

Micro-debates for Policy-Making

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Introduction

- Administrations and policy-makers are more and more interested in using the Internet, and in particular the social Web, as an e-participation tool
- Web 2.0 platforms allow for **online debates** between (informed) citizens.
- It becomes very expensive for policy-makers to make sense of opinions emerging from online debates.

Introduction

- Opinion mining/sentiment analysis techniques and tools look at sentiment orientation of opinions in terms of values in a positive/negative scale
- Classification **accuracy** is quite good in some domains, e.g., customer reviews
- But... it is not (yet) as good in political debates, and, above all, it does not explicitly tell **why** certain opinions are in place and how they relate to other opinions.

Introduction

- Our work goes in the perspective of encouraging free, unconstrained online debate, as a tool in the hands of the citizens, who can use it to voice their opinions, and convey them to the policy-makers.
- we need to provide the policy-makers with tools to automatically make sense of possibly very lengthy online debates

Our Aim:

- identify **specific opinions** used in a discussion
- identify the **argument structure** that is tied to such opinions (if any)
- identify the **relations amongst arguments**

Why arguments?

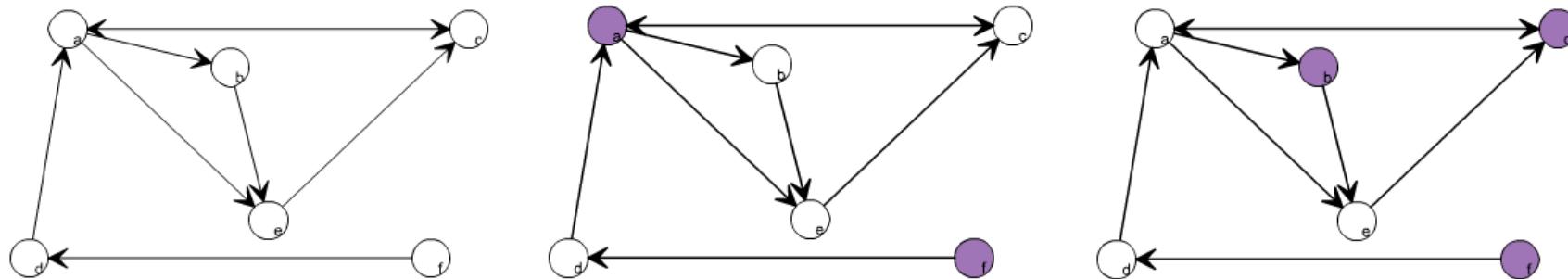
- The Argumentative Theory of Reasoning (Mercier, & Sperber, “Why do humans reason? Arguments for an argumentative theory”, *Behavioral and brain sciences* (2011) 34) tells us that people are good at reasoning when they communicate through an argumentative context
- When debating about policy issues, we thus expect that users will not only publish their opinion (like in a review setting), but also:
 - try to convince others by producing arguments;
 - rebut (attack) each others’ arguments.

Computational Argumentation

- We identify **computational argumentation**, and in particular **abstract argumentation**, as the conceptual and computational framework to model arguments and reason from them automatically.
- Bench-Capon & Dunne, “Argumentation in artificial intelligence”, *AIJ* 171 (2007) 619–64:
 - argumentation is concerned with how assertions are proposed, discussed, and resolved in the context of issues upon which several diverging opinions may be held
 - Defining the component parts of an argument and their interaction.
 - Identifying rules and protocols describing argumentation processes
 - Distinguishing legitimate from invalid arguments
 - Determining conditions under which further discussion is redundant

Computational Argumentation

- Dung’s “On the Acceptability of Arguments and its Fundamental Role in Non-monotonic Reasoning, Logic Programming and n-Person Games”, Artificial Intelligence 77(2): 321-358 (1995):
 - a set of atomic arguments, X
 - a binary attacks relation over arguments, $A \subseteq X \times X$, with $\langle x, y \rangle \in A$ interpreted as “the argument x attacks the argument y ”.
 - collections of justified arguments described by extension-based semantics
 - Many semantics: ways to define extensions...



