CLIP: A Visual Thinking Space to Support Collaborative Sensemaking and Reasoning

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May 2014

Research Problem

How to best support sensemaking in collaborative visual analytics?

Design Objectives

Build a "*Collaborative visual thinking space*" to support:

- Recording
- Organizing
- Sharing questions, findings, hypotheses, and evidence

Core feature:

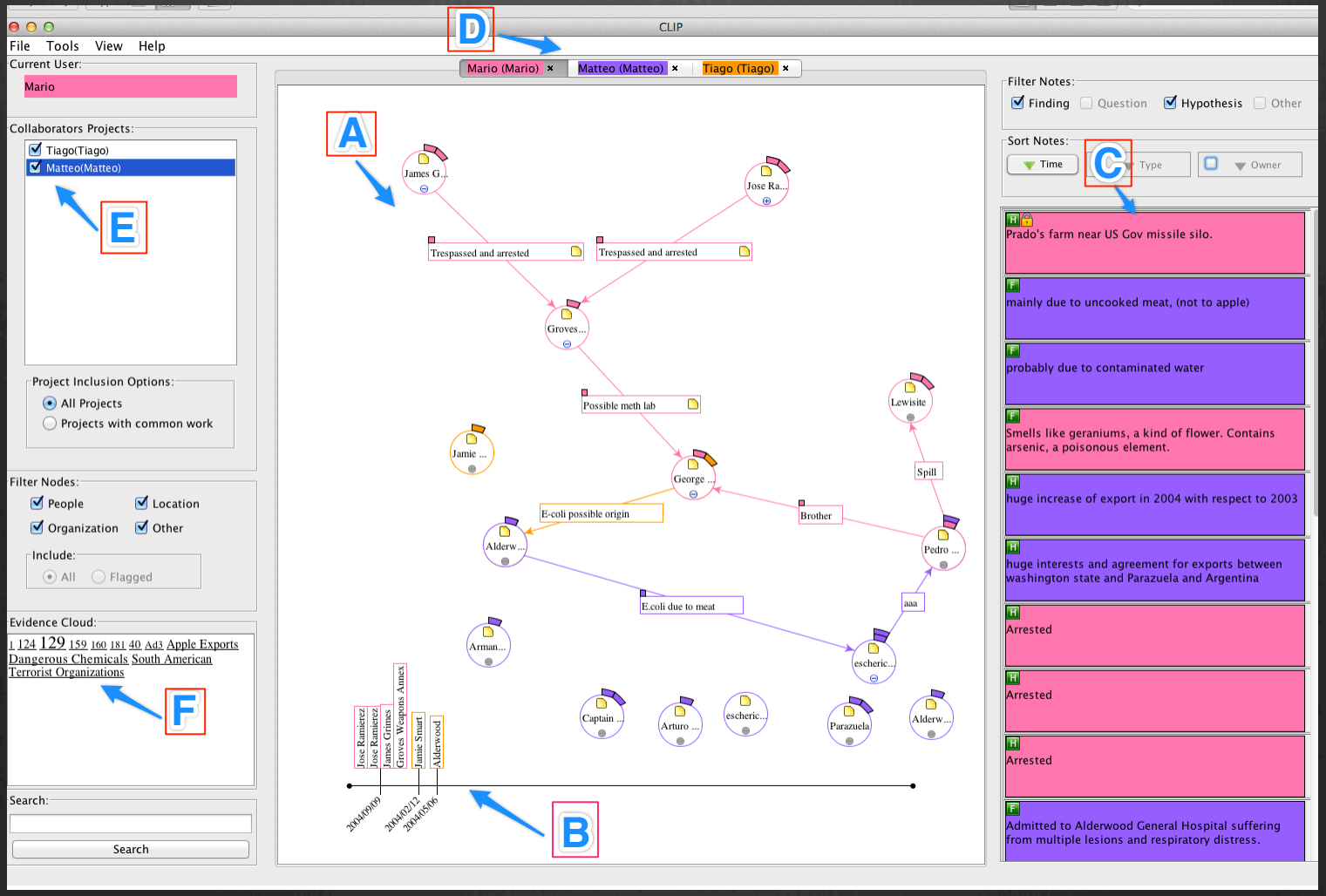
Increasing awareness with automatic discovery and linking of common works (LCW)

