# Practical approaches to exploiting body dynamics in robot motor control.

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**Abstract**

Motor control systems in the brain humans and mammals are hierarchically organised, with each level controlling increasingly complex motor actions. Each level is controlled by the higher levels and also receives sensory and/or proprioceptive feedback. Through learning, this hierarchical structure adapts to its body, its sensors and the way these interact with the environment. An even more integrated view is taken in morphological or embodied computation. On the one hand, there is both biological and mechanical (robotics) evidence that a properly chosen body morphology can drastically facilitate control when the body dynamics naturally generate low level motion primitives. On the other hand, several papers have used robot bodies as reservoirs in a reservoir computing setup. In some cases, reservoir computing was used as an easy way to obtain robust linear feedback controllers for locomotion. In other cases, the body dynamics of soft robots were shown to perform general computations in response to some input stimulation. In general, very specific highly compliant bodies were used. At Ghent University's Reservoir Lab, we have previously used reservoir computing to generate locomotion on quite different robot platforms: the highly compliant tensegrity robot Recter and the far less compliant quadruped robot Oncilla and a new low cost modular quadruped puppy robot. In all cases, we succeeded in generating stable gaits. However, not surprisingly, not all robot bodies are equally suitable to help generating their own motor actuations. As a result, the reservoir computing principle alone was not always sufficient. We present an overview of our experience with these different robot platforms and give practical guidelines for applying physical reservoir computing to new robots. We finally discuss some perspectives on a more systematic evaluation between body morphology, compliance and the complexity of generating stable gaits for locomotion.