



Competitive Strategies of U.S. Presidential Candidates in Election Campaigns

A. S. BELENKY

NISTRAMAN Consulting, P.O. Box 1314, Brookline, MA 02446, U.S.A.

(Received June 2004; accepted July 2004)

Abstract—The structure of the Electoral College based U.S. Presidential elections system suggests a certain approach to choosing campaign strategies by U.S. Presidential candidates, and problems associated with finding competitive strategies of the candidates are considered. Most of the problems are formulated as discrete mathematical programming ones or as those with mixed variables, whereas some of the problems are formulated as game ones. Approaches to solving all the considered problems with the use of both widely available and experimental software are proposed. © 2005 Elsevier Ltd. All rights reserved.

Keywords—Discrete optimization problems, Games on polyhedral sets, Problems with mixed variables.

1. INTRODUCTION

The U.S. Presidential elections system is unique and very logically designed although rather complicated for understanding in depth [1]. From the author's viewpoint, this system has not been studied to a degree allowing one to understand, in particular, how quantitative regularities embedded in the system affect campaigns of U.S. Presidential candidates. Only a few publications address some of these problems and propose certain approaches to their solving in particular cases (however, mostly, when only two candidates really compete in the race) [2–5]. At the same time, the Electoral College mechanism proposed by the Founding Fathers in the form similar to that used in the Centurial Assembly system of the Roman Republic [6] immediately suggests a manner in which U.S. Presidential candidates may design their campaigns. Namely, according to the U.S. Constitution, each of 51 places (states and the District of Columbia (DC)) appoints a particular number of the electors, and this number is subject to corrections every ten years [7]. The “winner-take-all” principle determines a manner in which a U.S. Presidential candidate who receives a plurality of the popular vote in each of the states (except for Maine and Nebraska) and in DC is awarded the whole number of the electoral votes which each such state or DC appoints in the election [8]. To win a particular U.S. Presidential election in the Electoral College, the successful candidate must receive a majority of the whole number of the electoral votes that are in play in the election. Currently, such a number does not exceed 538, and the above-mentioned majority can vary depending on this number.

It is clear that winning a plurality of the popular vote in a particular state and DC implies extensively campaigning there, which requires monetary and time resources. It is natural to assume that these resources are limited for each U.S. Presidential candidate in each U.S. Presidential election. So it is expedient to solve a problem of finding such combinations of states and DC the winning of the electoral votes in which secures the winning of the election in the Electoral College for a particular U.S. Presidential candidate while the total amounts of both resources fall within the limits existing for the candidate. Such a problem is easily formulated as a discrete optimization one of a particular kind, namely, as a Boolean knapsack problem (with an additional constraint) [9,10], and its solution determines possible ways of designing campaigns for U.S. Presidential candidates.

It turns out that this problem is not the only one which U.S. Presidential candidates' teams could be interested to consider; however, even this problem appears in several modifications. In particular, as long as winning a plurality of the popular vote in each state and DC can, generally, be attained only with a certain probability, approaches to allocating the resources depending on such probabilities for the states and DC are also expedient to consider.

The present article addresses the above-mentioned problems, along with others relevant to them, and suggests mathematical models for a formalized analysis of all the considered problems, as well as approaches to solving these problems. In all considerations throughout the article, for the sake of simplicity, we use current values of some parameters of the U.S. Presidential elections system. In particular, we assume that, for instance, the total number of the electoral votes that are in play in the election under consideration equals 538, and no stipulations on this matter are further made.

2. PROBLEMS OF ALLOCATING MONETARY AND TIME RESOURCES IN CAMPAIGNS OF U.S. PRESIDENTIAL CANDIDATES

Let A_1, A_2, A_3 be subsets of numbers from the set of natural numbers $H = \{1, 2, \dots, 51\}$, such that $A_1 \cup A_2 \cup A_3 = H$ and $A_1 \cap A_2 = \emptyset$, $A_1 \cap A_3 = \emptyset$, $A_2 \cap A_3 = \emptyset$. It is further assumed that each number from 1 through 50 is attributed to only one of the fifty states so that different states are attributed different numbers, whereas the number 51 is attributed to the District of Columbia.

Throughout this article, A_1 means a set of places (states and DC) in which a particular U.S. Presidential candidate (the candidate further in the article) believes that he or she can *a fortiori* win all the electoral votes that are in play there in a particular U.S. Presidential election, A_2 means a set of places (states and DC) in which that candidate cannot win the electoral votes in the election (from his or her viewpoint), and A_3 means a set of the so-called "toss-up" places (states and DC) in which the candidate has, eventually, a chance to win the electoral votes [5]. It is convenient to call states and DC places, meaning parts of the country which are entitled to appoint the electors, in order to avoid repeatedly distinguishing the states and the District of Columbia in the reasoning to follow in this article.

Further, let [5]

- x_i be equal 1 if place i is included in a combination of the places, and be equal 0, otherwise, $i \in H$,
- a_i be the number of the electoral votes that place i appoints in a particular election year,
- l^3 be the minimal number of the electoral votes to be won in places forming the subset A_3 in order to win the U.S. Presidential election in the Electoral College so that $l^3 \leq m^3$, where $m^3 = 270$,
- $m^3 - l^3$ be the number of the electoral votes secured for the candidate in places forming the set A_1 in the election,

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات