

# Multiple Solutions to Dirichlet Problems in Billiard Spaces

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**Abstract:** In [2], a Dirichlet problem in billiard spaces was considered. In the framework of impulsive differential equations, it can be written as a BVP

$$\begin{aligned}x'' &= f(t, x) \quad \text{if } x(t) \in \text{int } K, \\x'(t+) &= -x'(t-) \quad \text{if } x(t) \in \partial K, \\x(0) &= A, \quad x(T) = B,\end{aligned}$$

where  $T > 0$ ,  $K = [0, R] \subset \mathbb{R}$ ,  $R > 0$ ,  $f$  is a Carathéodory function on  $[0, T] \times K$ ,  $A, B \in \text{int } K$ . The main result of mentioned paper is the existence of solutions with prescribed number of impacts with the boundary. This was achieved using a method introduced in the same work—referred to here as a *tessellation technique*. We demonstrate that this technique can be extended in various directions. In the presentation, we will outline the tessellation technique and illustrate its application to more general problems, including those addressed in a recently submitted article [1].

## References

- [1] J. Andres and J. Tomeček. *Multiple solutions of vector Dirichlet problems to implicit differential equations and inclusions in billiard spaces*. submitted.
- [2] J. Tomeček. *Multiple solutions of Dirichlet problem in one-dimensional billiard space*. Math. Notes (Miskolc), 20(2):1261–1272, 2019.