

Preliminary Evaluation Example of the Spreading Activation Algorithm

In order to fully evaluate the spreading activation algorithm, as implemented in the Spreading Activation Protégé Plug-in¹ it should be incorporated in a PIM/TIM system that will be used by users while performing their everyday tasks with the computer. Although we are working towards this direction, for the moment there is no fully functional prototype to add the spreading activation module and evaluate it in the long term.

To this end we are proceeding with a preliminary evaluation based on a simulation of the algorithm usage with a set of user tasks.

As a first step of the evaluation, we asked one of the authors to populate her personal ontology with instances relevant to her work and computer-related activities in general for the past six months. These included colleagues and friends with whom she co-operated, papers submitted to journals and conferences, presentations prepared, conferences she attended, etc.

This preliminary evaluation would monitor changes in ontology weights while the user performed a series of tasks. These tasks included realistic usage scenarios compiled in cooperation with the user. Each task, for example “authoring a conference paper”, was broken down to basic steps, like “the user is editing the paper”, “the user e-mails the co-authors”, “the user receives reply with attachment”, etc. For each basic step, classes and instances that appear in the corresponding e-mails or documents were identified. Then, for each set of identified entities (classes and instances), corresponding to a basic step of the task, the entities were set as “selected” in the plug-in; afterwards, the “Update STA” button was pressed to invoke the STA, MTA and LTA computation algorithms. The user was asked to verify to what extent the entities identified as most relevant according to their STA score were in fact relevant and, also, to point out entities that did not receive a high STA score but are in fact relevant.

This report presents an example of a series of 3 tasks that have been used during the evaluation. The following algorithm parameters have been used.

Algorithm Parameters:

A	B	C	D	Iter.	STA Thres.	MTA Delta	MTA Thres	LTA delta
80	0.3	0.5	0.3	4	50	1	2	1

[1] ¹ <http://oceanis.mm.di.uoa.gr/pened/?c=pub#plugins>

SCENARIO 1 – WRITING AND SUBMITTING A PAPER

The user Vivi Katifori is compiling a paper with the collaboration of 2 colleagues, Alan Dix and Antonella Poggi. All communication is done through e-mail. (Not all authors are on-line to participate at this stage of authoring)

1. The user inserts in the ontology an instance of the PIM Workshop where the paper will be submitted

2. The user creates a first draft of the paper in doc format. A new instance (Creating an ontology based profiler...) is created in the ontology along with title, workshop where it will be submitted and authors. A connection is made between paper and workshop,

3. User edits draft: Activated instances: Creating an ontology based profiler..., Alan Dix (Person Name), Antonella Poggi (Person Name), Costas Vassilakis (Person Name), Ilias Daradimos (Person Name).

Entity	STA	MTA	LTA
Creating an ontology based...	98	0.93	0
Costas Vassilakis (person name)	88	0.93	0
Alan Dix (person name)	88	0.93	0
Ilias Daradimos (person name)	88	0.93	0
Antonella Poggi (person name)	88	0.93	0
Person Name	88	0.93	0
PIM Workshop	50	0.93	0
Costas Vassilakis (person)	27	0	0
Antonella Poggi (person)	27	0	0
Ilias Daradimos (person)	27	0	0
Alan Dix (person)	27	0	0
Conference paper	27	0	0
Person	27	0	0

4. The user sends an e-mail to the authors (they are already in the ontology as instances) with the draft. Activated instances: PIM Workshop, alan@, antonella@.

Entity	STA	MTA	LTA
alan@hci-book.com	100	1.71	0
antonella@hotmail.com	88	0.88	0
PIM Workshop	88	1.68	0
Creating an ontology...	73	1.7	0
E-mail	50	0.88	0
Conference	27	0	0
Alan Dix (Person Name)	27	0.8	0
DELOS Task 4.8 meeting	27	0.8	0
5/4/2008	27	0	0
Antonella Poggi (Person)	50	0	0
6/4/2008	27	0	0
15/6/2007	27	0	0

5. Alan sends e-mail with new version. Activated instances: PIM Workshop, alan@ (E-mail), antonella@ (E-mail)

Entity	STA	MTA	LTA
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PIM Workshop	100	2.29	1
antonella@hotmail.com	100	1.6	0
alan@hci-book.com	100	1.6	0
Creating an ontology...	88	1.6	0
E-mail	73	0.88	0
Conference	27	0	0
Antonella Poggi (Person)	27	0	0
Alan Dix (Person)	27	0	0
5/4/2008	27	0	0
6/4/2008	27	0	0
15/6/2007	27	0	0

6. User opens attachment. Activated instances: Creating an ontology based profiler..., Alan Dix (Person Name), Antonella Poggi (Person Name), Costas Vassilakis (Person Name), Ilias Daradimos (Person Name).

Entity	STA	MTA	LTA
Creating an ontology based...	100	2.64	2
Costas Vassilakis (person name)	100	1.36	0
Alan Dix (person name)	100	1.36	0
Ilias Daradimos (person name)	100	1.36	0
Antonella Poggi (person name)	100	1.36	0
PIM Workshop	100	2.64	2
Person Name	100	1.36	0
Costas Vassilakis (person)	27	0	0
Antonella Poggi (person)	27	0	0
Ilias Daradimos (person)	27	0	0
Alan Dix (person)	27	0	0
Conference paper	27	0	0
Conference	27	0	0
Person	27	0	0
DELOS Task 4.8 Meeting	27	0	0

7. User makes corrections and re-sends. Activated instances: PIM Workshop, alan@, antonella@

Entity	STA	MTA	LTA
PIM Workshop	100	2.87	3
antonella@hotmail.com	100	1.8	0
alan@hci-book.com	100	1.8	0
Creating an ontology...	100	2.87	3
E-mail	88	1.8	0
Conference Paper	27	0	0
Antonella Poggi (Person)	27	0	0
Alan Dix (Person)	27	0	0
5/4/2008	27	0	0
6/4/2008	27	0	0
15/6/2007	27	0	0
Conference	27	0	0

8. Antonella sends new version. She mentions previous paper to be referenced
Activated instances: PIM Workshop, alan@, antonella@, From information to interaction..., DELOS conference

Entity	STA	MTA	LTA
alan@hci-book.com	100	2.09	1
Delos Conference	100	0.74	0
antonella@hotmail.com	100	2.09	1
Creating an ontology based...	100	2.88	4
PIM Workshop	100	2.88	4
From information to interaction...	100	0.74	0
E-mail	100	2.09	1
Conference Paper	50	0.74	0
Conference	50	0.74	0
Alan Dix (Person)	27	0	0
Antonella Poggi (Person)	27	0	0
5/4/2008	27	0	0
6/4/2008	27	0	0
15/6/2007	27	0	0

9. User opens and edits attachment. Activated instances: Creating an ontology based profiler..., Alan Dix (Person Name), Antonella Poggi (Person Name), Costas Vassilakis (Person Name), Ilias Daradimos (Person Name),

Adds author e-mails: alan@, antonella@, drid@, costas@

Entity	STA	MTA	LTA
Costas Vassilakis (person name)	100	1.33	0
Alan Dix (person name)	100	1.33	0
Antonella Poggi (person name)	100	1.33	0
Ilias Daradimos (person name)	100	1.33	0
Creating an ontology based...	100	2.9	5
PIM Workshop	100	2.9	5
Person Name	100	1.33	0
Conference Paper	27	0.55	0
Conference	27	0.55	0
Person	27	0	0
DELOS Task 4.8 meeting	27	0	0
Antonella Poggi (person	27	0	0
Alan Dix (Person)	27	0	0
Ilias Daradimos (person)	27	0	0
Costas Vassilakis (person)	27	0	0
5/4/2008	27	0	0
6/4/2008	27	0	0
15/6/2007	27	0	0

10. User re-opens and adds author e-mails. Activated instances: Creating an ontology based profiler..., Alan Dix (Person Name), Antonella Poggi (Person Name), Costas Vassilakis (Person Name), Ilias Daradimos (Person Name), alan@, antonella@, drid@, costas@

