Abstracts of MMA2009, May 27 - 30, 2009, Daugavpils, Latvia

DYNAMICAL MODELS OF ECONOMIC COMPETITION: A GEOMETRICAL APPROACH

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The laws of movement of dynamical systems are best derived as extremals of suitable functionals (1):

$$c(t) \longmapsto \int_0^1 \mathcal{L}(\dot{c}(t))\, dt. \tag{1}$$

satisfying the constraints on the configuration and variations spaces.
Computing motion in this form is a classical problem in Geometric Mechanics defined with lagrangians $\mathcal{L}$ or hamiltonians $\mathcal{H}$.
Models of the economic growth of a nation and neoclassical model of the economy have been treated in [1], [3] in such Geometric Approach. Different lagrangian functions $\mathcal{L}$ and hamiltonians $\mathcal{H}$ with different sets of constraints result in different laws of economy.
Dynamic models of consumer behaviour, are also discussed in the literature [2] in this setting.

Dynamic models of competition and behaviour of players in the market, such as proposed in [4], should allow different players to devolop with less risk their best suited strategies of adaptation to the situation on the market.
As investing in the development, production, marketing and sales can be very costly, weaker players in the market can not survive and monopolies appear. But from customers' perspective, the situation of a monopoly, or almost monopoly, is bad and should be avoided.

We propose and discuss in a geometric approach, a model of competition on a market driven by a limited number of producers and distributors.
We show that parameters of a proposed model have well established meaning and can be measured. Statistical data of chosen markets prove useful in validating our method.
In geometric setting we are able to exhibit conservation laws, along the temporal evolution of the system, to better determine the initial dynamic system.

Computer simulations show the usefulness of the proposed method.

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