

Kinematic analysis of the rolling locomotion of mobile robots based on tensegrity structures with spatially curved compressed members

Einrique Roberto Carrillo Li, Philipp Schorr, Tobias Kaufhold, Jorge Antonio Hernandez Rodriguez, Lena Zentner, Klaus Zimmermann, Valter Böhm

Abstract: The use of mechanically compliant tensegrity structures in mobile robots is an attractive research topic, due to the possibility to adjust their mechanical properties reversibly during locomotion. In this paper rolling locomotion of mobile robots based on simple tensegrity structures, consisting of three or more compressed spatially curved members connected to a continuous net of prestressed tensional members, is discussed. Planar locomotion of these robots is induced by the movement of internal masses. The movement direction can be changed by changing the robot's shape between a cylinder and a truncated cone. The paper focuses on the description of the kinematics of these systems with respect to the shape change.

¹⁾ Einrique Roberto Carrillo Li, M.Sc.: Pontificia Universidad Católica del Perú, Av. Universitaria 1801, San Miguel 15088, Peru, Peru (PE), ecarrillo@pucp.pe .

²⁾ Philipp Schorr, M.Sc.: Ilmenau University of Technology, Faculty of Mechanical Engineering, Max-Planck-Ring 12, D-98693, Ilmenau, Germany (DE), philipp.schorr@tu-ilmenau.de .

³⁾ Tobias Kaufhold, Ph.D.: Ilmenau University of Technology, Max-Planck-Ring 12, D-98693 Ilmenau, Germany (DE), tobias.kaufhold@tu-ilmenau.de .

⁴⁾ Jorge Antonio Hernandez Rodriguez, Professor: Pontificia Universidad Católica del Perú, Av. Universitaria 1801, San Miguel 15088, Peru, Peru (PE), crodrig@pucp.edu.pe .

⁵⁾ Lena Zentner, Professor: Ilmenau University of Technology, Faculty of Mechanical Engineering, Max-Planck-Ring 12, D-98693 Ilmenau, Germany (DE), lena.zentner@tu-ilmenau.de .

⁶⁾ Klaus Zimmermann, Professor: Ilmenau University of Technology, Faculty of Mechanical Engineering, Max-Planck-Ring 12, D-98693 Ilmenau, Germany (DE), klaus.zimmermann@tu-ilmenau.de .

⁷⁾ Valter Böhm, Professor: Ostbayerische Technische Hochschule Regensburg, Galgenbergstr. 30, D-93053 Regensburg, Germany (DE), valter.boehm@oth-regensburg.de .