Entity	STA	MTA	LTA
Costas Vassilakis (person name)	100	1.46	0
alan@hci-book.com	100	1.6	1
Alan Dix (person name)	100	1.46	0
Antonella Poggi (person name)	100	1.46	0
antonella@hotmail.com	100	1.6	1

Ilias Daradimos (person name)	100	1.46	0
Creating an ontology based...	100	2.4	6
PIM Workshop	100	2.4	6
E-mail	100	1.6	1
Person Name	100	1.46	0
drid@hotmail.com	88	0.63	0
costas@di.uoa.gr	88	0.63	0
Antonella Poggi (person)	50	0.63	0
Alan Dix (Person)	50	0.63	0
Ilias Daradimos (person)	50	0.63	0
Costas Vassilakis (person)	50	0.63	0
Conference Paper	50	0.97	0
Person	50	0.63	0
Conference	27	0.35	0
5/4/2008	27	0	0
6/4/2008	27	0	0
15/6/2007	27	0	0
DELOS Task 4.8 TIM	27	0	0
DELOS Task 4.8 meeting	27	0	0

11. User re-sends. Activated instances: PIM Workshop, alan@, antonella@

Entity	STA	MTA	LTA
alan@hci-book.com	100	1.83	1
antonella@hotmail.com	100	1.83	1
E-mail	100	1.83	1
PIM Workshop	100	2.42	7
Creating an ontology...	100	2.42	7
Alan Dix (Person)	50	1.15	0
Conference Paper	27	0.69	0
Antonella Poggi (Person)	27	0.44	0
Conference	27	0.24	0
Person	27	0.44	0
5/4/2008	27	0	0
6/4/2008	27	0	0
15/6/2007	27	0	0

12. Alan sends confirmation that it is OK. Activated instances: PIM Workshop, alan@, antonella@

Entity	STA	MTA	LTA
alan@hci-book.com	100	2.08	2
antonella@hotmail.com	100	2.08	2
E-mail	100	2.08	2
PIM Workshop	100	2.5	8
Creating an ontology...	100	2.5	8
Alan Dix (Person)	50	1.57	0
Conference Paper	27	0.5	0
Person	27	0.32	0
Conference	27	0.18	0
Antonella Poggi (Person)	27	0.32	0
5/4/2008	27	0	0

6/4/2008	27	0	0
15/6/2007	27	0	0

13. Antonella sends confirmation that it is OK. Activated instances: PIM Workshop, alan@, antonella@

Entity	STA	MTA	LTA
alan@hci-book.com	100	2.29	3
antonella@hotmail.com	100	2.29	3
E-mail	100	2.29	3
PIM Workshop	100	2.6	9
Creating an ontology...	100	2.6	8
Alan Dix (Person)	50	1.9	0
Conference Paper	27	0.37	0
Person	27	0.24	0
Conference	27	0.13	0
Antonella Poggi (Person)	27	0.24	0
5/4/2008	27	0	0
6/4/2008	27	0	0
15/6/2007	27	0	0

14. User submits the paper. In the submission form the following entities become activated: Creating an ontology based profiler..., Alan Dix (Person Name), Antonella Poggi (Person Name), Costas Vassilakis (Person Name), Ilias Daradimos (Person Name), alan@, antonella@, drid@, costas@, PIM Workshop

Entity	STA	MTA	LTA
alan@hci-book.com	100	2.07	4
Alan Dix (person name)	100	1.83	0
Alan Dix (Person)	100	0.98	0
antonella@hotmail.com	100	2.07	4
Ilias Daradimos (person name)	100	0.98	0
drid@hotmail.com	100	0.78	0
Costas Vassilakis (person name)	100	0.98	0
costas@di.uoa.gr	100	0.78	0
Antonella poggi (Person name)	100	0.98	0
Creating an ontology...	100	2.27	10
PIM Workshop	100	2.27	10
Person Name	100	0.98	0
E-mail	100	2.07	4
Person	73	0.78	0
Costas Vassilakis	73	0.78	0
Ilias Daradimos	73	0.78	0
Antonella Poggi (person)	50	0.78	0
DELOS Task 4.8 meeting	50	0.63	0
Conference Paper	27	0.24	0
Conference	27	0.08	0
DELOS Task 4.8 TIM...	27	0	0
United Kingdom	27	0	0
15/6/2007	27	0	0
5/4/2008	27	0	0

