BINARY CORRESPONDENCES AND PROBLEMS OF CHEMICAL KINETICS WITH MANY-SHEETED SLOW SURFACE

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Formally, a problem is a binary correspondence $P = (A, B, C)$ with $C \subseteq A \times B$. The sets A, B, and C are treated as *the domain of data*, *the domain of unknowns*, and *the condition* of the problem P. The containment $(a, b) \in C$ is written as $P(a, b)$ and means that the unknown $b \in B$ is a *solution* to P for data $a \in A$. This approach provides a simple and adequate formalization for components of problems, their properties and constructions, makes it possible to formalize topological problems, their parametrizations, and dependence of solutions on parameters (see [1]).

As an example, we consider a singularly perturbed system of ordinary differential equations which describes a process of chemical kinetics with many-sheeted slow surface (see [2]). Suppose that $n \in \mathbb{N}$, $0 < \varepsilon_0 \in \mathbb{R}$, X is a domain in $\mathbb{R}^n$, $F := C(X^2 \times \mathbb{R} \times [0, \varepsilon_0], \mathbb{R}^n)$. Let P be the problem with data $F^2 \times [0, \varepsilon_0]$, unknowns $C^1(\mathbb{R}, X)^2$, and condition $P\big((f, g, \varepsilon), (x, y)\big) \Leftrightarrow \dot{x}(t) = f\big(x(t), y(t), t, \varepsilon\big)$, $\varepsilon\, \dot{y}(t) = g\big(x(t), y(t), t, \varepsilon\big)$ for all $t \in \mathbb{R}$. The formal inverse P^{-1} to the problem P is impractical and can be corrected by means of composition with the auxiliary problem Q with data $(\mathbb{R}^m)^3$, unknowns $C^1(\mathbb{R}, X)^2$, and condition $Q\big((t, \alpha, \beta), (x, y)\big) \Leftrightarrow x(t_i) = \alpha_i$, $\dot{x}(t_i) = \beta_i$, $i \in \{1, \ldots, m\}$. In [1], solvability of the composition problem $P^{-1} \circ Q$ is studied in a particular case.

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