Crawling, walking or rolling for obstacle-crossing? Bio-inspiration for the OpenWHEEL i3R agile mobile robot

Jean-Christophe.FAURoux@isima.fr
Clermont University – French Institute for Advanced Mechanics (IFMA), LAM – B.P. 10448 – 63000 CLERMONT-FERRAND, France

Philippe.VASLIN@isima.fr
Clermont University – Blaise Pascal University (UBP), LIMOS – B.P. 10448 – 63000 CLERMONT-FERRAND, France

OpenWHEEL i3R: a Lateral balancing HZAF, Sylvain METAIS, Christophe NOELLAT.

The same high level NXT controller as V2 generates 8kHz on unstructured terrain.

Multiple legs by a single mechanism of hybrid locomotion but replaces the clutch
→ no overconstraint when rolling → no suspension required with peak torque of 100Nm

Control unit

Convertible wheels / actuators only on legs

Mechanism

Actuated

and a pitch angle

Climbing process

To eliminate overconstraint we control a single degree of freedom

Three simple process for 18 wheels: symmetrical 1

Two steps: three wheels to 1

Obstacle Crossing

Full multibody model (Adams) confirms feasibility

2D model

Crawling, walking or rolling for obstacle-crossing?

Bio-inspiration from balancing of walking natural creatures

OpenWHEEL i3R V2

24V actuator (330W)

Dual-stage 10.5kW chain transmission

ATV tire

Battery and payload front crate

52V 45Ah traction battery

E lectric magnetic clutch

Curtis programmable DC controller

2D model

OpenWHEEL i3R V1

OpenWHEEL 1R, a novel mechanism based on the HZAF Symmetry

Front rear non-symmetry

(Fauroux 2006)

Wheel landing

(Figure below, right column) [Fauroux 2006]

Wheel landing

4 wheels: 3 wheels for stable support of

for the inter-axle central mechanism:

for the number of revolute joints used

Reconfigured

2D model

Mechanism

Climbing process

OpenWHEEL i3R

OpenWHEEL V3

OpenWHEEL i3R V2

Climbing process

Climbing process

Climbing process

Climbing process