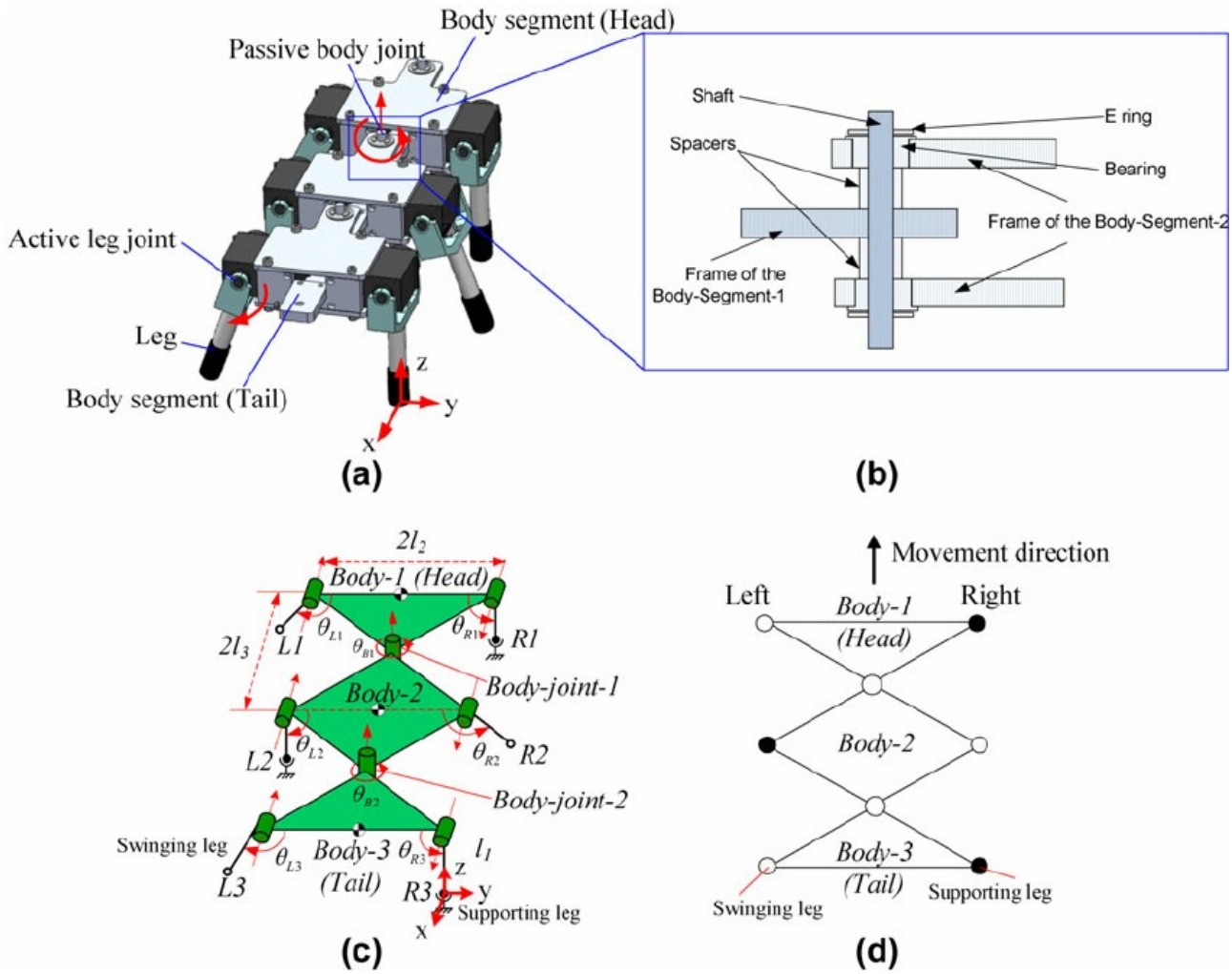
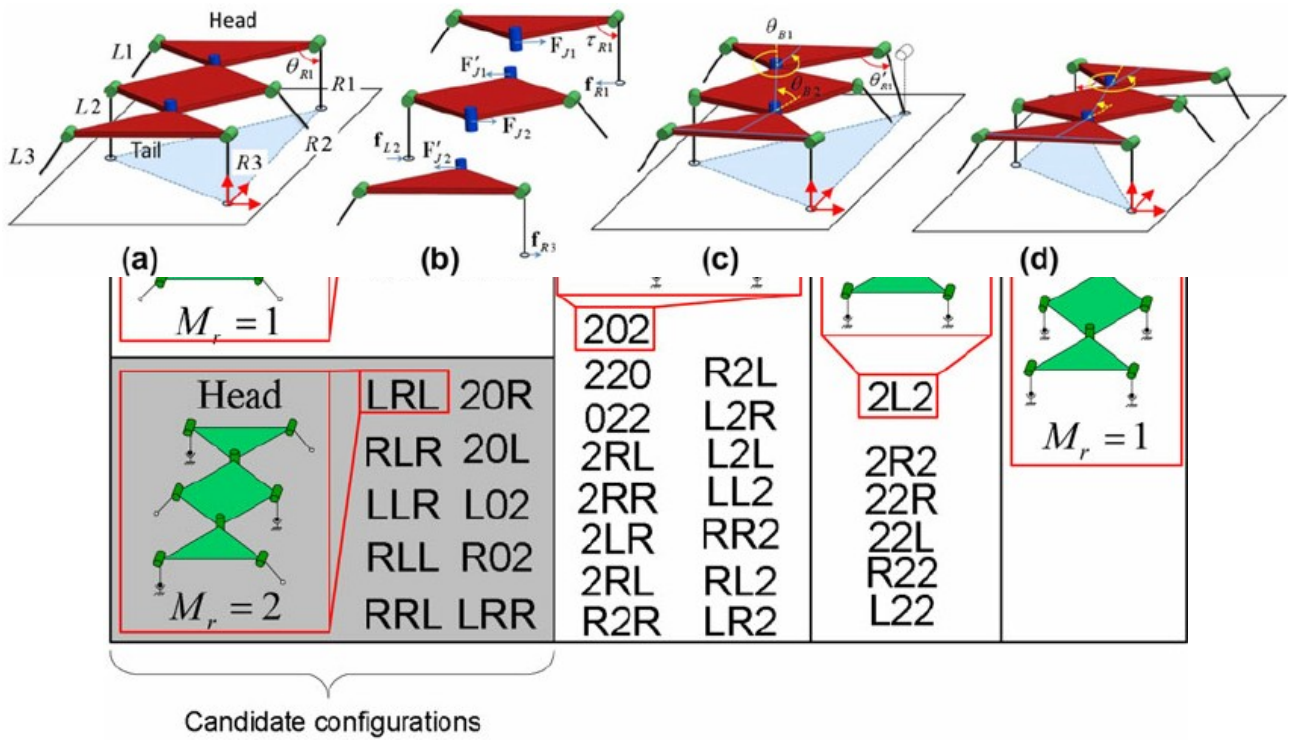
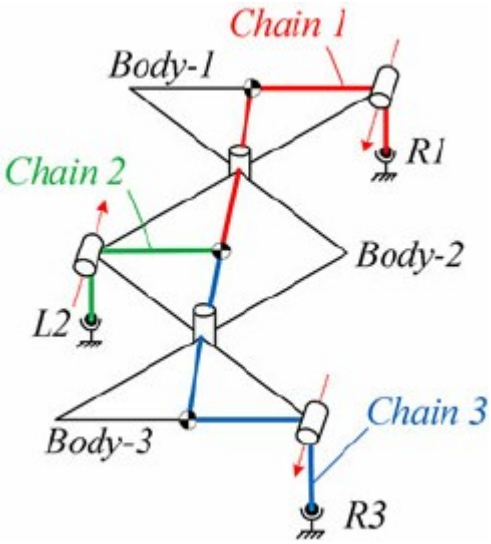


