































preted as a measure of similarity between two concepts in the discourse. A cluster of concepts indicates that the member concepts of this cluster most likely belong to the same argument or ideology.

Figure 5 applies the idea of an actor-based congruence network to the software patent conflict. It was a polarized political conflict in which two competing coalitions existed. The PCA data indicate that very few claims are neutral, while most of them are either clearly for or against software patents. To some extent, this polarization is already visible in figure 1, but the aggregation of individual actors into actor groups or categories somewhat obscures the real polarization of the conflict. However, if we employ discourse network analysis, there is no need to aggregate the actors.

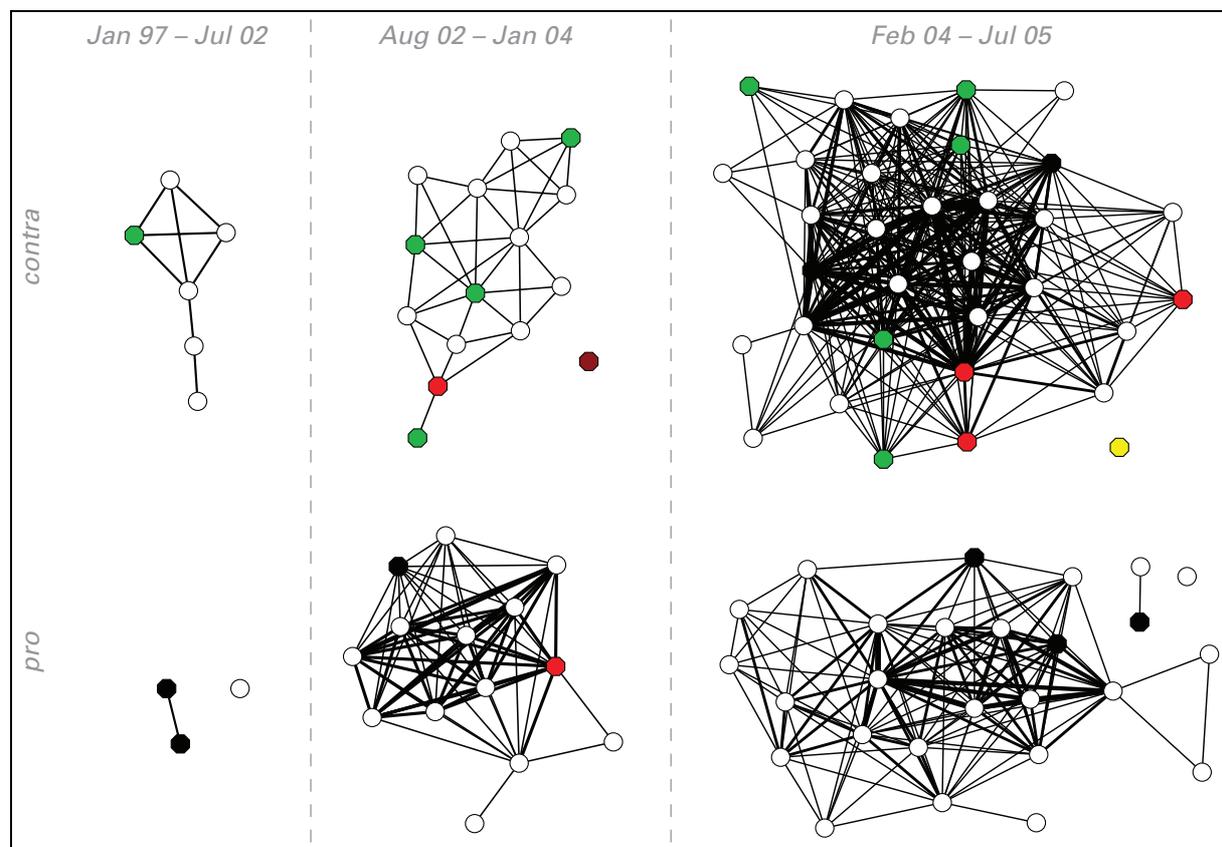


Figure 5: Congruence networks for three time periods: Jan 97 – Jul 02, Aug 02 – Jan 04, Feb 04 – Jul 05, from left to right

