MAS APPROACH TO POLITICAL PROSPECTION AND ALLIANCE ANALYSIS

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Abstract

The generalization of the Lotka-Volterra model (GLVM), to the N agents case is used in this contribution. The model is applied to model party alliances before election processes, as well as to prospect the final horizons of different candidates in Argentinian future elections which will take place on October 2011. The parameters of the model are setting using public polls. Romanian polls are used to validate the ansatz about the meaning of the parameters considering the available data, as this election results are known.

Key-words: *Multi Agent Systems, Politic analysis, Behaviour; Socio-economic uncertainty, New paradigms*

1. Introduction

The high complexity of human individuals, and the relations among them, or demand to apply new methods to describe the continuous change of social paradigms characterizing contemporary society [1,2] [3], [4]. In this contribution we applied a generalized Lotka-Volterra (L-V) model applied some years ago by [5], to describe the competition between web sites, and more recently to find hung scenarios and contrarians dynamics in sociology [6], to analyse, modeling and forecast actual voting process. One problem is to define which data (polls) are represented by the model parameters, as well as if the *ansatz* we made, is or not correct. In order to do so we deal with public polls (newspapers, wikipedia) for two different countries Romania and Argentina. It deserves a special paragraph to explain why this two countries. There are several reasons to do so, among which we can enumerate the following: a) both democracies are relatively young (Argentina since 1983, Romania, 1989), b) Argentina is a presidential and Romania a semi presidential representative democratic republics.

sed the western naming convention, with given names preceding surnames. This determines the structure of the names in the running heads and the author index.

Meantime the President of Argentina is both head of state and head of government, Romania has President and Prime Minister Charges; c) Both have Senate and Chamber of Deputies. In the Argentinean case the Senate President is the Nation Vice President and they are elected as a whole. Instead in Romania President and Prime Minister may come from different parties. Once elected the President remains independent. d) Both electoral systems have ballotage, and e) probably the most important there are more than two or three structured parties which give rise to a game of alliances. Briefly, in this contribution we look for the political horizons of the members of a given political system, in terms of the

L-V model. In this sense the different candidates are "agents" of the system, whose chances are measured by polls. No political considerations are taken into account, neither the simulations to be presented reflects political opinions of the authors. Only public information has been used.

2. **The model**

The model is written as [5]

$$\dot{s}_i = \alpha_i s_i (\beta_i - s_i) - \sum_{i \neq j} \lambda(s_i, s_j) s_i s_j \quad \text{for} \quad i = 1, .., n \tag{1}$$

For the present case, s_i, is the probability of winning elections for the candidate i (agents) at each time. The summation the s_i is equal 1, as we want to have probabilities. The parameters of the model deserve special attention. The α_i parameter, interpreted here as the growth rate of the candidate i. The meaning of this parameter is associated with how the positive image of a given candidate increases or decreased. So, making the differences between the different polls along time, the variation of the positive image can be measured and a value to the α_i parameter can be assigned. However polls have been not designed with enough refinement for allowing to assign values to this parameter. For this reason the neutral assignment for this parameter is $\alpha_i = 1$, for all the candidates. The β_i for candidate i capacity to satisfy the society requirements (vote capture ability). The $\lambda(s_i s_j)$ are here reduced to $\lambda(i, j)$. Their values represent the strength of the competition (maximum +1) or collaboration (maximum -1), and are fixed at the initial time of the simulations and remain fix along the iteration process, in the present approach. Notice that $\lambda(f_{i,f_j})$ is a matrix, and in the present case only +1 (competition) and -1 (collaboration, alliances) values are considered for i,j agents. Further details for $\lambda(f_{i,f_j})$ matrix varying with time are given in [3]. The initial condition of each agent is taken as the inverse of the negative image unless another criterion is explicitly mentioned.

The Romanian case. As we have said in the introduction we will use the 2009 Romanian electoral process to validate the use of the polls' information we are doing. After validating our *ansatz* about the meaning of the L-V model in a highly competitive system, like the political one, we will used for analyze the

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future 2011 electoral process according with the available data, extracted from newspapers. We will consider for the Romanian case, the CCSB July 2009, far from the elections which took place on November 26, 2009 and ended on December 6. As we know the final results of that election, as well as the alliances took place, we can "prospect" chances of different alliances, and compare them with the result. So the mechanisms involved in the L V model can be validate. Let us start with the following data Poll CCBS July 2009 (public data [7]):

Table 1

Poll CCBS July 2009

Candidate	Positive image	Party
Sorin Oprescu	0.48	Independent
Traian Basescu	0.37	PDL
Crin Antonescu	0.35	PNL
Theodor Stolojan	0.34	PDL
Mircea Geoana	0.32	PSD
Emil Boc	0.27	PDL