6/4/2008	27	0	0
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15. Later the user receives an email from Costas, asking about the paper submission. Activated entities: costas@, Paper

Entity	STA	MTA	LTA
E-mail	100	2.26	5
costas@di.uoa.gr	100	1.31	0
Paper	73	0.73	0
Costas Vassilakis (person)	27	0.58	0
Costas Vassilakis (person name)	12	0.73	0
Person	12	0.58	0
PIM Workshop	12	1.67	10
Creating an ontology-based profiler	5	1.67	10
Person name	5	0.73	0
DELOS Task 4.8 Meeting	5	0.46	0
Conference Paper	2	1.17	0
alan@haci-book.com	2	1.52	4
Alan Dix	2	1.35	0
antonella@hotmail.com	2	1.52	4

Collective Results of retrieved entities for task 1

Sub-task	Relevant Classes, useful	Relevant Classes, not useful	Relevant: total	Irrelevant Classes	Relevant, but not retrieved
3	7	2	9	0	DELOS Task 4.8 TIM
4	5	4	9	1	DELOS Task 4.8 TIM
5	5	4	9	0	DELOS Task 4.8 TIM
6	8	2	10	1	DELOS Task 4.8 TIM
7	6	4	10	0	DELOS Task 4.8 TIM
8	6	6	12	0	DELOS Task 4.8 TIM
9	8	3	11	1	DELOS Task 4.8 TIM
10	9	6	15	1	-
11	6	5	11	0	DELOS Task 4.8 TIM
12	6	5	11	0	DELOS Task 4.8 TIM
13	6	5	11	0	DELOS Task 4.8 TIM
14	9	6	15	2	-
15	4	2	6	1	DELOS Task 4.8 TIM

SCENARIO 2 – EXCHANGING E-MAILS ON TWO DIFFERENT ISSUES AT THE SAME TIME

The user for a period of 1 hour is exchanging e-mails with different colleagues on two different issues:

- The compilation of a trimester report for the Project Digitization of the Anthropology Museum
- The discussion on a visualization experiment in the context of the PENED project with Maria Golemati.

1. E-mail: From user to: Activated entities: vaso@, maria@, kuriakos@, costas@, First Trimester Report
2. E-mail: From vaso to the rest: Activated entities: vaso@, maria@, kuriakos@, costas@, First Trimester Report
3. E-mail: From user to the rest: Activated entities: vaso@, maria@, kuriakos@, costas@, First Trimester Report
4. From margo to user: margo
5. From user to margo: margo
6. E-mail: From vaso to the rest: Activated entities: vaso@, maria@, kuriakos@, costas@, First Trimester Report, attachment
7. Edit attachment: First Trimester Report, authors and project also become activated
8. E-mail: From user to: Activated entities: vaso@, maria@, kuriakos@, costas@, First Trimester Report
9. E-mail: From vaso to the rest: Activated entities: vaso@, maria@, kuriakos@, costas@, First Trimester Report
10. From margo to user: margo@

Collective Results of retrieved entities for task 2

Sub-task	Relevant Classes, useful	Relevant Classes, not useful	Relevant: total	Irrelevant Classes	Relevant, but not retrieved
1	7	2	9	0	-
2	7	2	9	0	-
3	7	2	9	0	-
4	2	2	4	1	-
5	2	2	4	1	-
6	7	2	9	0	-
7	7	2	9	0	-
8	7	2	9	0	-
9	7	2	9	0	-
10	2	2	4	1	-

SCENARIO 3 – COLLABORATIVE PAPER AUTHORIZING AND E-MAILS EXCHANGED ON ANOTHER PAPER.

