Towards a new generation of plant-inspired growing artefacts

Results

Project Information

GrowBot

Grant agreement ID: 824074

Project website

DOI
10.3030/824074

Project closed

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22 October 2018

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1 January 2019

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30 June 2023

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€ 6 997 482,50

EU contribution
€ 6 997 482,50

Coordinated by
FONDAZIONE ISTITUTO ITALIANO DI TECNOLOGIA
Italy

This project is featured in...

11 March 2024

CORDIS provides links to public deliverables and publications of HORIZON projects.

Links to deliverables and publications from FP7 projects, as well as links to some specific result types such as dataset and software, are dynamically retrieved from OpenAIRE.

Deliverables

Websites, patent fillings, videos etc. (6)

GrowBot Workshops II
GrowBot Workshops M24

GrowBot Workshops IV
GrowBot Workshops M48

Project website and dissemination materials

GrowBot Workshops I
GrowBot Workshops M12

GrowBot Platform
GrowBot on-line platform with open access to link different communities that work on plants.

GrowBot Workshops III
GrowBot Workshops M36

Other (9)

Workshops, Working Groups, Editorial Initiatives III
Organization of joint and common initiatives interdisciplinary workshops and Working Groups open to scientists outside the project M48

Workshops, Working Groups, Editorial Initiatives II
Organization of joint and common initiatives, interdisciplinary workshops, and Working Groups open to scientists outside the project. M36.

Prizes II
Second call for ideas

Demo days I
Organization of demo days, open to general public, industries and stakeholders. M36.

Demo days II
Organization of demo days open to general public industries and stakeholders M48

Workshops, Working Groups, Editorial Initiatives I
Organization of joint and common initiatives, interdisciplinary workshops, and Working Groups open to scientists outside the project. M12.

Tutorial on GrowBot-related technologies
The experts on bioinspired and soft robotics, multifunctional materials, mathematical modelling, robot architectures, bioenergy, nanotechnologies, and manufacturing, will present to biologists fundamental aspects on these topics, which are relevant for GrowBot. Demos of the existing and developed prototypes/technologies will be organized to better explain their basic principles.

Tutorial on fundamentals of plants biology
The experts on plant physiology, biomechanics, ecology and behaviour will summarise and present to the experts on the “artificial” counterparts selected climbing plants features relevant for developing innovative artefacts.

Prizes I
First call for ideas

Documents, reports (4)

Communication, Dissemination, and Exploitation plan (“CoDE” plan)

Detailed definition of the strategy, the planned activities outlined in WP11, and their expected impact. The CoDE plan will be periodically updated according to the progress and emerging results of the project, considering changes in the stakeholders, work context and potential use of results during the project lifetime.

Periodic management report I

This deliverable will collect the activities carried out in task 1.2 about the project management in the period M1-M12

GrowBot specifications and scenarios of use

As result of Task 2.3 activities, a report will be released with the definition of specifications for technologies realization and with the scenarios of use.

Periodic activity report I

This deliverable will report the technical activity carried out in the period M1-M12.

Demonstrators, pilots, prototypes (1)

GrowBot Traveling Exhibition

Realization of a GrowBot traveling exhibition for directly engage with the public

Open Research Data Pilot (4)

Data Management Plan III

Update at M36 of D11 and D14

Data Management Plan II

Update at M18 of D1.1

Data Management Plan I

This deliverable will contain all data relative to dissemination and exploitation activities carried out in the project to maximize the visibility of GrowBot results. The first report (at M6) will report the strategies that will be adopted.