According with Table 1, we prospect the horizon of each agent of the Romanian political system, assuming the following considerations: a) positive percentage represents the positive image, and it is represented by the β_i parameter; b) the remaining percentage is the negative image and is used to determine the initial conditions of each agent, taken them as the inverse of the negative image. Simulations, as well as initial conditions have been normalize to have probabilities. So: s_i are: 0.135, 0.164, 0.169 0.171, 0.1770 and β_i are: 0.480, 0.370, 0.350, 0.340, 0.319, 0.270, respectively. The $\lambda(i, j) = +1$ for all the simulations (competitive scenario), unless some alliance is explicated. The β_i, interpreted here as the growth rate of the candidate i are equal to $+1$, in all simulations, as we have explained in previous Section. Numerical simulations according with data from Table 1 are plotted in Fig. (1).

Besides it is possible to consider the so called **Cases A and B** of the same poll, with identical considerations as above. The difference between both is the inclusion or not of one of the Romanian system of political agents.

Simulations with data from Table 2 data are shown in Fig. (2). The **Case B** of the Poll CCBS July 2009, is given in Table 3, and simulations with this data arc plotted in Fig.3. Parameters in Fig.3 are normalized to 1: $s_i(0)$ are: 0.296, 0.250, 0.238, 0.214 and β_i are: 0.340, 0.221, 0.180, 0.0900, respectively. Fig.(1), Fig.(2) and Fig.(3) have been done using very sharp data, as only the positive image was measured, so the negative image is considered as I-positive image. However it is easily seen from them that: a) the assumption that positive image can be used as

β_i values is correct; b) always there is only one winner player very far from the rest if some sort of collaboration (alliance) is not constructed among the rest.
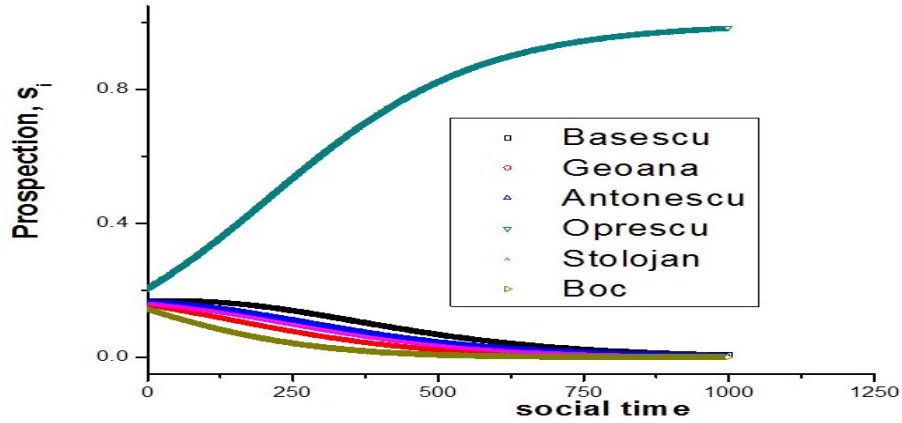

Fig. 1. *Prospection according with parameters given in table 1*

Table 2

Poll CCBS July 2009 Case A

Candidate	Positive image	Party
Traian Basescu	0.37	PD-L
Mircea Geoana	0.242	PSD+PC
Crin Antonescu	0.207	PNL
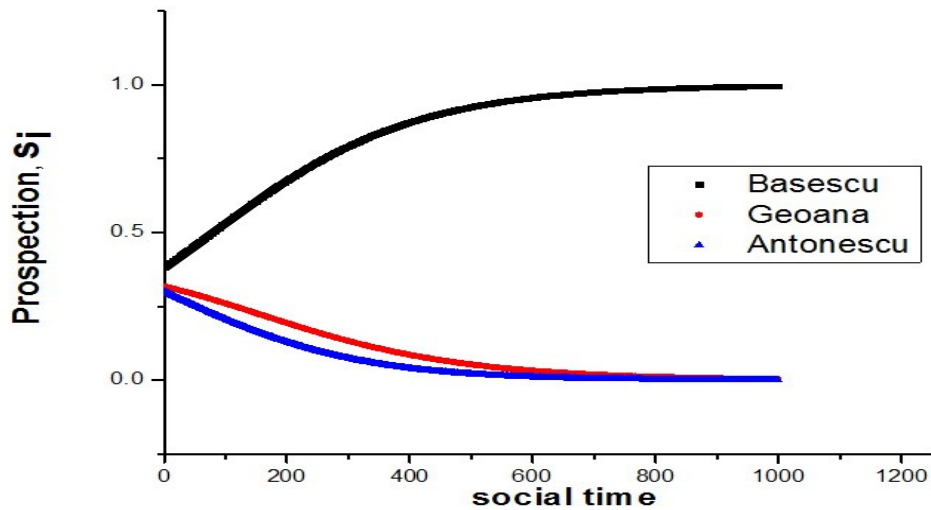
Fig. 2. *Prospection according with parameters given in table 2*