Target Domain: Intelligence Analysis

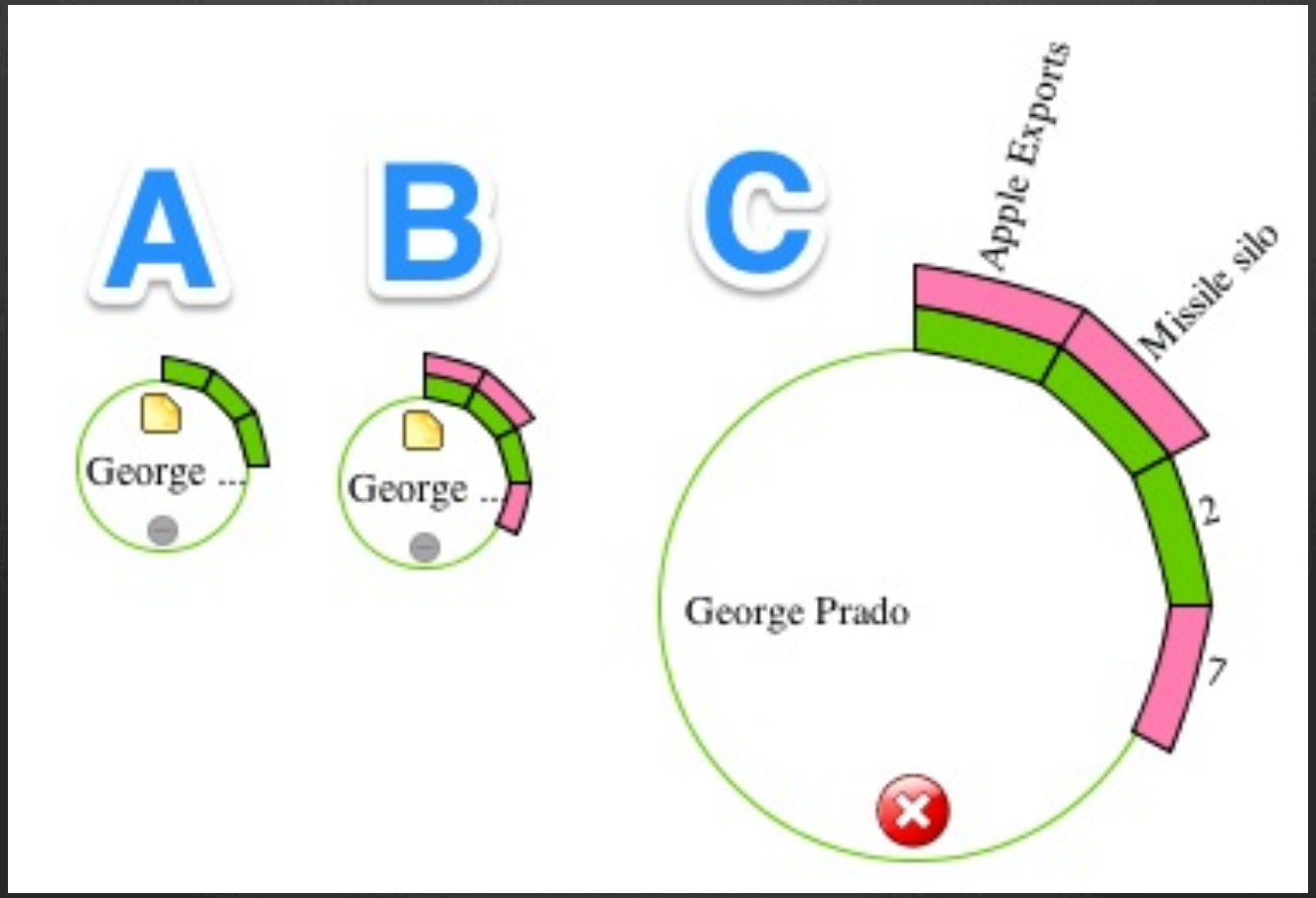
- e.g., solving a police mystery task

- Focus on this domain because of the availability of ground truth data sets
  - VAST 2006 Challenge dataset

