Параметры $E(\cdot)$, R_0, r, $E_{\max}$, $p(t)$ полностью аналогичны параметрам задачи (1). Функция $C(E)$ непрерывна на U, момент $T > 0$ фиксирован. Сформулируем основные результаты для задачи (2).

Теорема 2. *Если функция $C(E)$ непрерывна и выпукла на U, то в задаче (2) для любой функции $p(\cdot) \in L^2[0,T]$ существует оптимальное управление.*

Теорема 3. *В задаче (2) для произвольной функции $p(\cdot) \in L^2[0,T]$ и квадратичной функции $C(E) = c_0 + c_1 E + c_2 E^2$, где $c_0 \geq 0$, $c_1 \geq 0$, $c_2 > 0$, оптимальное управление существует и единственно.*

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Optimal control of systems with evolving dynamics

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This talk is dedicated to a new class of problems of optimal control systems under uncertainty. We start with problems of optimal control of systems in which uncertainty is modeled in terms of some scenarios of evolution of system's dynamics.

It is assumed that the set of such possible scenarios is finite and it is known along with probabilities of realization of such scenarios. We consider the problem of design of optimal control procedure which minimizes the mathematical expectation of the cost functional.

The significant difficulty in study of such problems lies in the fact that scenarios can bifurcate at some moments which requires the use of feedback control or of some non-anticipating strategy concept.

We demonstrate how to derive optimality condition for such optimal non-anticipating strategy in the form of some non-standard maximum principle.

The main component of this maximum principle is a new form of adjoint system which is significantly different from the classical one in Pontryagin maximum principle.

Of course, the use of non-anticipating strategies as control procedures is not very practical in applications and feedback control is preferable. The another new aspect of this work is the use of the new maximum principle and an adjoint system of equations for a design of optimal feedback control.

Certainly, such optimal feedback controls are discontinuous functions of a state vector. Important aspect of an implementation of discontinuous feedback control is its robustness properties with respect to small measurement errors of state vector and small perturbations of the dynamics. We discuss this aspect of an implementation of optimal discontinuous feedback to demonstrate its robustness.

Optimal solutions in a neighborhood of a singular extremal for a problem with two-dimensional control*

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We consider an optimal control problem that is affine in two-dimensional bounded control. We study a behavior of solutions in a neighborhood of a singular extremal. Optimal singular solutions and solutions with accumulations of control switchings (chattering solutions) are very typical for control-

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