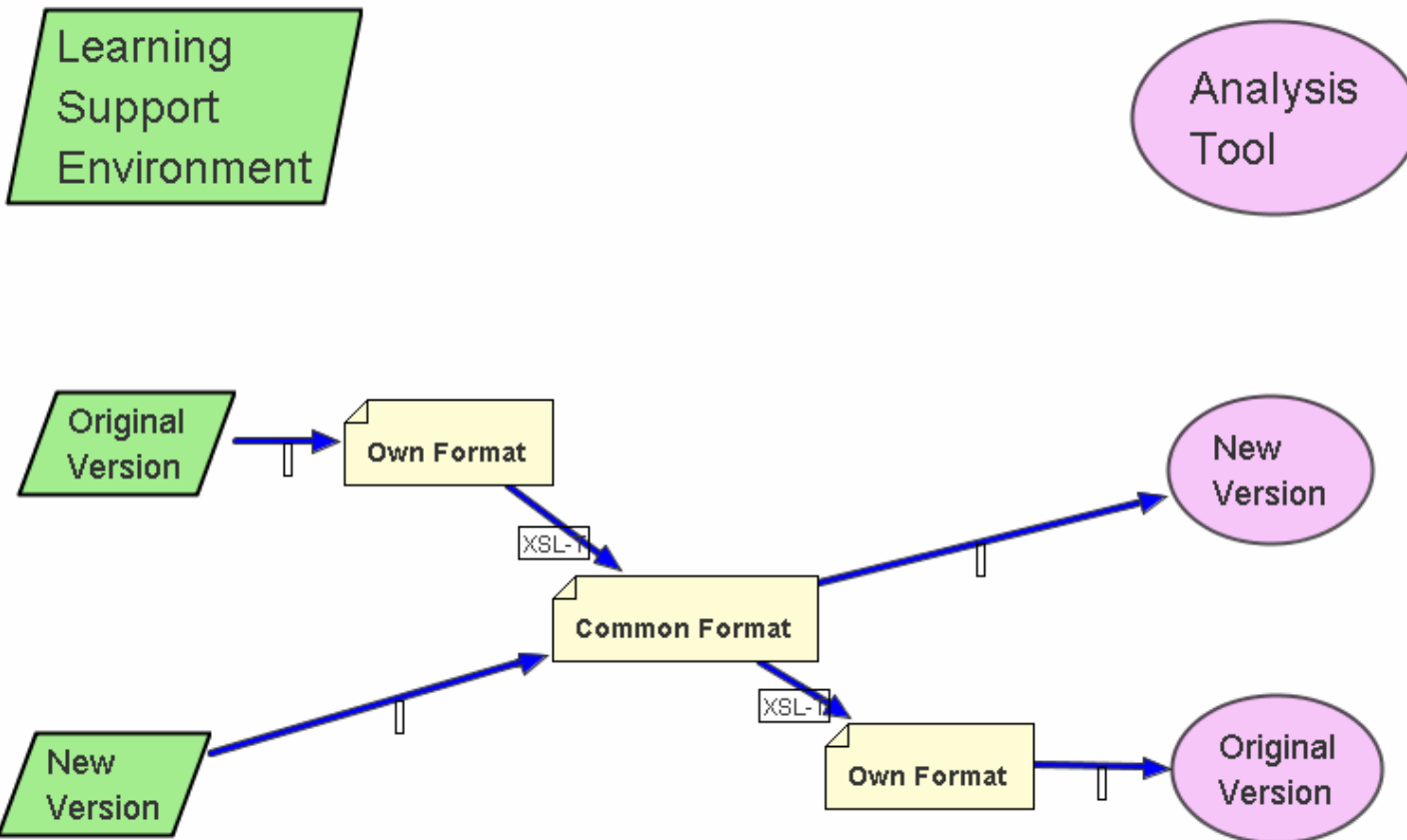


Teacher-collaborator

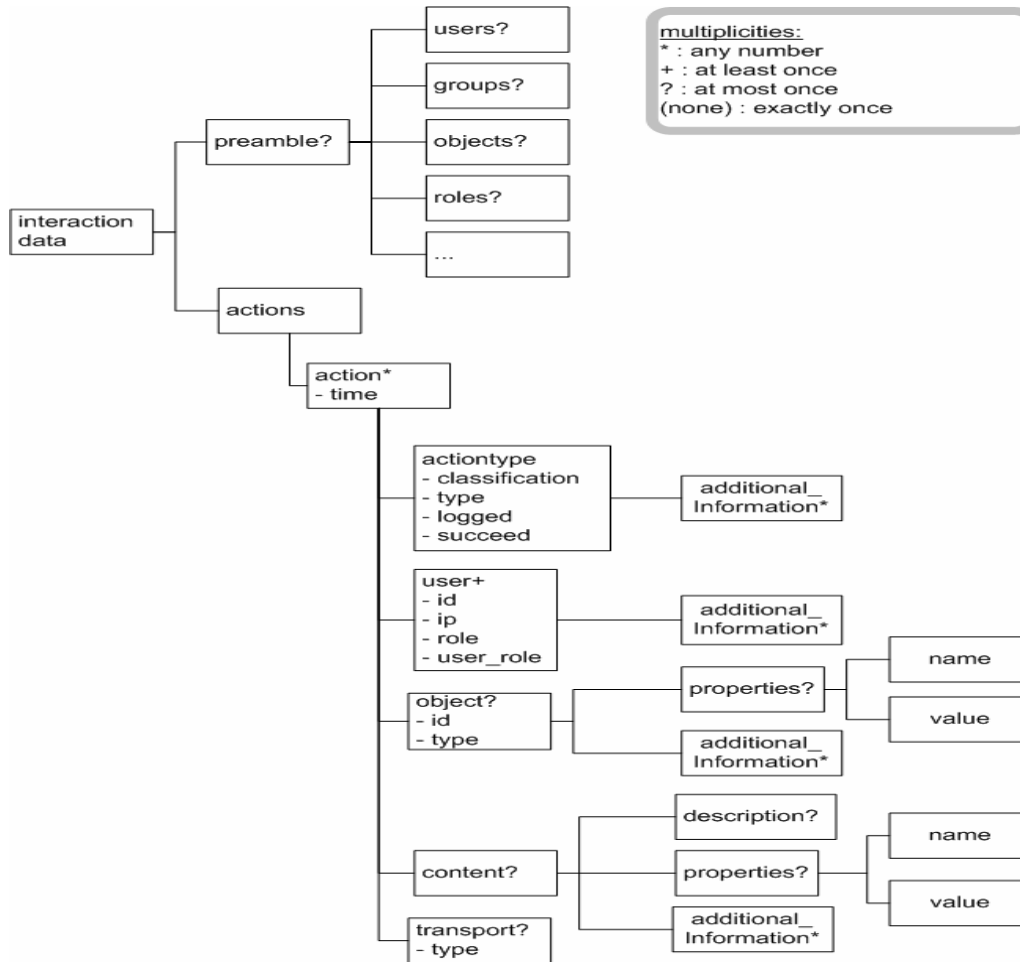
Coding data format and interoperable tools (I)



Coding data format and interoperable tools (II)



Coding data format and interoperable tools (III)



Lessons learned and future directions

- **Interoperability and common process models**
 - Need for common understanding and data-tool sharing
- **Case studies**
 - Real-life use of IA tools that provides evidence for their usefulness
- **Visualization**
 - Flexible tools for effective use
 - Importance of SNA representations

A sample of CAViCoLa publications

- **Cavicola Process model:**
 - Harrer, A., Zeini, S., Kahrmanis, G., Avouris, N., Marcos, J.A., Martínez-Mones, A., Meier, A., Rummel, N., Spada, H. (2007) "Towards a Flexible Model for Computer-based Analysis and Visualization of Collaborative Learning Activities", CSCL 2007, New Brunswick, July 2007
- **Duisburg-Patras cross case study:**
 - Harrer, A., Kahrmanis, G., Zeini, S., Bollen, L., Avouris, N. (2006) "Is there a way to e-Bologna? Cross-National Collaborative Activities in University Courses", EC-TEL 2006, Crete, October 2006 (LNCS 4227)
- **Visualization tools:**
 - Weaver: Harrer, A., Zeini, S., Ziebarth, S., Münter, D. (2007): "Visualisation of the Dynamics of Computer-mediated Community Networks", International Sunbelt Social Network Conference 2007