CLIP Interface



Node Details



CLIP Features

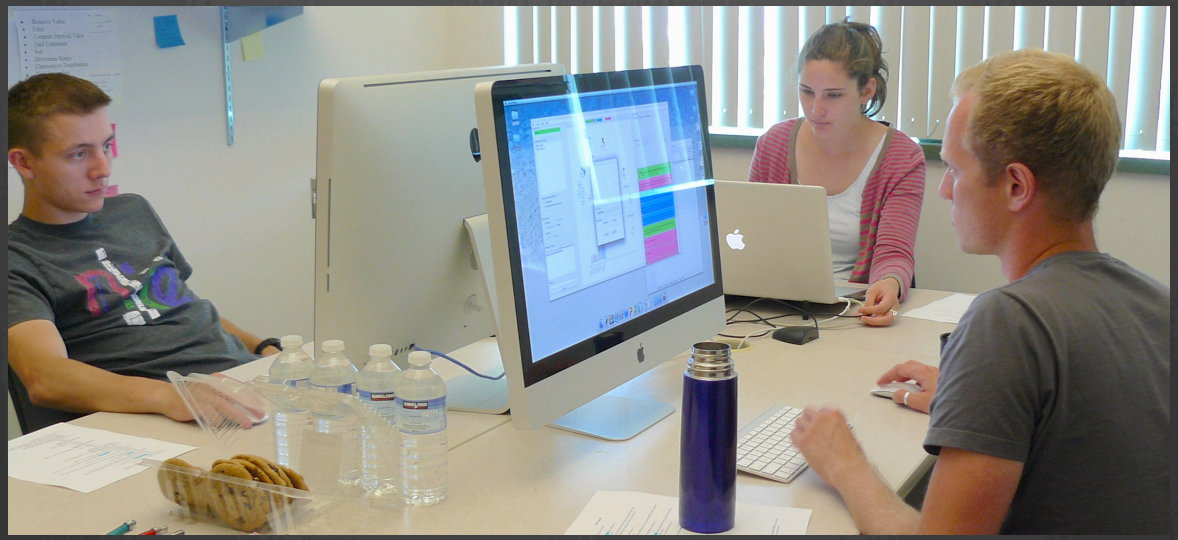
- Externalization
  - Node-link graph
  - Timeline
  - Free form notes
- Awareness Support
  - Partial Merging (subtle changes in local nodes)
  - Tabs (view each others' work)
  - Full Merging (combine collaborator's' work)

Contributions & Future Work

- Explored design of a collaborative thinking space
- Demonstrated that LCW can be employed within `thinking spaces' to support collaborative analytics

- Future work:
  - Scalability to larger problems
  - Extension to different data types and domain problems

Thanks for your attention!



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Backup0-Evaluation

- Experimental comparison of CLIP to a baseline tool
- Baseline tool:
  - CLIP with LCW features removed
  - Users can see each other's workspaces, but cannot merge other's work with their own view
- Scoring scheme (from previous research):
  - Positive points for finding and connecting relevant facts
  - Negative points for incorrect hypotheses
- Conducted an in-depth qualitative analysis of group coordination and communication