Standing configurations that can be used to form a static-stable standing of the passive-spine hexapod shown in Figure 1(a).

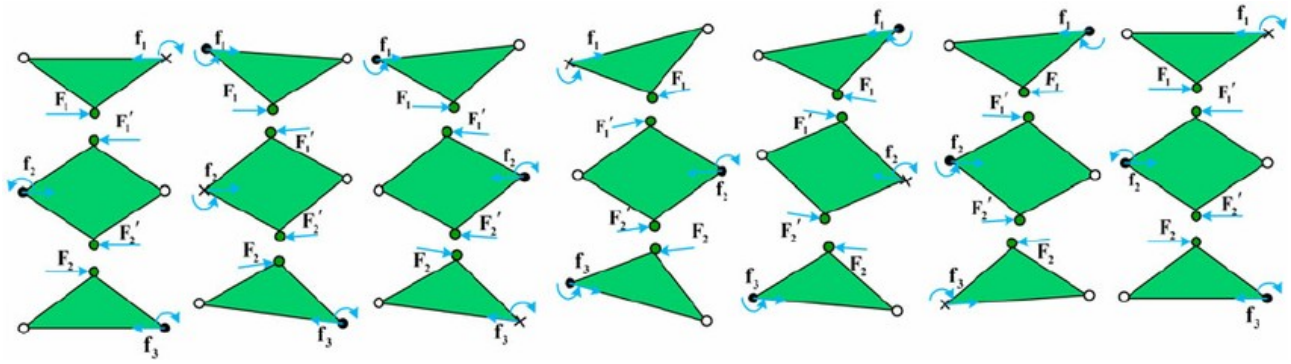
Concept of the passive-spine legged robot. (a) CAD model of a passive-spine hexapod. (b) Implementation of the passive body joints. (c) Schematic diagram of the passive-spine hexapod. The labels ‘ L 1’, ‘ L 2’, and ‘ L 3’ specify the left legs 1, 2, and 3, respectively. The labels ‘ R 1’, ‘ R 2’, and ‘ R 3’ specify the right legs 1, 2, and 3, respectively. (d) Schematic diagram of the configuration of the robot, where solid and open circles indicate footprints of the supporting and the swinging legs, respectively.