Note: Circles represent organizations while octagons are Members of the European Parliament (Greens/EFA green, PSE red, EPP-ED black, and GUE/NGL dark red). The pro-SWP coalition for each time period is in the lower half, the anti-SWP coalition in the upper half of the picture. Line width reflects the number of different frames two actors agree on. Actor labels have been omitted in order to improve legibility.

Figure 5 shows visualizations of the congruence network in the three periods presented in the political claims analysis of the software patents conflict.<sup>4</sup> The first wave of the discourse from January 1997 to July 2002 consists of the European Commission (the blue vertex) and two

<sup>4</sup> Due to the low number of claims in the first and the second period, we have combined them.

French Members of the European Parliament (MEP) who belong to the European People's Party (EPP-ED). The anti-SWP coalition consists of a Green MEP as well as several other actors. All actors except for the European Commission are based in France. The first wave of the discourse obviously takes place in the French press only. The remaining two waves are mainly composed of EU-level actors with some exceptions from various European countries. In all waves, there is absolutely no overlap between the coalitions in terms of statements, while agreement within coalitions is substantial.

Let us take a look at Members of the European Parliament. If MEPs are aggregated at the level of political groups and over time, the two largest groups PSE and EPP-ED connect the two coalitions (cf. figure 6). Once broken down to the individual level and different time periods as in figure 5, however, the apparent broker role of the two biggest political groups disappears. Rather than mediating between the coalitions by taking up frames from both camps, PSE and EPP-ED are deeply divided between the two camps. Not a single MEP moves from one coalition to the other over time or adopts positions from both coalitions. This solves the puzzle which the political claims analysis in the previous section has revealed: the moderate position of the MEPs on the one-dimensional scale of figure 1 disappears and turns into extreme positions if MEPs are treated individually. The fact that the MEPs, although appearing rather moderate, tend towards the anti-SWP position on average can be attributed to the fact that a number of Green MEPs argues consistently over all time periods against software patents.

Another interesting finding from the congruence networks is the differential internal coherence of the coalitions: in the first two waves, we can observe that the anti-SWP coalition is not very clustered or dense (global weighted clustering coefficient: 0.75 and 0.56, respectively; density: 0.32 and 0.36) while the pro-SWP subgraph – as a result of a common statement by most of its members – is almost completely connected in the second wave (clustering: 1.51; density: 0.77). In the third time period, the pattern is reversed: the anti-SWP coalition develops a rather consistent line of reasoning (clustering: 1.33; density: 0.77) while the coherence of the pro-SWP coalition is slightly diminished (clustering: 1.28; density: 0.55). The increased internal coherence of the opponents of software patents could be an explanation of their success in forestalling the software patents directive: the more coherent a coalition appears in the public sphere, the more able it is to convince key decision-makers and voters. Future research may show whether this hypothesis withstands comparative empirical tests.

### *Conflict networks*

So far, co-occurrence networks of actors or concepts have been representations of similarity between actors or between concepts. However, there is another piece of information hidden in the original data: conflictual relations, or dissimilarity between vertices. For example, one actor makes a claim in a positive way while another actor makes the same claim in a negative

way – in other words, one actor rejects the claim of the other actor. Conflict ties can be expected to be prevalent between the clusters of a congruence network, but not within clusters.

