

Full 3D printed hexapod robots with energy efficient joints

Ilya Brodoline, Stéphane Viollet, Julien Serres

► **To cite this version:**

Ilya Brodoline, Stéphane Viollet, Julien Serres. Full 3D printed hexapod robots with energy efficient joints. Workshop GDR 2088 BIOMIM 1st Annual Meeting, CNRS, Oct 2020, Nice, France. pp.33. hal-03319418

HAL Id: hal-03319418

<https://hal-amu.archives-ouvertes.fr/hal-03319418>

Submitted on 12 Aug 2021

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Full 3D printed hexapod robots with energy efficient joints

Ilya BRODOLINE, Stéphane VIOLLET, Julien R. SERRES

Aix Marseille Univ., ISM, Marseille, France

Keywords: biomimetics, biorobotics, irreversible joints, cost-effective platform, force sensing.

Nowadays, servomotors are classically used as actuators for actuating small legged robots [1,2]. Their advantages are numerous: simple to control, miniature size, and a large choice of various dynamic models, which permits to choose the best speed and torque tradeoff for robot joints. However, the main drawback of servomotors is their permanent energy consumption, due to the permanent effort required to keep joint angle constant, for example when the robot stays on the spot. In addition, the dramatic heating of the servo case and gears can break the robot.

The goal of our project is to design a new energy efficient robot's leg for full 3D printed hexapod robots, called Pohod15 and Pohod15J (Fig. 1). The principle of our new leg structure is based on an irreversible mechanism inside each joint (an actuated lead screw), which will drastically reduce the robot's power consumption by half, compared to our previous one version, called AntBot [1]. The design of this new leg is directly inspired by insect leg structure [3,4]. As a fair return, it will provide an efficient robotic tool for biologists to test both ant-based pattern of locomotion and insect-based navigation across long range without servomotors limitations, therefore saving energy resource.

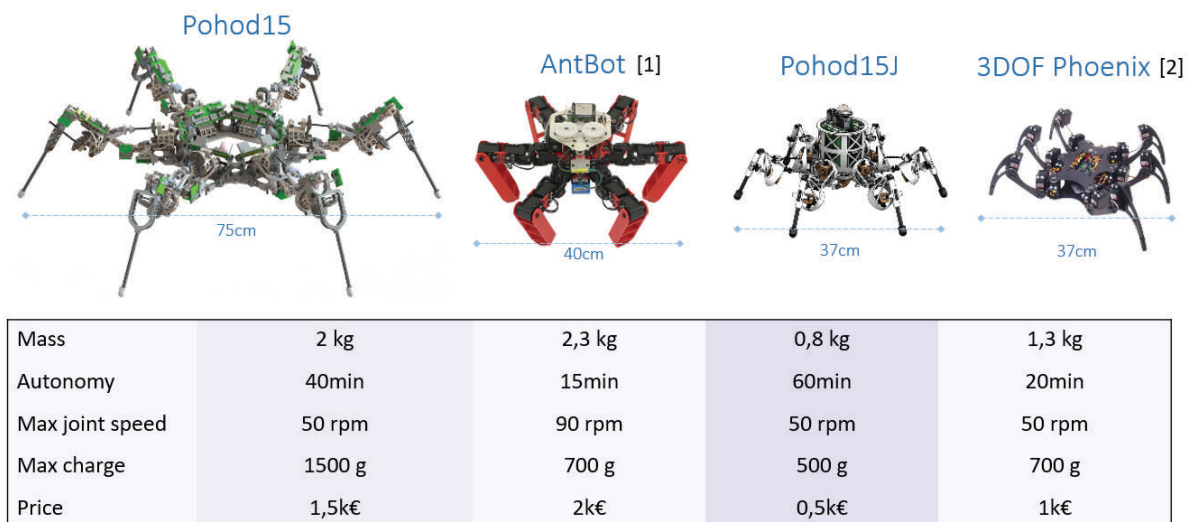


Fig. 1: Comparison table of hexapod robots specifications. Pohod15 and Pohod15J are currently developed in our lab with built-in irreversible joints.

- [1]. Dupeyroux, J.; Serres, J. R.; Viollet, S. AntBot: A six-legged walking robot able to home like desert ants in outdoor environments. *Science Robotics*, 2019.
- [2]. Barron-Zambrano, J. Hugo; Torres-Huitzil, C.; Girau, B. Perception-driven adaptive CPG-based locomotion for hexapod robots, *Neurocomputing*, Volume 170, 2015.
- [3]. Kaliyamoorthy, S; Roger, D. Quinn; Zill, Sasha N. Force Sensors in Hexapod Locomotion. *The International Journal of Robotics Research*, 2005
- [4]. Zill, S.; Schmitz, J.; Büschges, A Load sensing and control of posture and locomotion. *Arthropod Structure and Development*, 2004.