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Discrete mathematical modeling and optimal control of the marital status: the monogamous marriage case. (English) [Zbl 1444.37091](#)

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Summary: In this paper, we consider a discrete model of the marital status of the family dynamics. It is assumed that individuals in the society can be classed in one of the eight compartments: virgin men, virgin women, married men, married women, divorced men, divorced women, widowed men and widowed women. The objective of this work is to treat the modeling and control the system that describes the case of monogamous marriage. We determine two controls which allow to reduce the number of virgin, divorced individuals and increase the number of married individuals. The first control is the benefits of an awareness campaign to educate virgin men and women about the benefits of marriage for the individual and for the society, the second control characterizes the legal procedures, administrative complications and the heavy financial and social consequences of divorces. The optimal control problems are procured based on a discrete version of Pontryagin's maximum principle and determined numerically using a progressive-regressive discrete schema that converges following a convenient test related to the Forward-Backward Sweep Method (FBSM) on the optimal control.

MSC:

- [37N35](#) Dynamical systems in control
- [37N40](#) Dynamical systems in optimization and economics
- [93C55](#) Discrete-time control/observation systems

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