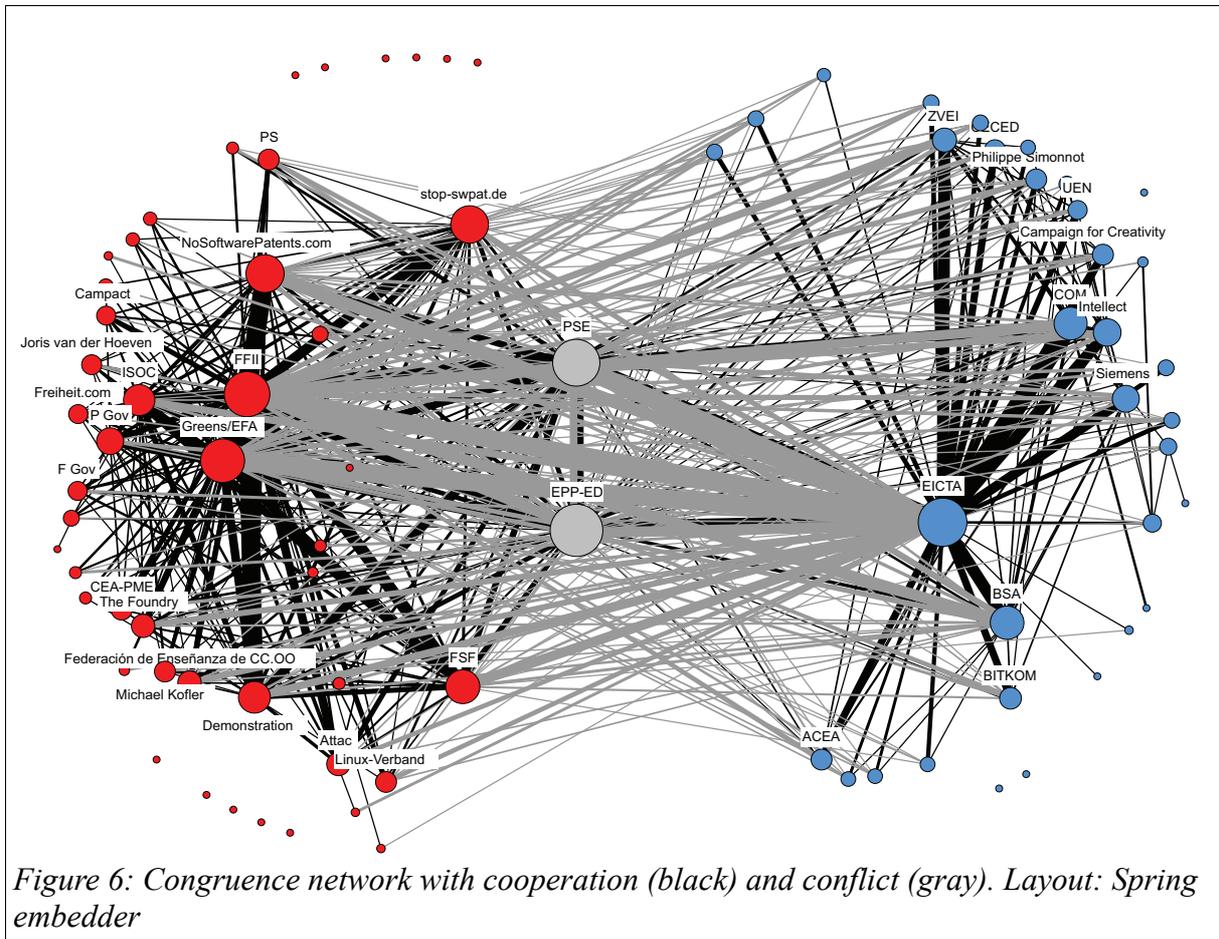


Figure 6 presents a multiplex view of the actor network over all time periods, with black edges representing congruence and gray lines conflict ties, i.e., direct contradictions between actors on the same frame. As expected, the congruence relation exhibits strong bipolarity between the coalitions. The more interesting question, however, is whether the camps simply occupy different, non-overlapping topics or whether they actually refer to the same contested frames and try to re-frame them according to their policy goals. The gray edges strongly suggest the latter. Conflict ties are in fact rare within congruence coalitions, but very prevalent between them. This can be confirmed statistically by considering the QAP correlation of -0.67 between congruence and conflict. The more frame congruence between two actors, the less likely are conflict ties. The result corroborates the intuition that frame amplification and re-framing are important strategies in the public discourse, as set out in the political claims analysis in the previous section and as suggested by the initial analysis of the affiliation network.