Data Management Plan IV

Update at M48 of D11 D14 and D17

Publications

Peer reviewed articles (55)

Mind the Gap: Reach and Mechanical Diversity of Searcher Shoots in Climbing Plants
Author(s): Hattermann, T., Petit-Bagnard, L., Heinz, C., Heuret, P., and Rowe, N.P.
Published in: Frontiers in Forests and Global Change, Issue 5, 836247, 2022, ISSN 2624-893X
Publisher: Frontiers media
DOI: 10.3389/ffgc.2022.836247

Liquid-solid contact electrification when water droplets hit living plant leaves
Author(s): Serena Armiento, Carlo Filippeschi, Fabian Meder, Barbara Mazzolai
Published in: Communications Materials, Issue 24, 2022, ISSN 2662-4443
Publisher: Springer Nature
DOI: 10.1038/s43246-022-00302-x

Climbing Plant-Inspired Micropatterned Devices for Reversible Attachment
Author(s): Isabella Fiorello, Omar Tricinci, Giovanna Adele Naselli, Alessio Mondini, Carlo Filippeschi, Francesca Tramacere, Anand Kumar Mishra, Barbara Mazzolai
Published in: Advanced Functional Materials, Issue 30/38, 2020, Page(s) 2003380, ISSN 1616-301X
Publisher: John Wiley & Sons Ltd.
DOI: 10.1002/adfm.202003380

3D printed composites from heat extruded polycaprolactone/sodium alginate filaments and their heavy metal adsorption properties
Author(s): Liakos, Ioannis L.; Mondini, Alessio; Del Dottore, Emanuela; Filippeschi, Carlo; Pignatelli, Francesca; Mazzolai, Barbara
Published in: Materials Chemistry Frontiers, Issue 2, 2020, ISSN 2052-1537
Publisher: Royal Society of Chemistry
DOI: 10.5281/zenodo.4475699

Biohybrid generators based on living plants and artificial leaves: influence of leaf motion and real wind outdoor energy harvesting
Author(s): Fabian Meder, Serena Armiento, Giovanna Adele Naselli, Marc Thielen, Thomas Speck, Barbara Mazzolai
Published in: Bioinspiration & Biomimetics, 2021, ISSN 1748-3182
Publisher: Institute of Physics Publishing
DOI: 10.1088/1748-3190/ac1711

Editorial: Generation Growbots: Materials, Mechanisms, and Biomimetic Design for Growing Robots

Author(s): Barbara Mazzolai, Ian Walker, Thomas Speck
Published in: Frontiers in robotics and AI, Issue 8, 711942, 2021, ISSN 2296-9144
Publisher: Frontiers Media SA
DOI: 10.3389/frobt.2021.711942

Mechanical Innovations of a Climbing Cactus: Functional Insights for a New Generation of Growing Robots

Author(s): Patricia Soffiatti, Nick P. Rowe
Published in: Frontiers in Robotics and AI, Issue 7, 2020, ISSN 2296-9144
Publisher: Frontiers Media S. A.
DOI: 10.3389/frobt.2020.00064

Bioperspectives for Shape-Memory Polymers as Shape Programmable, Active Materials

Author(s): Andreas Lendlein, Maria Balk, Natalia A. Tarazona, Oliver E. C. Gould
Published in: Biomacromolecules, Issue 20/10, 2019, Page(s) 3627-3640, ISSN 1525-7797
Publisher: American Chemical Society
DOI: 10.1021/acs.biomac.9b01074

Towards a framework for collective behavior in growth-driven systems, based on plant-inspired allotropic pairwise interactions

Author(s): Renaud Bastien, Amir Porat, Yasmine Meroz
Published in: Bioinspiration & Biomimetics, Issue 14/5, 2019, Page(s) 055004, ISSN 1748-3190
Publisher: IOP Publishing
DOI: 10.1088/1748-3190/ab30d3

Searching and Intertwining: Climbing Plants and GrowBots

Author(s): James Gallentine; Michael B. Wooten; Marc Thielen; Ian D. Walker; Thomas Speck; Karl J. Niklas
Published in: Frontiers in Robotics and AI, Issue 15, 2020, ISSN 2296-9144
Publisher: Frontiers Media S.A.
DOI: 10.5281/zenodo.3999641