Debates on Twitter

- Toni & Torroni, “Bottom-up argumentation”, *Proc. TAFA-11 LNAI 7132*, (2012) 249-262:
 - proposal for enhancing online debate platform, allowing users to specify elements of argumentation framework within ongoing debate (sample platform: facebook)
- Our proposal is to develop an application based on a Twitter dialect that allows users to discuss about topics, aided (in the back-end) by computational argumentation.
- We therefore introduce the concept of **micro-debates**

Twitter Micro-Debates

- a **micro-debate** is a stream of tweets where users annotate their messages by using some special tags:
 - # tag identifies a specific micro-debate (name)
 - \$ tag identifies one or more assertions they support
 - !\$ tag identifies one or more assertions they oppose
- thus a micro-debate tweet will look like:
 - tweet := comment #debateName <\$opinionA, ..., \$opinionM> <!\$opinionB, ..., !\$opinionN>
- We have developed an agent-based model in NetLogo and a NetLogo extension to automate parsing

Twitter Micro-Debate

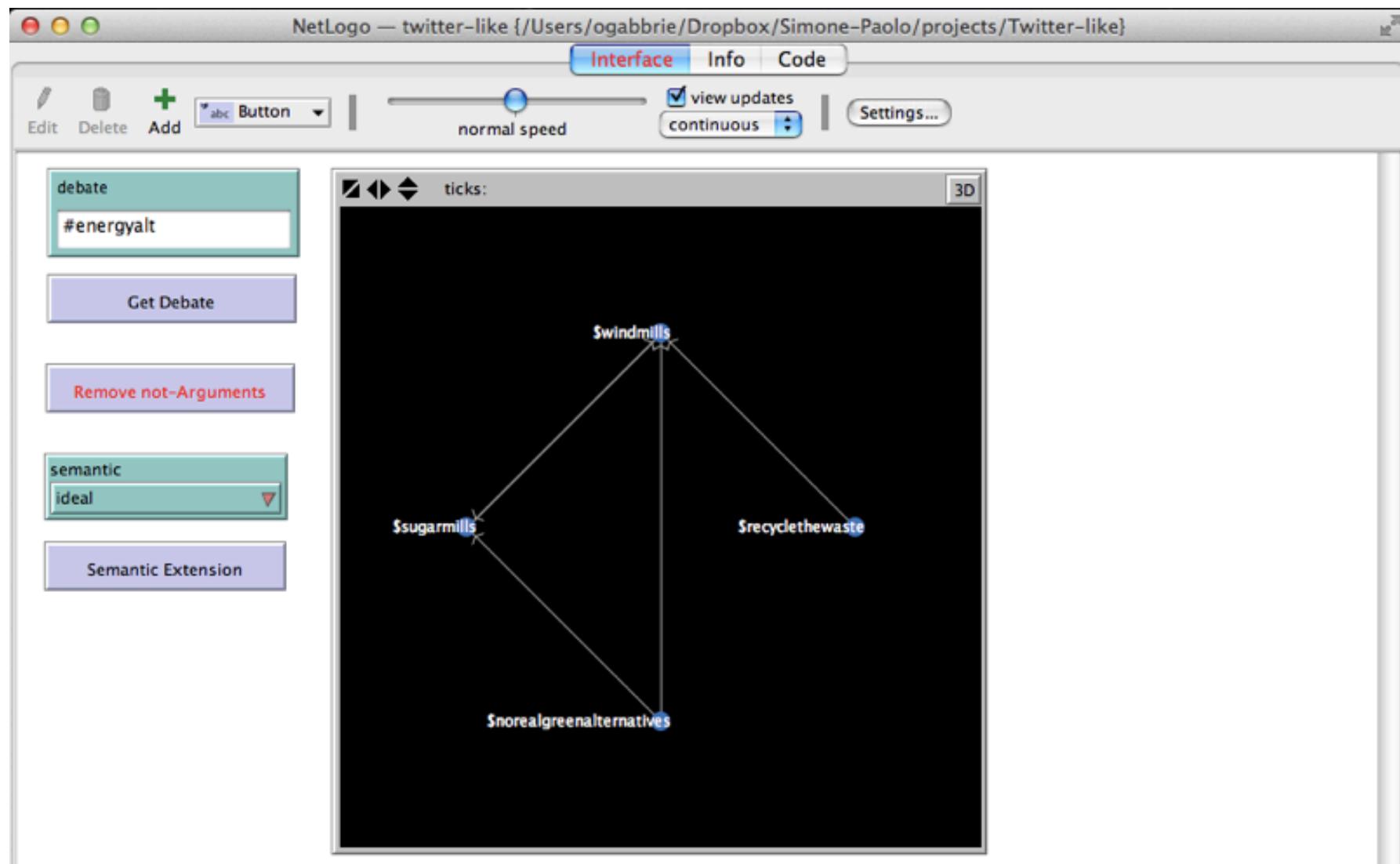
...an excerpt from an
hypothetical Twitter
micro-debates...

