Rotation intervals for quasi-periodically forced circle maps

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Rotations numbers have been long used to describe the dynamics of circle maps.

It is known that for invertible maps the rotation number is independent of the initial point, whereas for non-invertible maps different points may have different rotation rates and thus the dynamics can be more complex. Nevertheless, rotation numbers for a given choice of parameters always form a closed interval (including the possibility of a point).

Analogous results have been proved for quasi-periodically forced circle maps [1], however, the structure in terms of rotation numbers in several regions of the parameter space remains unknown.

This piece of work computes the borders of rotation intervals using an extension to the quasi-periodically forced case of Boyland's method [2], which relies in the construction of an associated family of invertible maps, and the algorithms on [1], specifically in the case of a large coupling force.

These results show that for large coupling strength, the boundaries of the rotation interval are approximated by integrating the maps on Boyland's construction. As a result, the length of the rotation interval can be approximated, and a scaling for its growth is presented [3].

References

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