On locally linearizable billiard systems

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On positive metric entropy conjecture

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We prove the folowing conjecture by Herman:

Arbitrarily close, in the C^∞-topology, to the identity map of a two-dimensional disc there exists an area-preserving diffeomorphism with positive metric entropy.

Investigation of Ring - Star Network of van der Pol Oscillators

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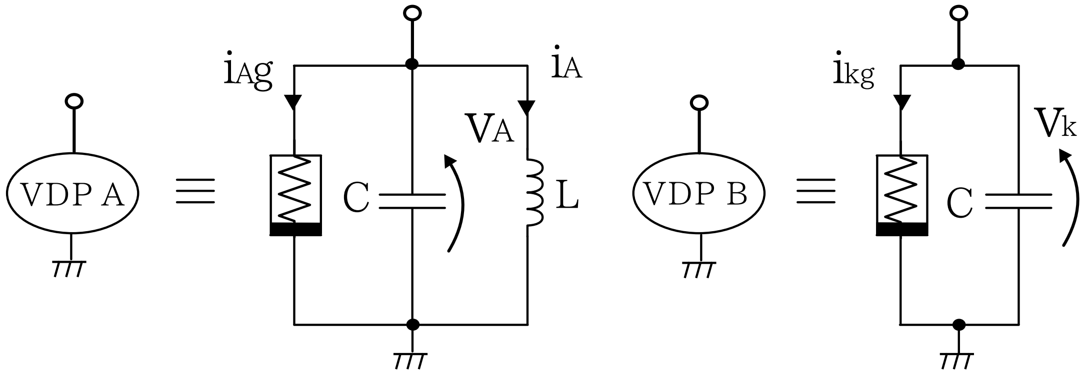
There are a lot of synchronization phenomena in this world. This is one of the nonlinear phenomena that we can often observe by natural animate beings which do collective actions. For example, firefly luminescence, cry of birds and frogs, applause of many people, and so on. Synchronization phenomena have a feature that the set of small power can produce very big power by synchronizing at a time. Therefore, study of synchronization phenomena has been widely reported not only in the engineering but also the physical and the biological fields. Investigation of coupled oscillators is focused on many researchers, because coupled oscillatory network produces interesting synchronization phenomena, such as the phase propagation wave, clustering, and complex patterns. In addition, it has the advantage of being able to manufacture for circuit on the board[1, 2, 3].

In this study, we investigate synchronization phenomena observed in the system model containing a ring and a star of van der Pol oscillators by circuit experiment and computer simulation. We observe several types of synchronization phenomena by increasing the coupling strength of the ring. Then, we observe the synchronization phenomena with computer simulation. van der Pol oscillator is shown in Fig. 1.

Figure 2 shows a system model constituted van der Pol oscillators (VDP-A and VDP-B). We couple each VDP-B via inductor L and ground by coupling resistor R. In addition, We couple VDP-A via resistor r. VDP-A is the only one central circuit which is connected to all VDP-B in this system by resistor r.



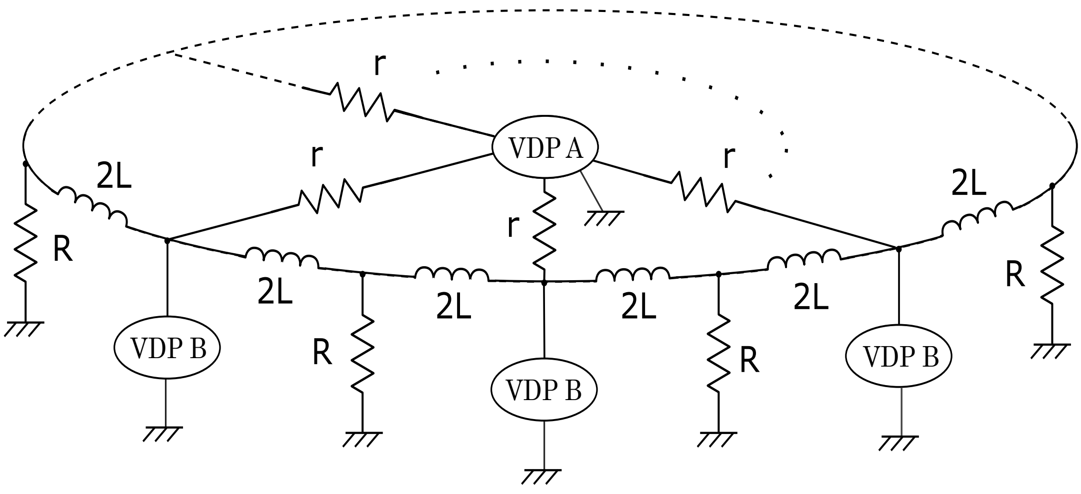


Figure 2: System model.

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Dynamics of monotone maps on a one-dimensional locally connected continuum

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By continuum we mean a compact connected metric space.

Let X be a one-dimensional locally connected continuum, $f : X \to X$ be a continuous map. A map f is called to be monotone, if for every connected subset $C \subset X$, $f^{-1}(C)$ is connected.

One-dimensional locally connected continua have a complicated topological structure. Therefore, even monotone maps on them have nontrivial dynamics (see, e.g., [1] - [5]).

In this report dynamics of monotone maps on a one-dimensional locally connected continuum is studied.

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