Multifunctionality in Polymer Networks by Dynamic of Coordination Bonds

Author(s): Pengfei Zhang, Andraž Rešetič, Marc Behl, Andreas Lendlein
Published in: Macromolecular Chemistry and Physics, Issue 222/3, 2021, Page(s) 2000394, ISSN 1022-1352
Publisher: John Wiley & Sons Ltd.
DOI: 10.1002/macp.202000394

Force Generation in the Coiling Tendrils of Passiflora caerulea
Author(s): Frederike Klimm, Thomas Speck, Marc Thielen
Published in: Advanced Science, Issue 2301496, 2023, ISSN 2198-3844
Publisher: Wiley-VCH
DOI: 10.1002/advs.202301496

Electrical Actuation of Coated and Composite Fibers Based on Poly[ethylene- co -(vinyl acetate)]
Author(s): Muhammad Farhan, Deeptangshu Chaudhary, Ulrich Nöchel, Marc Behl, Karl Kratz, Andreas Lendlein
Published in: Macromolecular Materials and Engineering, Issue 306/2, 2021, Page(s) 2000579, ISSN 1438-7492
Publisher: John Wiley & Sons Ltd.
DOI: 10.1002/mame.202000579

Fast estimation of plant growth dynamics using deep neural networks
Author(s): Gabriella E. C. Gall; Talmo D. Pereira; Alex Jordan; Yasmine Meroz
Published in: Plant Methods, 2022, ISSN 1746-4811
Publisher: BioMed Central
DOI: 10.1186/s13007-022-00851-9

Robust Fractional-Order Control Using a Decoupled Pitch and Roll Actuation Strategy for the I-Support Soft Robot
Author(s): Jorge Muñoz, Francesco Piqué, Concepción A. Monje, Egidio Falotico
Published in: Mathematics, Issue 9/7, 2021, Page(s) 702, ISSN 2227-7390
Publisher: MDPI
DOI: 10.3390/math9070702

The Bio-Engineering Approach for Plant Investigations and Growing Robots. A Mini-Review
Author(s): Barbara Mazzolai, Francesca Tramacere, Isabella Fiorello, Laura Margheri
Published in: Frontiers in Robotics and AI, Issue 7, 2020, ISSN 2296-9144
Publisher: Frintiers Media
DOI: 10.3389/frobt.2020.573014

Structural performance of a climbing cactus: making the most of softness
Author(s): Anil K. Bastola, Patricia Soffiatti, Marc Behl, Andreas Lendlein, Nick P. Rowe
Published in: Journal of The Royal Society Interface, Issue 18/178, 2021, ISSN 1742-5662
Publisher: Royal Society
DOI: 10.1098/rsif.2021.0040

Artificial Venus Flytraps: A Research Review and Outlook on Their Importance for Novel Bioinspired Materials Systems
Author(s): Falk J. Esser, Philipp Auth, Thomas Speck
Published in: Frontiers in Robotics and AI, Issue 7, 2020, ISSN 2296-9144
Publisher: Frontiers Media SA
DOI: 10.3389/frobt.2020.00075

Plants as inspiration for material-based sensing and actuation in soft robots and machines
Author(s): Thomas Speck, Tiffany Cheng, Frederike Klimm, Achim Menges, Simon Poppinga, Olga Speck, Yasaman Tahouni, Falk Tauber, Marc Thielen
Published in: MRS Bulletin, Issue 48, 2023, ISSN 1938-1425
Publisher: Springer
DOI: 10.1557/s43577-022-00470-8

Living Plant-Hybrid Generators for Multidirectional Wind Energy Conversion
Author(s): Fabian Meder, Marc Thielen, Alessio Mondini, Thomas Speck, Barbara Mazzolai
Published in: Energy Technology, Issue 8/7, 2020, Page(s) 2000236, ISSN 2194-4288
Publisher: Wiley
DOI: 10.1002/ente.202000236