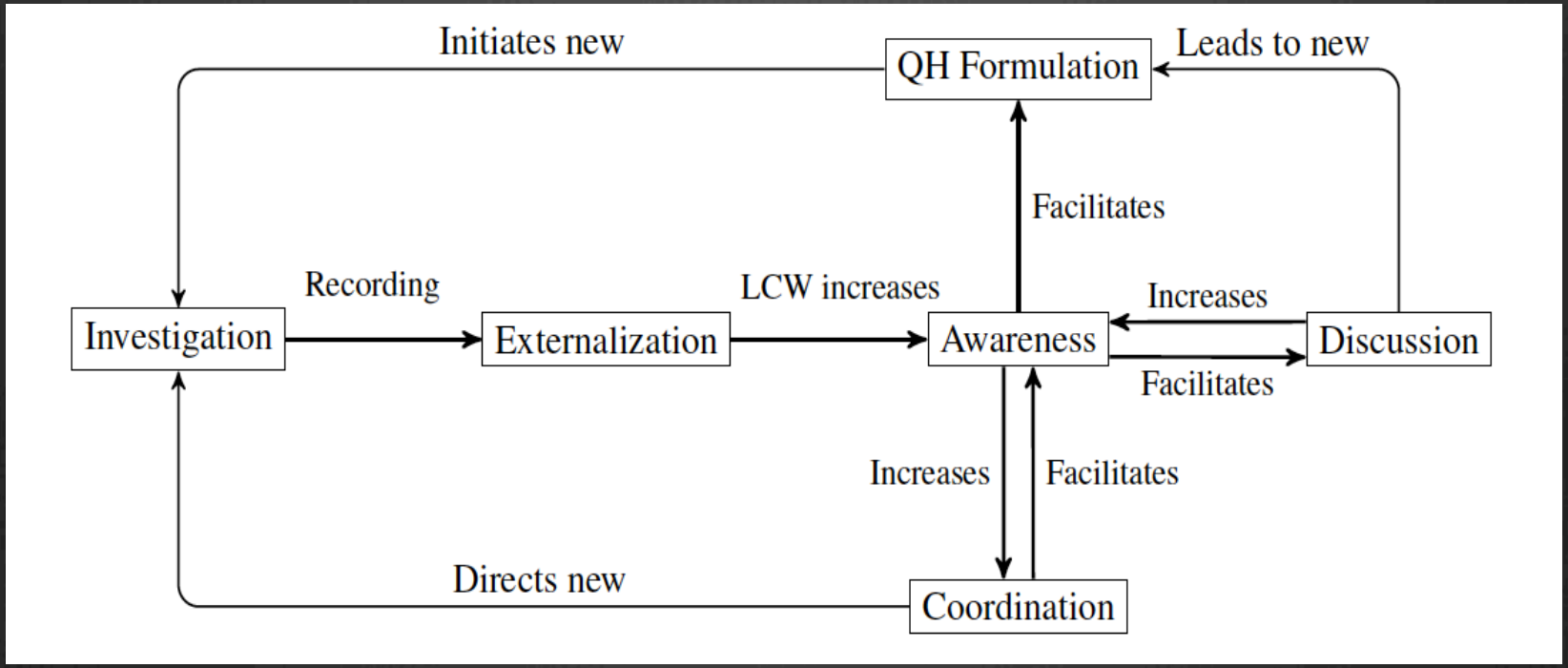
Backup1-communication coding

Code	Description
DH	Having discussion or generating hypotheses
RV	Referring to the visualization tool
CO	Coordinating the group
SA	Seeking awareness
VF	Verbalizing findings
QF	Questions about findings of another group member
RU	Relevant but otherwise uncategorized