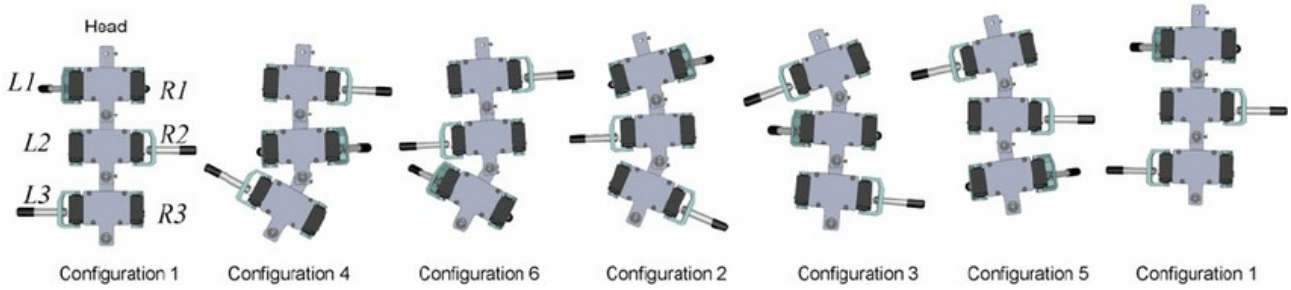
Principle of the passive-spine legged walking. (a) The hexapod starts walking at an initial configuration ‘RLR’ by simultaneously abducting leg R 1 and adducting leg L 1. (b) Horizontal reaction forces on footprints of the supporting legs are generated during the short period of time before the lifting of leg R 1. (c) These horizontal reaction forces result in rotation of the body segments and swinging of the swinging legs. (d) After leg L 1 touched the ground, the robot enters configuration ‘LLR’. During the transition from configuration ‘RLR’ and ‘LLR’, CoM of the robot moves due to rotation of the body segments.



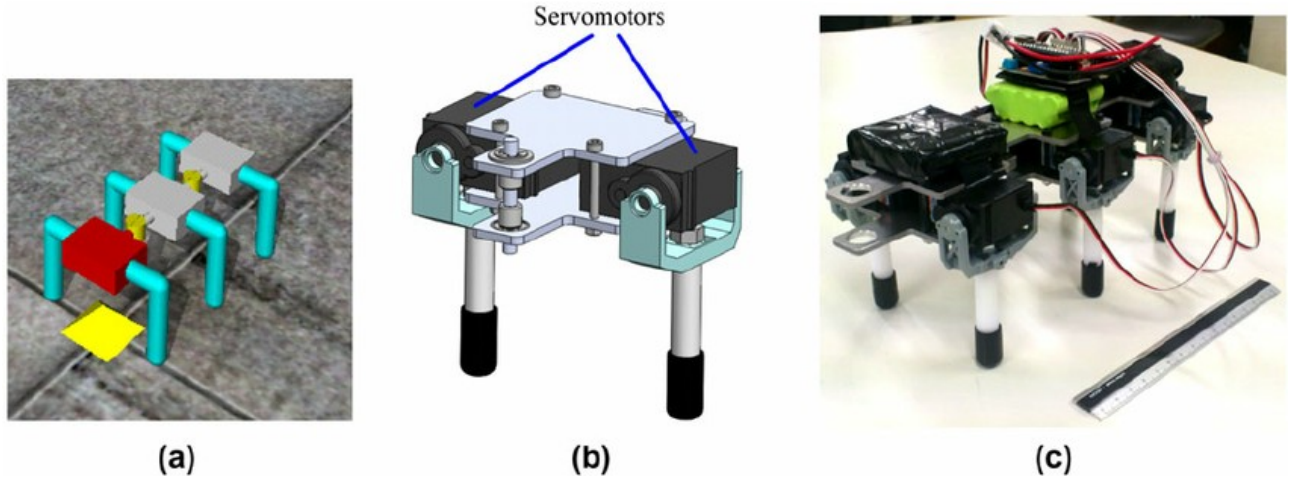
The passive-spine hexapod in configuration ‘RLR’, as shown in Figure 1(c), can be treated as a parallel mechanism consisting of three chains.



Rotation directions of the body segments of a six-legged robot. From left to right, the figure shows each step of the configuration transition for the transition 1 → 4 → 6 → 2 → 3 → 5 → 1. The rotation direction of each body segment is indicated by the blue curved arrows, which are marked on each supporting leg.



Sequence of the passive-spine gait 1 → 4 → 6 → 2 → 3 → 5 → 1. Robot's posture is plotted according to simulation results presented in Section 5.



(a) ODE model of the six-legged robot. (b) CAD model of one-module design of the six-legged robot. (c) Six-legged robot prototype.