### *Dynamic discourse networks*

As pointed out in the description of figure 5, political discourse is essentially a dynamic rather than a stable phenomenon. Discursive interactions are conditional on past interactions. One way to measure change over time is to subdivide the whole discourse into several time slices. We have done this in the analysis of the four waves of the software patent conflict. Beyond simply comparing static pictures, it is possible to use dynamic network visualization tools in order to visualize the changing roles of actors in an animation.

This is basically a discretization of time, which is actually continuous. However, by using discrete time steps, one may lose some information. Generating a continuous-time animation would be desirable. The above-mentioned software Discourse Network Analyzer offers several more nuanced ways to create dynamic discourse networks or to aggregate dynamic data into static representations. The description of these longitudinal algorithms, however, is beyond the scope of this article (see Leifeld 2010a; Leifeld 2010b for details).

### **Advantages of discourse network analysis**

Political claims analysis and discourse network analysis share the insight that statements should be the primary unit of measurement and analysis, and that actors and concepts should be analyzed simultaneously. But what are the advantages of discourse network analysis over political claims analysis?

Firstly, political claims analysis assumes that a discourse surrounding one issue is one-dimensional. Actors and frames are marked on a range from -1 to +1, designating opposition or support. This is also true of other text analysis approaches like the Wordscore project (Laver et al. 2003). Discourse network analysis conceptualizes political discourse as multidimensional, and one of the key insights it can generate is the number of cleavage lines that are actually empirically present in the discourse. Depending on the concepts used to code the data and the scope of the actors, it becomes possible to identify sub-topics and sub-coalitions in a policy subsystem. Political reality is complex, and discourse network analysis is a suitable tool to reduce this complexity to a degree that is interpretable by the researcher. A visualization of a discourse network immediately reveals how each single actor or concept is embedded in the discourse. At the same time, it is possible to assess the overall topography of the discourse and identify cleavage lines and roles of actor types. Many studies provide only anecdotal evidence for the existence of adversarial coalitions and changes in their composition. Apart from using visualizations directly as explanations (Brandes et al. 2006), network-analytic methods like blockmodeling or centrality (Wasserman & Faust 1994) can be employed to measure network properties in a more reliable and valid way.

Secondly, discourse network analysis allows to distinguish neutral concepts from highly contentious concepts which are only neutral on average. In political claims analysis, both kinds of frames are placed in the middle of the one-dimensional scale: positive statements receive a

score of +1 and negative statements a score of -1. Positive and negative instances of the same frame are summed up, and the balance is taken as a measure of the pro or contra affiliation of a concept. It does not make a difference if a concept is ten times neutral, or if it is cited five times in a positive way and five times in a negative way. In discourse network analysis, neutral statements do not exist. If a concept is highly disputed, this is visible in the affiliation network because actors from one camp will cite the concept in a positive way, while actors from the other camp will cite it in a negative way. If the pattern is less clear-cut between the camps, the concept is more neutral.

Thirdly, discourse network analysis allows to track changes in the discourse over time. Political claims analysis offers time series graphs of discourse activity and of the number of positive and negative citations at each time step. Discourse network analysis allows to observe if an actor leaves a coalition and joins another coalition over time, or if a formerly united discourse is polarized and develops two or more distinct clusters of concepts over time. This meets the demand of policy network scholars who have called for dynamic policy network analyses for a long time (McAdam 2003). The collection of network data is usually costly, so there have been only few longitudinal network studies. Discourse network analysis allows to accomplish this task, albeit for the sake of changing research questions away from (material) coordination as in the policy networks approach towards (latent) preference similarity. Dynamic discourse network analysis also meets the demand of scholars interested in longitudinal changes in policy ideas and learning (Hall 1993, p. 290ff.).