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Table 3

Poll CCBS July 2009 Case B

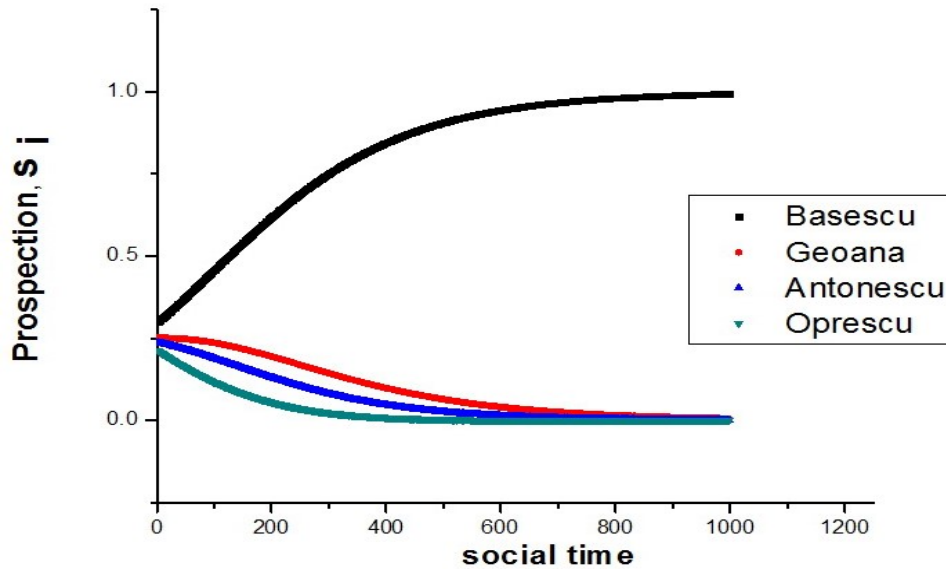| Candidate	Positive image	Party
Traian Basescu	0.34	PD-L
Mircea Geoana	0.221	PSD+PC
Crin Antonescu	0.182	PNL
Sorin Oprescu	0.09	Independent

Fig. 3. *Prospection according with parameters given in table 3*

Alliances. Considering the facts outlined in the previous Section, some alliance should be constructed. From Fig.(l), Fig.(2) and Fig.(3) it is possible suggest that political agents can decide some sort of alliance. From Fig.(2) the alliance to have a chance is unavoidable, which means that an alliance between PSD and PNL between PSD and PNL will be taken place. On the other side, Table I suggests that the positive image of Sorin Oprescu allows this candidate to try to keep aside any alliance. Following the data of Tables 1, 2 and 3 we can imagine an scenario where: $s_i(0)$ are: 0.5, 0.2, 0.2, 0.1, and β_i are: 0.370, 0.350, 0.320, 0.480. The initial conditions are estimated considering the differences in the horizons plotted in Fig.(3) and positive images according to Table I for the candidates mentioned in Table 3. Alliance between PSD and PNL are taken into account through the $\lambda(i, j)$, parameters. This scenario is plotted in Fig.(4).
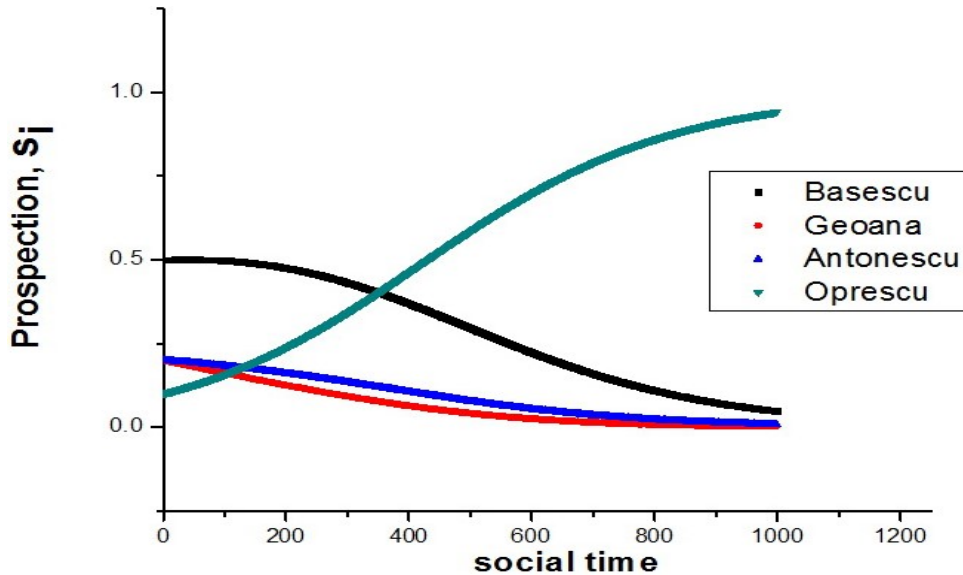
Fig. 4. *Prospection for the following parameters (see text) $s_i(0)$ are: 0.5, 0.2, 0.2, 0.1 and β_i are: 0.370, 0.350, 0.320, 0.480*