- \$sugarmills productivity is also tied to policy for selling energy, and in Brazil and India is convenient !\$windmills #energyalt
Expand 1m
- Ok, but !\$sugarmills productivity is tied to sugar prices, while \$windmills productivity is not! #energyalt
Expand 1m
- I do believe you are leaving out the cost of both the plants ... \$norealgreenalternatives !\$windmills !\$sugarmills #energyalt
Expand 1m
- \$recyclethewaste is a good feature, because makes energy production integrated with consumption good production #energyalt
Expand 1m
- \$sugarmills consume 30%, but help to \$recyclethewaste of sugar production... !\$windmills #energyalt
Expand 1m
- ok, but how much do !\$sugarmills consume? \$windmills just 20% of their energy #energyalt
Expand 1m
- well, in India only, \$sugarmills produce 2,000 megawatt of biomass-based energy every year, as much as !\$windmill #energyalt
Expand 1m
- Don't think so, \$windmills are much more productive than !\$sugarmills, as recent studies proved... #energyalt
Expand 1m
- \$sugarmills produce as much as windmills produce, and at half the cost! #energyalt
Expand 1m

Naive Argument Framework

- As a first step, we extract and parse the stream of tweets in a selected micro-debate so that:
 - for each \$opinionName tag, an argument is created;
 - for each !\$opinionName tag, an attack link is created toward the named opinion
 - each argument stores all the comments that refer to that argument in the micro-debate
- **Naive AF:** we consider every assertion to be an argument and include it in the argumentation framework

Naive AF



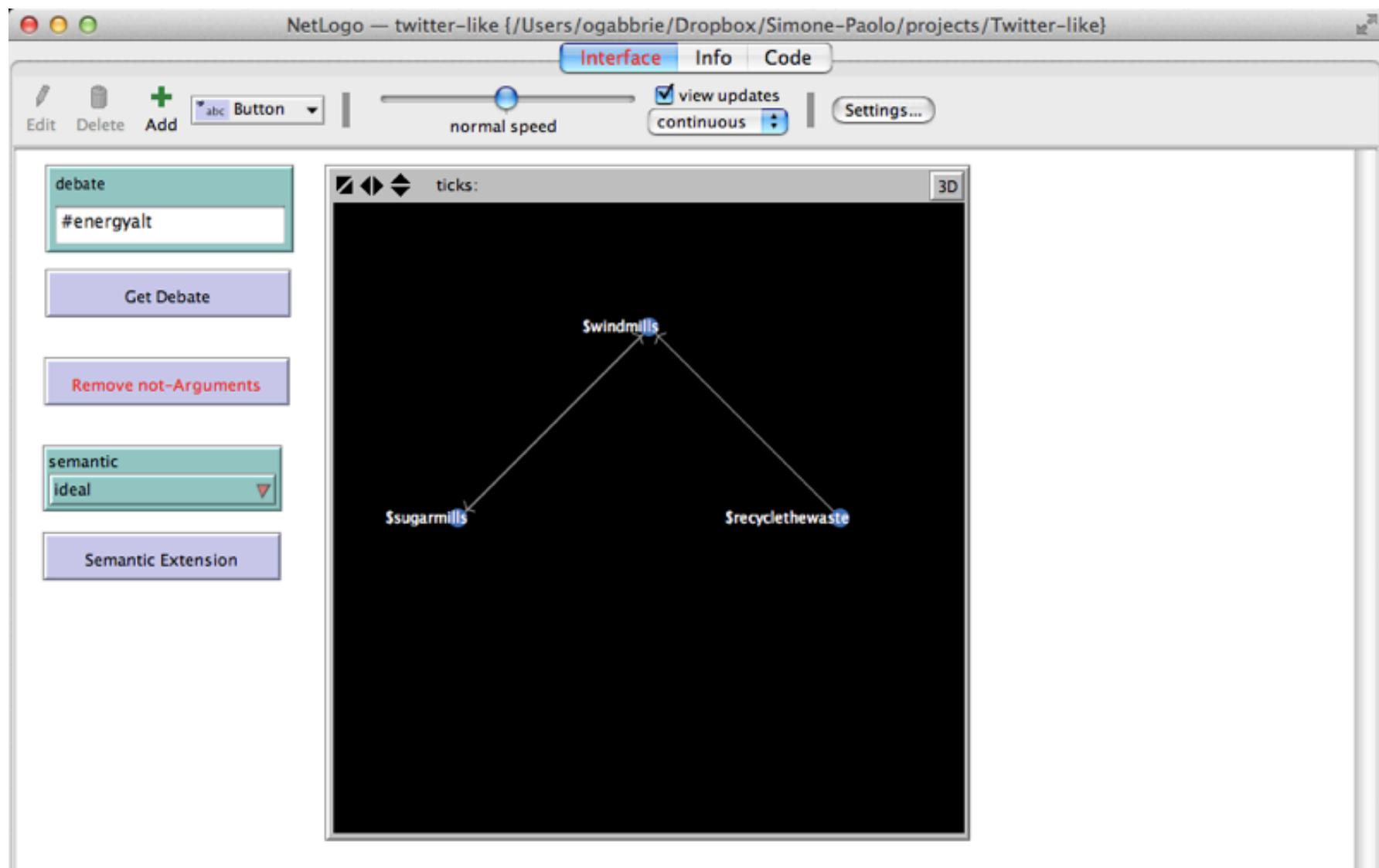
Command Center

```
observer> ask turtles [print (word "argument is: " label " and comments are: " comments)]
argument is: $windmills and comments are: [[Yes, but $sugarmills productivity is tied to sugar prices, while $windmills productivity is also tied to policy for selling energy, and in Brazil and]]
argument is: $recyclethewaste and comments are: [[$sugarmills consume 30%, but help to $recyclethewaste of sugar production... !$recyclethewaste productivity is also tied to policy for selling energy, and in Brazil and]]
argument is: $sugarmills and comments are: [[$sugarmills productivity is also tied to policy for selling energy, and in Brazil and]]
argument is: $norealgreenalternatives and comments are: [[I do believe you are leaving out the cost of both the plants ... $norealgreenalternatives productivity is also tied to policy for selling energy, and in Brazil and]]
```

From naive to **smart** AF

- We then propose **argument classification** as a way to verify if each node is a well-formed argument or not:
 - If, based on its comments, a node proves to be a well-formed argument, we keep it in the AF;
 - if, based in its comments, a node prove **not** to be a well-formed argument, we exclude it from the AF.

Smart AF



Command Center

```
observer> ask turtles [print (word "argument is: " label " and comments are: " comments)]
argument is: $windmills and comments are: [[Yes, but $sugarmills productivity is tied to sugar prices, while $windmills productivity is also tied to policy for selling energy, and in Brazil and other countries like India, there is a lot of wind power available. So, I think we should invest more in wind power. $windmills]]
argument is: $recyclethewaste and comments are: [[$sugarmills consume 30%, but help to $recyclethewaste of sugar production... !$recyclethewaste]]
argument is: $sugarmills and comments are: [[$sugarmills productivity is also tied to policy for selling energy, and in Brazil and other countries like India, there is a lot of wind power available. So, I think we should invest more in wind power. $sugarmills]]
argument is: $norealgreenalternatives and comments are: [[I do believe you are leaving out the cost of both the plants ... $norealgreenalternatives]]
observer> ask turtles with [label = "$norealgreenalternatives"] [die]
```

Enhanced Visualization

- finally, we compute semantic extensions (i.e., we find coherent group of arguments based on some criterion) on the **smart AF**, in order to visualise possible results of the discussion, thus helping policy-makers and citizens better understand what is going on in the discussion

Visualization

NetLogo — twitter-like {/Users/ogabbrie/Dropbox/Simone-Paolo/projects/Twitter-like}

Interface | Info | Code

Edit Delete Add view updates
normal speed continuous Settings...

debate
#energyalt

Get Debate

Remove not-Arguments

semantic
complete

Semantic Extension

ticks: 3D

admissible extension set(s) is: [[\$recyclethewaste] [\$recyclethewaste \$sugarmills] [\$sugarmills] []]
complete extension set(s) is: [[[\$recyclethewaste \$sugarmills]]]

Future work

- All the tools needed are partially implemented.
- Still missing:
 - argument classification to filter arguments and keep well-formed arguments only
 - experimental evaluation to test the effectiveness of this approach in a real-world setting.

Conclusions

- CON: work in progress
 - the tool is only partially developed (argument classifier still under develop.)
 - using our syntax, Twitter users may develop habits that could be different from what we expect, leading to unforeseen system behaviour
- CON: needs active engagement from users
- CON: high-risk action: many innovations required together
- PRO: allows deep analysis of arguers' position in a debate
- PRO: technology may be useful in many other domains:
 - it uses a multidisciplinary approach
 - valuable outcome of e-Policy project

Conclusions

- PRO: no need to manually analyse documents:
 - posts are annotated by users (a form of “crowdsourcing”: less qualified labor needed)
 - argument classification is automated (eliminates important bottle-neck)
- PRO: exploits wisdom of crowds (bottom-up argumentation), and as opposed to polls:
 - arguments arise bottom-up from the debate, it is not necessary that a single user expresses the argument entirely; many users can contribute
 - open approach (analysis dynamically visible to all users)

Readings

- Bench-Capon & Dunne, “Argumentation in artificial intelligence”, *AIJ* 171 (2007) 619–64
- Dung, “On the Acceptability of Arguments and its Fundamental Role in Non-monotonic Reasoning, Logic Programming and n-Person Games”, *Artificial Intelligence* (1995) 77(2): 321-358
- Mercier & Sperber, “Why do humans reason? Arguments for an argumentative theory”, *Behavioral and brain sciences* (2011) 34
- Toni & Torroni, “Bottom-up argumentation”, *Proc. TAFA-11 LNAI 7132*, (2012) 249-262

Thank you for
your attention!!!

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