On the Influence of Some Discretization Methods in the Study of the Dynamical Systems, D. CONSTANTINESCU, Dept. of Applied Math., University of Craiova, Romania - It is already known that, in the case of the simple dynamics, the discretization process for the dynamical systems modulated by nonlinear differential equations has no significant effect. But when the flow is not stable - it appears the sensitivity of the initial conditions - or when the system is not structurally stable, the numerical dynamics is not always the same with the dynamics of the original system. The aim of this paper is to study, by different numerical methods, some equations which describe the dynamics of the particle beams and to compare qualitatively and quantitatively the results. In the particular cases studied we make some remarks about the optimal choice of the method and of the discretization step in order to obtain a faithful description of the initial system. We are also interested in the occurrence of the chaotic behaviour due to the discretization method. We analyse a system with discontinuous control in order to observe that the discretization using the exponential scheme introduces a new degree of freedom whose value is crucial in the occurrence of the chaotic behaviour.