 - Activity Lens: Avouris, N., Fiotakis, G., Kahrmanis, G., Margaritis, M. & Komis, V. (2007). "Beyond Logging of Fingertip Actions: Analysis of Collaborative Learning Using Multiple Sources of Data". Journal of Interactive Learning Research. 18 (2), pp. 231-250
 - Samsa tool and role detection: Marcos, J.A., Martínez, A., Dimitriadis, Y., Anguita, R., "A role framework for interactions analysis-based support of collaborative learning activities", e-Services Journal, 5 (2008)
- **Freiburg-Patras cross case studies:**
 - Meier, A., Voyiatzaki A., Kahrmanis G., Rummel, N., Spada, H., Avouris, N. (2008). Teaching students how to improve their collaboration: Assessing collaboration quality and providing adaptive feedback in a CSCL setting. Submitted as part of the symposium "New Challenges in CSCL: Towards adaptive script support" (Nikol Rummel and Armin Weinberger), ICLS 2008, Utrecht, June 2008
 - Diziol D., Rummel N., Kahrmanis G., Guevara G., Holz J., Spada H., Fiotakis, G. (2008). Using contrasting cases to better understand the relationship between students' interactions and their learning outcome. Submitted as part of the symposium "Using contrasting cases to relate collaborative processes and outcomes in CSCL" (Nikol Rummel and Cindy Hmelo-Silver) ICLS 2008, Utrecht, June 2008
- **Dissemination:**
 - Cavicola Workshop, CSCL SIG, Kaleidoscope Alpine Rendezvous, Villars, Alpes, January 2007