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ON THE RECONSTRUCTION OF AN UNKNOWN INPUT OF A SYSTEM OF DIFFERENTIAL EQUATIONS

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Рассматривается задача динамического восстановления неизвестного входного воздействия, действующего на систему нелинейных по фазовым переменным и линейных по управлению обыкновенных дифференциальных уравнений. В данной статье мы рассмотрим случай отсутствия мгновенных ограничений, т. е. будем считать, что неизвестное возмущение может быть неограниченным, являясь суммируемой с квадратом евклидовой нормы функцией. Принимая во внимание этот факт, мы конструируем устойчивый к информационным помехам и погрешностям вычислений алгоритм решения данной задачи, основанный на комбинации конструкций теории некорректных задач с известным в позиционных дифференциальных играх методом экстремального сдвига. Алгоритм ориентирован на случай "непрерывного" измерения фазовых состояний системы.

Ключевые слова: система дифференциальных уравнений, устойчивое восстановление.

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We study the problem of dynamic reconstruction of an unknown input acting on a system of ordinary differential equations nonlinear in the state variables and linear in the control. We consider the case of the absence of instantaneous constraints; i.e., we assume that the unknown perturbation can be unbounded, being a function summable with the square of the Euclidean norm. Taking this fact into account, we construct an algorithm for solving this problem that is resistant to information interferences and computational errors. The algorithm is based on a combination of constructions from the theory of ill-posed problems with the extremal shift method known in positional differential games. The algorithm is focused on the case of "continuous" measurement of the states of the system.

Keywords: system of differential equations, stable reconstruction.

MSC: 34A55, 49N45

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