Fourthly, discourse network analysis can be nicely combined with other policy network approaches. Methods such as QAP regression (Krackhardt 1988) or exponential random graph models (Robins et al. 2007) provide means to treat discursive ties as covariates of other network relations.

Fifthly, the approach presented here can be conceived of as a lens through which a discourse can be observed. Therefore it is not only applicable to empirical data. Discourse network analysis could be employed to understand the results of computational models of discourse or to theorize about discourse-related behavior of actors.

Finally, discourse network analysis is flexible regarding the type of concepts used in the analysis. Discourse network analysis is not confined to the analysis of frames. It can be applied to the actors' choice of solution concepts (Hall 1993), linguistic peculiarities or symbols (Wodak & Meyer 2009), beliefs (Sabatier & Weible 2007) or interpretive frames (Hajer 1995), as in our analysis of the software patents conflict.

## **Conclusion**

In this article, we have proposed a new methodology for the analysis of political discourse which is complementary to existing approaches such as political claims analysis. Moreover,

we have applied this approach to the European conflict about software patents. As for the software patent case study, the analysis in the preceding sections has produced a number of interesting findings and hypotheses:

- The constellation shows all elements of a highly politicized conflict. The actors are split into two very distinct discourse coalitions which do not share a single conviction. However, topical overlap between the coalitions is large, and conflicts between the coalitions (but not within coalitions) are prevalent.
- The European parties do not act as brokers between the discourse coalitions. Individual MEPs rather stick to one or the other coalition. This runs counter to models of policy-making where parties take intermediary positions (e.g., the role of brokers as hypothesized in the Advocacy Coalition Framework, or the moderating role of parties in pressure pluralist or neo-corporatist systems).
- Over time, the internal coherence of the anti-SWP coalition increases while the internal coherence of the pro-SWP coalition decreases. We interpret this as a learning process in which the emerging oppositional coalition first has to develop a shared collective action frame. Once this unifying frame has been established, it has certainly improved the chances of the anti-SWP coalition to impede the SWP directive.
- The anti-SWP coalition is able to reclaim important economic frames in the last stage of the political discourse while the pro-SWP coalition is left with value-laden arguments and some highly contested economic frames, which may have further contributed to the defeat of the pro-SWP coalition.

These substantial findings demonstrate that discourse network analysis is capable of producing insights which were previously unobservable when relying on conventional approaches. Particularly, the discourse network framework allows to

- track the evolution of a discourse over time,
- observe the overall topography of the discourse on the actor level, concept level or a combined display, thus providing the missing link between actors and concepts,
- measure discourses in a multidimensional way, rather than imposing a one-dimensional, reductionist constraint on the data, and
- distinguish neutral from contentious concepts, something that political claims analysis is only able to accomplish in a qualitative way.

However, there are potential limitations of this approach that researchers should keep in mind: archival data like newspaper articles, position papers or parliamentary protocols answer different research questions than interviews or participant observation. While the former are tailored for policy learning and discourse theories like the Advocacy Coalition Framework, the latter may be able to explain policy change by reverting to power positions, bargaining or institutions. Integration of these factors into a discourse network analysis is only possible on a qualitative basis at the present time. A policy network analysis of the same conflict (Haunss &

Kohlmorgen 2010), which uses more diverse data sources (interviews, newspaper articles, documents, web pages), shows that the discourse network generated from newspaper articles only partially represents the actors involved in the conflict. Public discourse represented in newspapers is skewed toward certain actors. Particularly MEPs are highly visible in the media, which probably overstates their ability to shape the political conflict. Conversely, many smaller organizations, NGOs and individual actors are underrepresented in the news if compared with the conflict network (Haunss & Kohlmorgen 2010). Consequently, the analysis of discourse networks should be combined with conventional methods. It is well equipped for this task because its data structure is largely compatible with policy network analysis.

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