

## Insects moving gaits and patterns

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### SUMMARY

The study of the synchronization patterns in biological processes is a growing discipline. Small networks of neurons model central pattern generators (CPG) that control insect locomotion (see [1, 2]).

Here we want to present some of the results we obtained in [3, 4]. Firstly, we study small CPGs (6-neuron model) for insect locomotion where each neuron follows the Hodgkin-Huxley like model of [2], presenting a *roadmap* with exhaustive information on the dynamical behavior of a single neuron [3], using Spike-counting diagrams and bifurcation analysis.

Then, we analyze the complete system, performing a quasi-Monte-Carlo sweep coupled with an automatic detection techniques. These methods allow us to obtain a complete picture of pattern evolution on the movement gaits of the CPG leading to a global dominance of the tripod gait on the fast movement regime (see [3, 4]) as shown in the gaits of real animals. Using continuation techniques we explain the transitions of different gaits in the current CPG.

Finally we explore other CPGs with similar behaviour.

**Keywords:** Dynamical systems, CPG, neuron model, bifurcations. . .

**AMS Classification:** 34C60, 92B05

### References

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