High-Throughput and Combinatorial Approaches for the Development of Multifunctional Polymers.
Author(s): Stefan Baudis; Marc Behl
Published in: Macromolecular Rapid Communications, 2021, Page(s) 2100400, ISSN 1022-1336
Publisher: John Wiley & Sons Ltd.
DOI: 10.1002/marc.202100400

Trellis-forming stems of a tropical liana Condylocarpon guianense (Apocynaceae): a plant-made safety net constructed by simple “start-stop” development
Author(s): Soffiatti, P., Fort, E., Heinz, C., and Rowe, N.P
Published in: Frontiers in Plant Science, Issue 7, 64, 2022, ISSN 1664-462X
Publisher: Frontiers Media S. A.
DOI: 10.3389/fpls.2022.1016195

Lignin, the Lignification Process, and Advanced, Lignin-Based Materials
Author(s): Balk, M.; Sofia, P.; Neffe, A.T.; Tirelli, N.
Published in: International Journal of Molecular Sciences, Issue 24, 2023, 2023, ISSN 1422-0067
Publisher: Multidisciplinary Digital Publishing Institute (MDPI)
DOI: 10.3390/ijms241411668

Microspines in tropical climbing plants: a small-scale fix for life in an obstacle course

Author(s): Lehnebach, R., Paul-Victor, C., Courric, E., and Rowe, N. P.
Published in: Journal of Experimental Biology, 2022, ISSN 1460-2431
Publisher: Oxford University Press
DOI: 10.1093/jxb/erac205

Device for Simultaneous Wind and Raindrop Energy Harvesting Operating on the Surface of Plant Leaves

Author(s): Serena Armiento, Fabian Meder, Barbara Mazzolai
Published in: IEEE Robotics and Automation Letters, Issue 20, 2023, ISSN 2377-3766
Publisher: IEEE
DOI: 10.1109/LRA.2023.3250006

Plant-like hooked miniature machines for on-leaf sensing and delivery

Author(s): Fiorello, Isabella; Meder, Fabian; Sinibaldi, Edoardo; Filippeschi, Carlo; Tricinci, Omar; Mazzolai, Barbara
Published in: communications materials, 2021, ISSN 2662-4443
Publisher: Springer Nature
DOI: 10.1038/s43246-021-00208-0

Roadmap on soft robotics: multifunctionality, adaptability and growth without borders

Author(s): Barbara Mazzolai, Alessio Mondini, Emanuela Del Dottore, Laura Margheri, Federico Carpi, Koichi Suzumori, Matteo Cianchetti, Thomas Speck, Stoyan K Smoukov, Ingo Burgert, Tobias Keplinger, Gilberto De Freitas Siqueira, Felix Vanneste, Olivier Goury, Christian Duriez, Thrishantha Nanayakkara, Bram Vanderborght, Joost Brancart, Seppe Terryn, Steven I Rich, Ruiyuan Liu, Kenjiro Fukuda, Takao Someya,
Published in: Multifunctional Materials, Issue 5/3, 032001, 2022, ISSN 2399-7532
Publisher: IOP Publishing Ltd.
DOI: 10.1088/2399-7532/ac4c95

A Plant Tendril-Like Soft Robot That Grasps and Anchors by Exploiting its Material Arrangement

Author(s): Fabian Meder, Saravana Prashanth Murali Babu, Barbara Mazzolai
Published in: IEEE Robotics and Automation Letters, 2022, ISSN 2377-3766
Publisher: IEEE
DOI: 10.1109/LRA.2022.3153713

Responses to single and multiple temperature-, medium-, and pH-stimuli triggering reversible shape shifts in hydrogel actuators

Author(s): X. Wang; M. Behl; A. Lendlein; M. Balk
Published in: Materials & Design, Issue 11, 2022, ISSN 0264-1275
Publisher: Elsevier BV
DOI: 10.1016/j.matdes.2022.111511

Cactus-inspired design principles for soft robotics based on 3D printed hydrogel-elastomer systems

