bistable.tk

Description

In a dynamical system, **bistability** means the system has two stable equilibrium states.[1] Something that is **bistable** can be resting in either of two states. These rest states need not be symmetric with respect to stored energy. An example of a mechanical device which is bistable is a light switch. The switch lever is designed to rest in the “on” or “off” position, but not between the two. Bistable behavior can occur in mechanical linkages, electronic circuits, nonlinear optical systems, chemical reactions, and physiological and biological systems.

In a conservative force field, bistability stems from the fact that the potential energy has two local minima, which are the stable equilibrium points.[2] By mathematical arguments, a local maximum, an unstable equilibrium point, must lie between the two minima. At rest, a particle will be in one of the minimum equilibrium positions, because that corresponds to the state of lowest energy. The maximum can be visualized as a barrier between them.

A system can transition from one state of minimal energy to the other if it is given enough activation energy to penetrate the barrier (compare activation energy and Arrhenius equation for the chemical case). After the barrier has been reached, the system will relax into the other minimum state in a time called the relaxation time.

Bistability is widely used in digital electronics devices to store binary data. It is the essential characteristic of the flip-flop, a circuit widely used in latches and some types of semiconductor memory. A bistable device can store one bit of binary data, with one state representing a “0” and the other state a “1”. It is also used in relaxation oscillators, multivibrators, and the Schmitt trigger. Optical bistability is an attribute of certain optical devices where two resonant transmissions states are possible and stable, dependent on the input. Bistability can also arise in biochemical systems, where it creates digital, switch-like outputs from the constituent chemical concentrations and activities. It is often associated with hysteresis in such systems.

Category

1. External Domains

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