Chapter 17
Using Graph Theory Software for Political Discourse Analysis

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ABSTRACT

In this chapter, the authors show how, using graph theory, one can make a content analysis of political discourse. The premises of this analysis are: we have a corpus of speech of each party or candidate, as empirical data; speeches convey economic, political, and socio-cultural values, these taking the form of words or word families; there are interdependences between the values of a political discourse; they are given by the co-occurrence of two values, as words in the text, within a well-defined fragment or they are determined by the internal logic of political discourse; established links between values in a political speech have associated positive numbers indicating the "power" of those links; these "powers" are defined according to both the number of co-occurrences of values and the internal logic of the discourse where they occur. In this context, the authors highlight the following: a) the dominant values in a political speech; b) groups of values that have ties between them and have no connection with the rest; c) the order in which political values should be set in order to obtain an equivalent but more concise speech compared to the already given one; d) the links between the values that form the "core" political speech; and e) one can get from one value to another by using as few words as possible from the discourse to be analyzed.

1. INTRODUCTION

There are several computing methods for text analysis. We are interested in methods for summarizing a discourse, or methods for extracting relevant information from a text. The problem of extracting the relevant aspects of data, either text or image, is an important aspect, treated in computational linguistics with mathematical methods. Many times, this problem faces complex modeling of data. For example, Tishby, Pereira and Bialek (1999) describe the information bottleneck method. In (Chechik and Tishby, 2002) it is presented how to extract relevant structures with side information for text data, (Chen and Lin, 2000) proposed a multilingual summarizer for news posted on the web. They proposed an architecture of multilingual news summarizer, including monolingual and multilingual clustering, and similarity measure among meaningful units. START (see (Katz, Borchardt and Felshin, 2006)) is a natural language question answering system, developed at MIT (http://start.csail.mit.edu/). START aims to supply users with "just the right information," instead of merely providing a list of hits. In (Patrut, Furdu and Patrut, 2008) it is described a method for constructing a question answering system for a text describing a social context, based on some pragmatic particularities of verbs describing actions or feelings that can appear between two human beings. In this chapter, we show how, using graph theory, we can extract relevant information from texts. Even our perspective uses political speeches or party programs as empirical data, our approach can be extended to other texts that refer to some *values*. In our paper we will refer to key terms in a discourse as *values*. Political discourses will contain political, economic, and socio-cultural values. These are required in order to make a content analysis of a political discourse.

In this context we intend to highlight the following: (a) Which is the dominant value in a political speech? (b) Which groups of values have ties between them and have no connection with the rest? (c) Which is the order in which political values should be set in order to obtain an equivalent but more concise speech compared to the already given one? (d) Which are the links between values that form the "core" political speech? (e) How can one get from one value to another by using as few words as possible from the discourse to be analyzed?

2. ELEMENTS OF GRAPH THEORY IN THE CONTEXT OF POLITICAL DISCOURSE

In social and political sciences, the *graph theory* is usually used when dealing with social networks, recruitment into political movements, and diffusion of information, study of markets, social organizations, and military intelligence. For example, Kitsak, Gallos, Havlin et al (2010) wrote on the influential spreaders in networks. The social networks are related to the main topic of graph theory. Graph theory is the study of graphs. The *graphs* are mathematical structures used to model pairwise relations between objects from a certain collection. As objects we can consider individuals (like in social networks) but even words from a text. In this context1, a graph is a collection of *nodes* (or vertices) and a collection of *edges* that connect pairs of nodes. In a formal manner, the *graph* means a couple G = (N, E), where *N* is a finite non-empty set of nodes, and *E* is a finite set of edges. Edges are pairs of nodes. If the order of nodes from an edge is important, then the graph is called *directed graph*, otherwise called *undirected graph* (see (Diestel, 2012) for details). Subsequently, we will refer only to undirected graphs as they are used by the *Political Analyst* program, developed by us and presented in sections 5 and 6.

Considering a political discourse context, an example of a graph is the following:

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