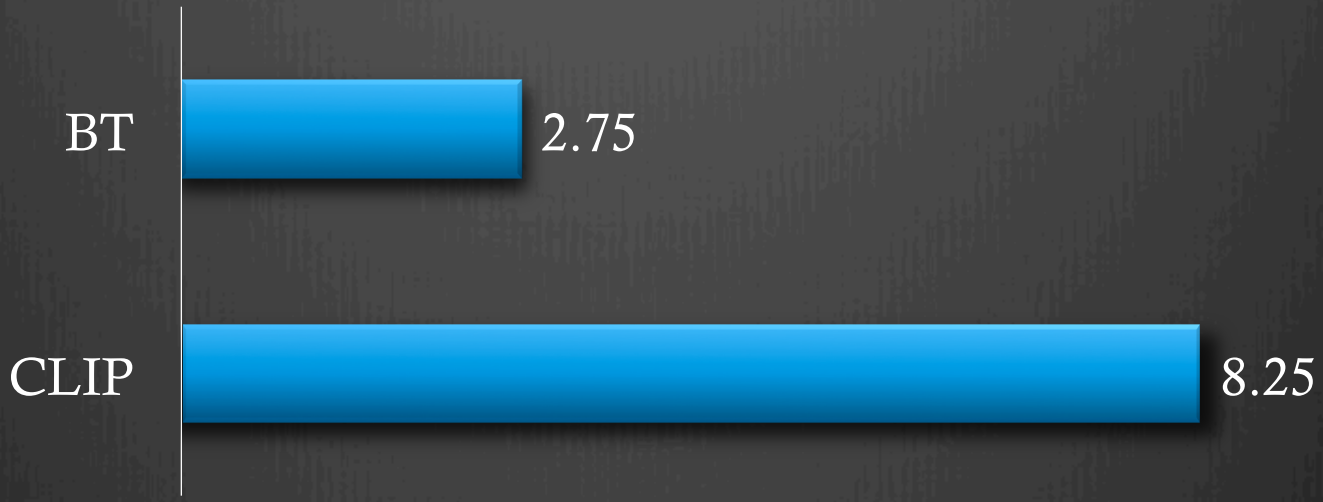
Backup2-Results

Ver.	Group	Score	DH	RV	CO	SA	VF	QF
CLIP	12	11	185	178	57	0	15	5
	5	10	127	76	15	0	10	7
	8	10	124	26	23	1	1	6
	6	8	131	37	16	2	11	6
	15	8	123	15	10	4	4	3
	1	7	116	20	10	2	2	5
	11	7	102	20	20	1	6	4
	3	5	88	65	11	1	7	2
Avg	-	**8**	**116**	**30**	**15**	**2**	**5**	**4**
Baseline	9	7	116	17	10	9	38	27
	13	6	19	5	5	8	19	9
	16	5	114	6	14	7	10	5
	10	2	23	5	8	7	18	13
	4	2	20	5	9	11	21	15
	14	2	13	8	6	9	14	16
	2	0	11	4	5	4	5	2
	7	-2	25	9	4	1	3	5
Avg	-	**3**	**43**	**7**	**8**	**7**	**16**	**12**