Author(s): Anil K. Bastola, Nadia Rodriguez, Marc Behl, Patricia Soffiatti, Nick P. Rowe, Andreas Lendlein
Published in: Materials & Design, Issue 202, 2021, Page(s) 109515, ISSN 0264-1275
Publisher: Elsevier BV
DOI: 10.1016/j.matdes.2021.109515

Approaches of combining a 3D-printed elastic structure and a hydrogel to create models for plant-inspired actuators

Author(s): Nadia Rodriguez, Anil K. Bastola, Marc Behl, Patricia Soffiatti, Nick P. Rowe, Andreas Lendlein
Published in: MRS Advances, 2021, ISSN 2059-8521
Publisher: Springer
DOI: 10.1557/s43580-021-00081-6

Self-contained and integral microbial fuel cells as portable and sustainable energy sources for low-power field devices

Author(s): Naroa Uria-Molto, Ruben D. Costa, Cybeles Nunziata, Sara Santiago, Gonzalo Guirado, Xavier Muñoz-Berbel, Lukasz Kowalski
Published in: Electronic Journal of Biotechnology, Issue volume 57, 2022, 2022, ISSN 0717-3458
Publisher: EJB Electronic Journal of Biotechnology
DOI: 10.1016/j.ejbt.2022.04.004

Artificial Tendrils Mimicking Plant Movements by Mismatching Modulus and Strain in Core and Shell

Author(s): Muhammad Farhan, Frederike Klimm, Marc Thielen, Andraž Rešetič, Anil Bastola, Marc Behl, Thomas Speck, Andreas Lendlein
Published in: Advanced Materials, Issue 35, 2211902, 2023, ISSN 1521-4095
Publisher: Wiley-VCH GmbH
DOI: 10.1002/adma.202211902

Linking drone and Ground-based liana measurements in a Congolese Forest

Author(s): Kaçamak, V., Barbier, N. Aubry-Kientz,, M. Forni, E. Gourlet-Fleury, S., Guibal, D. I., Loumeto, J. J., Pollet, S., Rossi, V , Rowe, N. P.van Hoef, Y. Réjou-Méchain, Y.
Published in: Frontiers in Forests and Global Change, Issue 5:803194, 2022, ISSN 2624-893X
Publisher: Frontiers Media
DOI: 10.3389/ffgc.2022.803194

Ultraconformable, Self-Adhering Surface Electrodes for Measuring Electrical Signals in Plants

Author(s): Fabian Meder, Sirgi Saar, Silvia Taccola, Carlo Filippeschi, Virgilio Mattoli, Barbara Mazzolai
Published in: Advanced Materials Technologies, Issue 6/4, 2021, Page(s) 2001182, ISSN 2365-709X
Publisher: Wiley
DOI: 10.1002/admt.202001182

Quo vadis plant biomechanics: Old wine in new bottles or an up-and-coming field of modern plant science?
Author(s): Thomas Speck, Olga Speck
Published in: American Journal of Botany, Issue 106/11, 2019, Page(s) 1399-1403, ISSN 0002-9122
Publisher: Botanical Society of America, Inc.
DOI: 10.1002/ajb2.1371

Remotely Light-Powered Soft Fluidic Actuators Based on Plasmonic-Driven Phase Transitions in Elastic Constraint
Author(s): Fabian Meder, Giovanna Adele Naselli, Ali Sadeghi, Barbara Mazzolai
Published in: Advanced Materials, Issue 31/51, 2019, Page(s) 1905671, ISSN 0935-9648
Publisher: United Nations Industrial Developement Organization
DOI: 10.1002/adma.201905671

Passive Morphological Adaptation for Obstacle Avoidance in a Self-Growing Robot Produced by Additive Manufacturing
Author(s): Ali Sadeghi, Emanuela Del Dottore, Alessio Mondini, Barbara Mazzolai
Published in: Soft Robotics, 2019, ISSN 2169-5172
Publisher: Mary Ann Liebert, Inc.
DOI: 10.1089/soro.2019.0025

