

Biosystems & Biorobotics

Ralf Simon King

# BiLBIQ: A Biologically Inspired Robot with Walking and Rolling Locomotion

 Springer

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# Foreword

## Ein kurzes Vorwort

Vorweggenommen: Es ist spannend, die Arbeit von Ralf Simon King zu lesen. Eine Spinne, so haben wir es in der Schule gelernt, läuft auf 8 Beinen. So sollte es auch ein Spinnenroboter machen – denkt man. Aber seit Neuestem weiß man, dass eine Saharaspinne der Gattung *Cebrennus* auch mit ihren 8 Beinen rollen kann. Ein neues Feld der Bio-Robotik tut sich auf.

*Cebrennus* kann achtbeinig krabbeln und Purzelbaum schlagend rollen, so wie es die Situation erfordert. Es gibt viele Vorschläge, auch Roboter zu konstruieren, die laufen und rollen können. Mit der Saharaspinne wird die Lösung der biologischen Evolution favorisiert. Ralf Simon King analysiert anhand von Videoaufnahmen eingehend die Beinbewegung der rollenden *Cebrennus*. Sein Hardware-Ergebnis, ein Quadroped-Roboter, der wie *Cebrennus* laufen und rollen kann, fasziniert.

Ein Mars-Rover nach dem Vorbild der rollenden Saharaspinne hat einen Nachteil: Alles dreht sich, es gibt keine raumfeste Plattform. Ich denke mir, dass der *Cebrennus*-Rover eher als laufender und rollender Kundschafter (Scout) Anwendung finden könnte. Der 6-rädrige Mars-Rover "Spirit" hat sich im Sand festgefahren. Dem Mars-Rover Curiosity wird es möglicherweise ähnlich ergehen, denn Räder schieben den Sand nach hinten und wühlen sich so ein. Sich rollend fortzubewegen, indem man sich mehr senkrecht vom Boden abstößt, ist im losen Dünensand die bessere Lösung. Und wird das Gelände rau mit vielen Hindernissen, beginnt der Cebrennus-Rover auf seinen Beinen zu laufen.

Ich wünsche der hochaktuellen und mit Genuss lesbaren Publikation von Ralf Simon King viel Erfolg und eine weite Verbreitung.

Ingo Rechenberg

## A Short Foreword

Let me anticipate this: It is going to be exciting to read Ralf Simon King's book.

A spider walks on eight legs – that's what we learned in school. Consequently it is what we expect of a spider robot too. However, for a short while now, we have known that a Sahara spider of the species *Cebrennus* can also roll with the use of its eight legs. This led to the opening of a new field in bio-robotics. By simultaneously using all legs available *Cebrennus* is - depending on what the actual situation requires - capable of either scuttling or rolling in a somersaulting manner. There are also many suggestions to construct robots that can both walk and roll. The preferred solution is the one provided by biological evolution: the Sahara spider. Ralf Simon King analyses the leg movement of the rolling *Cebrennus* in great detail with the help of video footage. The result, a quadruped robot that can both walk and roll like the *Cebrennus*, is extremely fascinating.

A Mars rover modelled on the rolling Sahara spider has one disadvantage: everything is spinning; there is no fixed platform. I believe that the *Cebrennus* rover could operate better as a walking and rolling scout. The six-wheeled Mars rover Spirit got stuck in the sand. The Mars rover Curiosity is probably going to suffer the same fate since wheels shovel the sand towards the rear and thus tend to burrow. The better solution, when dealing with loose dune sand, is to make way in a rolling locomotion by pushing oneself off the ground in a vertical direction. In addition, when the terrain gets rough, whereby there are many obstacles, the *Cebrennus* rover could simply start to run on its legs.

I hope the publication by Ralf Simon King, which not only discusses a highly topical issue but is also a pleasure to read, is received with great interest and spread widely.

Ingo Rechenberg

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