Backup3-Collaboration Model

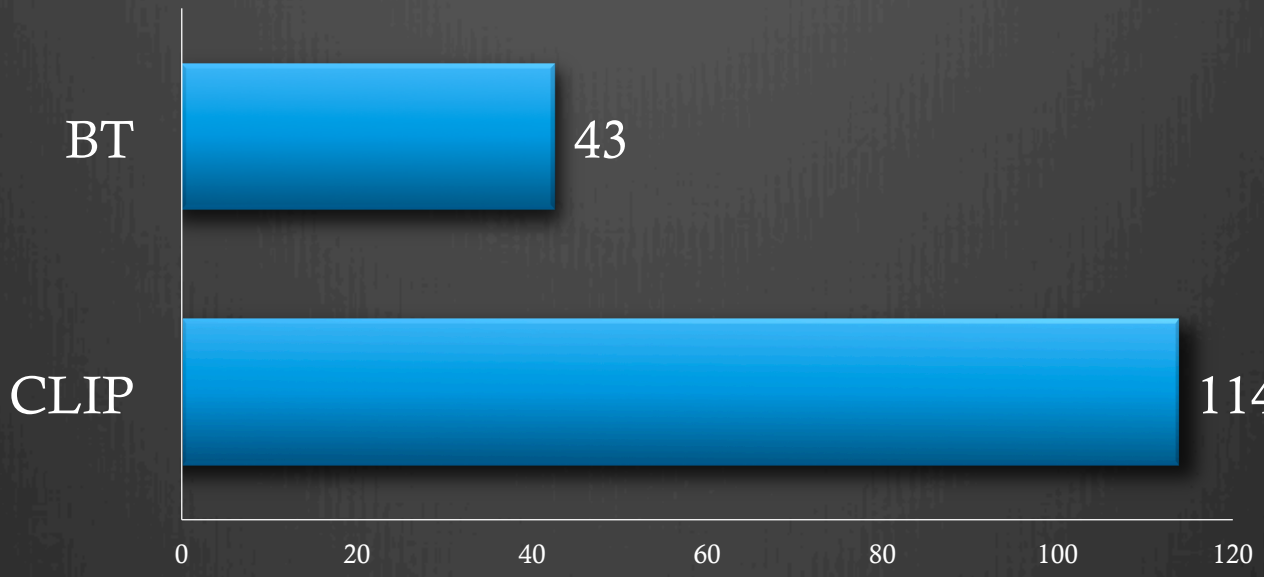


Backup4-Performance



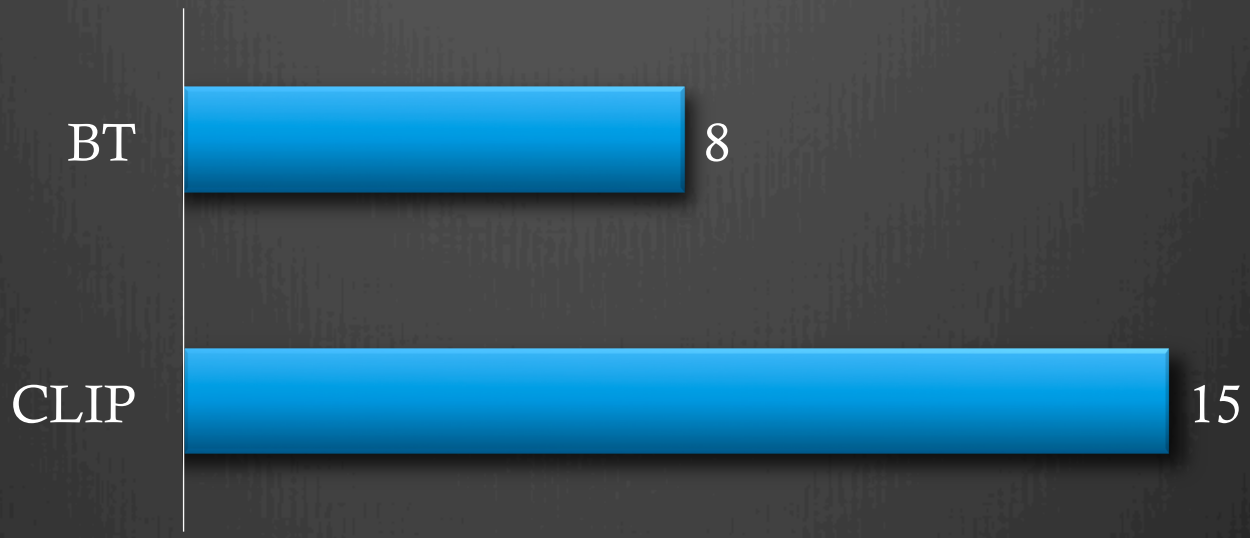
Hypothesis: CLIP groups will have better performance than BT; higher task score.

Backup5-Discussion



Hypothesis: CLIP groups will have more instances of related discussion than BT groups.

Backup6-Coordination



Hypothesis: CLIP groups will have more instances of coordination than BT groups.

Backup7-Implementation

- Concurrently running instances of CLIP communicate using a peer-to-peer protocol.
- Changes by any collaborator are broadcasted across the group if a new node or link is created, or an existing node or link is updated or deleted.
- Upon receiving a message, the receiving end:
- 1) compares the local version of the collaborator's work (if existing) and updates the view accordingly. If a local view does not exist yet, a new tab is created that will encompass the collaborator's work.
- 2) compares the collaborator's content against the local content in search of common entities, which are then merged in the display.

- 16 groups of 3, 8 groups in each condition
- Worked for 90 minutes on the VAST 2006 challenge