Characterization of the Growing From the Tip as Robot Locomotion Strategy
Author(s): Emanuela Del Dottore, Alessio Mondini, Ali Sadeghi, Barbara Mazzolai
Published in: Frontiers in Robotics and AI, Issue 6, 2019, ISSN 2296-9144
Publisher: Frontiers Media S.A
DOI: 10.3389/frobt.2019.00045

The softness distribution index: towards the creation of guidelines for the modeling of soft-bodied robots
Author(s): Giovanna A Naselli, Barbara Mazzolai
Published in: The International Journal of Robotics Research, 2019, Page(s) 027836491989345, ISSN 0278-3649

Publisher: SAGE Publications
DOI: 10.1177/0278364919893451

Plant-Inspired Soft Bistable Structures Based on Hygroscopic Electrospun Nanofibers
Author(s): Dario Lunni, Matteo Cianchetti, Carlo Filippeschi, Edoardo Sinibaldi, Barbara Mazzolai
Published in: Advanced Materials Interfaces, 2020, Page(s) 1901310, ISSN 2196-7350
Publisher: Wiley
DOI: 10.1002/admi.201901310

Taking inspiration from climbing plants: methodologies and benchmarks—a review
Author(s): Fiorello, Isabella; Del Dottore, Emanuela; Tramacere, Francesca; Mazzolai, Barbara
Published in: Bioinspiration & Biomimetics, Issue 1, 2020, ISSN 1748-3182
Publisher: Institute of Physics Publishing
DOI: 10.1088/1748-3190/ab7416

Plant tropisms as a window on plant computational processes
Author(s): Yasmine Meroz
Published in: New Phytologist, Issue 229/4, 2021, Page(s) 1911-1916, ISSN 0028-646X
Publisher: Blackwell Publishing Inc.
DOI: 10.1111/nph.17091

Wind dynamics and leaf motion: Approaching the design of high-tech devices for energy harvesting for operation on plant leaves
Author(s): Fabian, Meder; Giovanna Adele, Naselli; Barbara, Mazzolai
Published in: Frontiers in Plant Science, Issue 5, 2022, ISSN 1664-462X
Publisher: Frontiers Media S. A.
DOI: 10.3389/fpls.2022.994429

Biomechanics of tendrils and adhesive pads of the climbing passion flower Passiflora discophora
Author(s): Frederike Klimm, Stefanie Schmier, Holger F Bohn, Svenja Kleiser, Marc Thielen, Thomas Speck
Published in: Journal of Experimental Botany, Issue 73/4, 2022, Page(s) 1190–1203, ISSN 0022-0957
Publisher: Oxford University Press
DOI: 10.1093/jxb/erab456

A General 3D Model for Growth Dynamics of Sensory-Growth Systems: From Plants to Robotics
Author(s): Amir Porat, Fabio Tedone, Michele Palladino, Pierangelo Marcati, Yasmine Meroz
Published in: Frontiers in Robotics and AI, Issue 7, 2020, ISSN 2296-9144

Publisher: Frontiers Media SA
DOI: 10.3389/frobt.2020.00089

Hamilton-Jacobi-Bellman Equation for Control Systems with Friction
Author(s): Fabio Tedone, Michele Palladino
Published in: IEEE Transactions on Automatic Control, 2020, Page(s) 1-1, ISSN 0018-9286
Publisher: Institute of Electrical and Electronics Engineers
DOI: 10.1109/tac.2020.3040726

Multisource energy conversion in plants with soft epicuticular coatings
Author(s): Fabian Meder, Alessio Mondini, Francesco Visentin, Giorgio Zini, Marco Crepaldi, Barbara Mazzolai
Published in: Energy & Environmental Science, 2022, ISSN 1754-5706
Publisher: Royal Society of Chemistry
DOI: 10.1039/D2EE00405D