1. User edits draft of paper Evaluating the Significance... No author names available yet.
2. Sends draft to co-authors: Alan@, Azrina@, George@. Concepts Conference and Rio de Janeiro are also activated
3. From margo to user: margo

4. From user to margo: margo
5. Alan sends e-mail with new version. Activated instances: Alan@, Azrina@, George@. Concepts Conference and Rio de Janeiro are also activated
6. User opens and edits attachment. Activated instances: Evaluating the Significance...., Alan Dix (Person Name), Azrina Kamarrudin (Person Name), George Lepouras (Person Name)
7. Sends draft to co-authors: Alan@, Azrina@, George@. Concepts Conference and Rio de Janeiro are also activated
8. George sends draft to co-authors: Alan@, Azrina@, George@. Concepts Conference and Rio de Janeiro are also activated
9. From margo to user: margo
10. User opens and edits attachment. Activated instances: Evaluating the Significance...., Alan Dix (Person Name), Azrina Kamarrudin (Person Name), George Lepouras (Person Name)
11. Sends draft to co-authors: Alan@, Azrina@, George@. Concepts Conference and Rio de Janeiro are also activated
12. From margo to user: margo
13. Alan sends draft to co-authors: Alan@, Azrina@, George@. Concepts Conference, Paper and Rio de Janeiro are also activated
14. George sends draft to co-authors: Alan@, Azrina@, George@. Concepts Conference, Paper and Rio de Janeiro are also activated

Collective Results of retrieved entities for task 3

Sub-task	Relevant Classes, useful	Relevant Classes, not useful	Relevant: total	Irrelevant Classes	Relevant, but not retrieved
1	6	2	8	1	0
2	3	3	6	0	1
3	3	2	5	0	0
4	3	2	5	0	0
5	4	2	6	3	1
6	6	2	8	1	0
7	4	3	7	2	2
8	4	3	7	2	2
9	3	2	5	0	0
10	6	2	8	1	0
11	5	5	10	2	1
12	3	2	5	0	0
13	5	4	9	2	2
14	5	4	9	2	2

Results for all 3 tasks:

Sub-task	Relevant	Relevant	Relevant:	Irrelevant	Relevant, but not
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	Classes, useful	Classes, not useful	total	Classes	retrieved
1.3	7	2	9	0	1
1.4	5	4	9	1	1
1.5	5	4	9	0	1
1.6	8	2	10	1	1
1.7	6	4	10	0	1
1.8	6	6	12	0	1
1.9	8	3	11	1	1
1.10	9	6	15	1	0
1.11	6	5	11	0	1
1.12	6	5	11	0	1
1.13	6	5	11	0	1
1.14	9	6	15	2	0
1.15	4	2	6	1	1
2.1	7	2	9	0	0
2.2	7	2	9	0	0
2.3	7	2	9	0	0
2.4	2	2	4	1	0
2.5	2	2	4	1	0
2.6	7	2	9	0	0
2.7	7	2	9	0	0
2.8	7	2	9	0	0
2.9	7	2	9	0	0
2.10	2	2	4	1	0
3.1	6	2	8	1	0
3.2	3	3	6	0	1
3.3	3	2	5	0	0
3.4	3	2	5	0	0
3.5	4	2	6	3	1
3.6	6	2	8	1	0
3.7	4	3	7	2	2
3.8	4	3	7	2	2
3.9	3	2	5	0	0
3.10	6	2	8	1	0
3.11	5	5	10	2	1
3.12	3	2	5	0	0
3.13	5	4	9	2	2
3.14	5	4	9	2	2

Using the parameters of Table 2 to compute activation levels for 37 sub-tasks, the following results have been recorded:

The mean percentage of the entities that were characterized as relevant and useful compared to the total number of entities with STA greater than 20 was 59%

The mean percentage of the entities that were characterized as relevant but not useful (this includes trivial classes like Person and E-mail) compared to the total number of entities with STA greater than 20 was 33.3%

The mean percentage of the entities that were characterized as irrelevant compared to the total number of entities with STA greater than 20 was 6.1%

In 14 of the sub-tasks, 1 entity identified by the user as important did not receive high STA score whereas in 4 sub-tasks 2 important entities did not receive a sufficiently high score.