

Why does the kid swing alone in the park? Parametric resonance

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Why does the kid swing alone in the park? The first experiences of a kid in the swing are thanks to the parents' help pushing the kid to keep oscillating. Later, the parents encourage the kid to learn to move his legs to swing without help. This phenomenon is very well known. It is called parametric resonance, an effective way to transmit energy. In this case, the transmission is from the biological energy of the kid moving his legs to the mechanical energy of the swing. This phenomenon has been used in the cathedral of Santiago of Compostela; the famous "botafumeiro" is a renowned [thurible](#) for spreading incense since the Middle age, see the [video](#).

We can also find the parametric resonance in celestial mechanics. The sun-earth-satellite system is an example of the restricted three-body problem, where we assume the satellite's mass is depreciable. The system earth-satellite lays in a plane with a fixed angle with respect to the plane of the sun-earth system.

The main goal of this project is to make an introduction to the parametric resonance mixing techniques from O.D.E and geometrical mechanics.