Learning from Romanian polls. We can select the poll as far as possible to the electoral process. The parameters have been settled as: $\alpha_i = 1$, the growth rate of the candidate, as no more refined information is available; β_i, candidate i capacity to satisfy the society requirements (vote capture ability), the positive image, the $\lambda_{i,j}$) values represent the strength of the competition (maximum +1) or collaboration (maximum -1), and the specific scenario are detailed below figures. These values are fixed at the initial time and remain fix along the iteration process. The initial condition of each agent is taken as the inverse of the negative image, except in case of Fig.(4). As it could be seen since July 2009 Oprescu and Basescu horizons were difficult to reach for the other candidates. When Oprescu is not taken into the simulations, Basescu is able to leave the other candidates far from him. For the other two candidates, even in alliance it is not easy to reach the Basescu's horizon. In Fig.(4), it could be seen that at social time 400 (around September 2009, departing from the July 2009 poll), the Oprescu chances increases very fast. In brief, we consider that our *ansantz* concerning how to connect data with parameters is reasonable and can be used for the Argentinean case.

Prospecting Argentinean elections

Taken into account the validation we made with the correlation between parameter and data polls, we will analyze different scenarios according with a polls made by Management and Fit, (February 9,10 2010, sample 1212 persons) published at [8] February 21, 2010. Argentinean elections will take place on

October 2011. Table 4 shows more details about candidates' images, which are not shown as we restrained the data to good and bad images information. The values for the parameters using the criteria applied in Romanian elections are: $s_i(0),0.258$, 0.072, 0.102, 0.093, 0.050, 0.037, 0.090, 0.089, 0.067, 0.1375 and β_i are: 0.83, 0.294, 0.21, 0.229. 0.428, 0.572, 0.273. 0.24, 0.31. 0.156, respectively. Simulations results are plotted in Fig.5. Data of Table 4 are prospected in Fig.5.

Table 4

Poll Management and Fit. February, 2010

Candidate	Good image	Bad image
Hermes Binner	17.8	831
Elisa Carrio	28.8	29.11
Julio Cobos	38.2	21
F. de Narvaez	35.7	22.9
E. Duhalde	17.6	42.8
N. Kirchner	19.3	57.2
M. Macri	30.3	23.7
C. Reuteman	34.4	24
D. Scioli	26.6	31.8
P. Solanas	26.8	15.6

Conclusions

The generalization of the Lotka-Volterra model (GLVM), to the *N* agents case is used in this contribution. It is applied to model party alliances before election processes, as well as to prospect the final horizons of different candidates in Romanian past elections and Argentinean future elections which will take place on October 2011. The parameters of the model are setting using public polls.
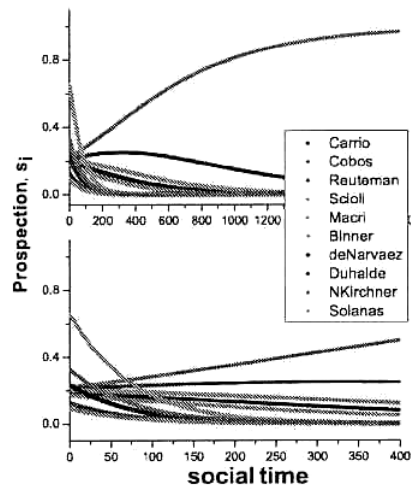

Fig. 5. *Prospection according with parameters given in text. Upper: long time interval.* Lower: Short time interval.

Romanian polls are used to validate the *ansatz* about the meaning of the parameters considering the available data, as this election results are known. The agreement with simulations done with the Romanian case encourages to insist with this approach. Fig. (5) shows Argentinean candidates horizons according to Table 4. At short social times candidates with low bad images have good chances. Long time prospection shows that the candidate with better positive image is the winner as in the Romanian case. At the time this contribution has to be ready, only one public Argentinean poll was available, so, no further protections can be made and simulations related with alliances among candidates would be very speculative as the information is still insufficient.

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