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BOUNDARY VALUE PROBLEMS FOR TWO-DIMENSIONAL DIFFERENTIAL SYSTEMS WITH PERIODIC FUNCTIONS IN PHASE VARIABLES

INARA YERMACHENKO[1] AND FELIX SADYRBAEV[1,2]

[1] *Department of Mathematics, Daugavpils University*
[2] *Institute of Mathematics and Computer Science, University of Latvia*

[1] Parādes iela 1, Daugavpils LV-5400, Latvia
[2] Raiņa bulv. 29, Rīga LV-1459, Latvia

E-mail: `inara.jermacenko@du.lv, felix@latnet.lv`

We treat a dynamical system

$$\begin{cases} \dfrac{du}{dt} &= f(u,\, v), \\ \dfrac{dv}{dt} &= g(u,\, v), \end{cases} \tag{1}$$

where f, g are continuous in some domain $D \subset \mathbb{R}^2$ and T-periodic in phase variables u, v

$$\begin{matrix} f(u+T,\, v) = f(u,\, v+T) = f(u,\, v), \\ g(u+T,\, v) = g(u,\, v+T) = g(u,\, v), \end{matrix} \qquad \forall \big(u,\, v\big) \in D.$$

Suppose that $F(w) = (f(w),\, g(w))$ satisfies a uniform Lipschitz condition, i.e.

$$\exists L \geq 0 \quad \text{such that} \quad \| F(w_1) - F(w_2) \| \leq L \| w_1 - w_2 \| \quad \forall w_1, w_2 \in D.$$

The system (1) is considered together with following boundary conditions:

$$u(a) = A, \qquad u(b) = B; \tag{2}$$

$$v(a) = A, \qquad v(b) = B; \tag{3}$$

$$u(a) = A, \qquad v(b) = B; \qquad \text{or} \qquad v(a) = A, \qquad u(b) = B; \tag{4}$$

$$u(a) = u(b), \qquad v(a) = v(b). \tag{5}$$

By a solution of boundary value problem (1),(2) (or (1),(3), or (1),(4), or (1),(5)) we mean a pair of differentiable functions $\Big(u(t),\, v(t)\Big)$ such that satisfies the system and boundary conditions above.

We investigate an existence and non-existence of solutions to the mentioned boundary value problems.

Results are visualized on torus.

REFERENCES

[1] V. Arnold. *Geometric methods in the theory of the ordinary differential equations.* (Russian), 2000.

[2] V. Arnold, Y. Ilyashenko. *Ordinary differential equations.* (Russian), 1985.

[3] J.-M. Ginoux. *Diferential geometry applied to dynamical systems.* World Scien., 2009.