Topological analysis of dynamics of a periodically forced system.

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Using mathematical model of the priodically stimulated system, we analyse in detail the influence of stimulations of different periods T, and amplitudes A_1, on a system in a limit cycle regime. Results show that the trajectory remains strongly periodic in a wide interval of the driving frequencies (a wide $1:1$ entrainment region). Below some T-value the system period changes and the trajectory bifurcates many times into different shapes leading eventually to serrated oscillations. For some values of T the phase trajectory deforms, near its lower left and upper right corners, developing bulges. The time spent at the part of the trajectory not including the bulges *remains a constant for a wide range of T's which depends on the amplitude of the driving sinus.* The bifurcation point between the entrained trajectories and the transient chaotic ones depends almost linearly on the amplitude of the driving sinus depicting the main Arnold tongue. As possible application we consider here only a single application, namely the operation of the sinus node of the heart.