Defining strategies to win in the Internet market

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Abstract

This paper analyzes a model for the competition dynamics of web sites in the Internet, based on the Lotka–Volterra competition equations. This model shows the well known appearance of a winner-take-all characteristic and is based in the nonvalidity of traditional offer and demand equilibrium theory of these kinds of markets. From the stability analysis of the model, we establish a series of rules which are useful for defining strategies in the Internet market. One of the most important results that emerge from this simple model is the appearance of some unexpected phenomena related to the collaboration and competition between sites. © 2001 Elsevier Science B.V. All rights reserved.

1. Introduction

One of the most important drawbacks when planning the development of web sites is the absence of realistic mathematical models of the Internet markets. In the same way in which we can find models for the different phenomena in the traditional economy (equilibrium models, offer and demand models, competition models, etc.), it could be useful to develop mathematical explanations for the Internet business. In the past few years, some models of the competition dynamics of the Internet, and other phenomena related to the World Wide Web, have emerged [1–3]. Precisely, in Ref. [1], a model based on the Lotka–Volterra competition equations for *n* variables was first used

considering complete symmetric conditions for the competition parameters. In this paper, we are using the same model for the case of three variables, since it is the simplest to account at the same time for collaboration and competition. The model does not consider any random effects, which could be desirable for a more real description. However, we want to point out that our main interest resides in the competitive dynamics of the model. Furthermore, we believe that this is a good starting point to gain a better understanding of the dynamics of the web sites. Seasonal effects, which might be modeled by external periodic perturbations or random perturbations, to take into account fluctuations on the system or the unpredictable behavior of the Internet users, could be useful in further developments. Stochastic effects for a generalized Lotka–Volterra model have been included in Ref. [4].

One of the main objectives here is to show how unexpected behaviors of these markets are predicted by simple models. Results from our analysis make it possible to obtain some rules, which can be useful to understand the competitive dynamics between the different web sites. As a matter of fact, one of the conclusions of our work is that very new and interesting phenomena emerge from the models when cooperation between sites is considered. In the same way in which some kind of ants and mushrooms cooperate in particular ecosystems complementing its capabilities and surviving like a single being, little web sites can collaborate with each other to avoid being destroyed by powerful Internet corporations. Even more interesting is the fact that the cooperation between sites drives to better economic results in terms of investment revenues. Numerical simulations show that the investment necessary for new companies to get into a particular Internet market segment is higher when one tries to accomplish it by developing a large single site. The cost can be extremely reduced by introducing little cooperating sites that complement its contents and services.

The organization of this paper is as follows: First, we describe the mathematical model and compute the fixed points and its stability. These results are used later to perform an analysis of the different kinds of markets. This previous analysis is used to define strategies for the web sites. Finally, a critical review of the model is performed and the conclusions are presented.

2. Description of the model

Every real-world market is complicated enough to be never fully explained by a mathematical model; nevertheless, we can create very simple models of market segments that present the main characteristics of the real Internet behavior. A complete model of the competition dynamics should take account of so many different effects and influences that would be impractical for simulation and analysis purposes. Nevertheless, in Ref. [1], it has been shown that the main characteristics of the Internet markets can be reproduced from a very simple model based on the Lotka–Volterra competition equations. This model can be described, in the general case of n different