Origami hand for soft robotics driven by thermally controlled polymeric fiber actuators
Author(s): Muhammad Farhan, Marc Behl, Karl Kratz, Andreas Lendlein
Published in: MRS Communications, Issue 11/4, 2021, Page(s) 476-482, ISSN 2159-6859
Publisher: Cambridge University Press
DOI: 10.1557/s43579-021-00058-4

Bio-inspired and computer-supported design of modulated shape changes in polymer materials
Author(s): Johan Bäckemo, Yue Liu, Andreas Lendlein
Published in: MRS Communications, Issue 11/4, 2021, Page(s) 462-469, ISSN 2159-6859
Publisher: Cambridge University Press
DOI: 10.1557/s43579-021-00056-6

By hook or by crook: how and why do compound leaves stay curved during development?
Author(s): Yasmine Meroz, Wendy K Silk
Published in: Journal of Experimental Botany, Issue 71/20, 2020, Page(s) 6189-6192, ISSN 0022-0957
Publisher: Oxford University Press
DOI: 10.1093/jxb/eraa389

Bio-Inspired Magnetically Controlled Reversibly Actuating Multimaterial Fibers
Author(s): Muhammad Farhan; Daniel S. Hartstein; Yvonne Pieper; Marc Behl; Andreas Lendlein; Axel T. Neffe
Published in: Polymers, Issue 5, 2023, Page(s) 2233, ISSN 2073-4360
Publisher: MDPI
DOI: 10.3390/polym15092233

Optimal control of plant root tip dynamics in soil

Author(s): Fabio Tedone, Emanuela Del Dottore, Michele Palladino, Barbara Mazzolai, Pierangelo Marcati
Published in: Bioinspiration & Biomimetics, Issue 15/5, 2020, Page(s) 056006, ISSN 1748-3190
Publisher: Institute of Physics Publishing
DOI: 10.1088/1748-3190/ab9a15

Failure without tears: two-step attachment in a climbing cactus

Author(s): Rowe, N.P., Cheng Clavel L., Soffiatti P.
Published in: Biomimetics, Issue 8, 220, 2023, ISSN 2313-7673
Publisher: MDPI
DOI: 10.3390/biomimetics8020220

Shape-Memory Polymers Designed in View of Thermomechanical Energy Storage and Conversion Systems.

Author(s): Andreas Lendlein; Matthias Heuchel
Published in: ACS Central Science, 2021, Page(s) 1599 - 1601, ISSN 2374-7951
Publisher: ACS Publications
DOI: 10.1021/acscentsci.1c01032

Other (8)

GROWBOT — TOWARDS A NEW GENERATION OF PLANT-INSPIRED GROWING ARTEFACTS
Author(s): Thomas Speck, Marc Thielen, Frederike Klimm
Published in: REPORT 2022 FIT FREIBURG CENTER OF INTERACTIVE MATERIALS AND BIOINSPIRED TECHNOLOGIES, 2023, Page(s) 78-79
Publisher: Freiburg Center for Interactive Materials

GROWBOT—TOWARDS A NEW GENERATION OF PLANT-INSPIRED GROWING ARTEFACTS
Author(s): T. Speck, M. Thielen, Frederike Klimm, B. Mazzolai et al.
Published in: REPORT 2020 FIT FREIBURG CENTER FOR INTERACTIVE MATERIALS AND BIOINSPIRED TECHNOLOGIES, 2021, Page(s) 87-88
Publisher: Freiburg Center for Interactive Materials and Bioinspired Technologies (FIT)

Biomechanics of climbing plant attachment: The tendrils and adhesive pads of thepassionflower Passiflora discophora
Author(s): Frederike Klimm, Thomas Speck, Marc Thielen
Published in: REPORT 2021 FIT FREIBURG CENTER FOR INTERACTIVE MATERIALS AND BIOINSPIRED TECHNOLOGIES, 2022, Page(s) 44-46

Publisher: Freiburg Center for Interactive Materials and Bioinspired Technologies (FIT)

Towards a new generation of plant-inspired growing artefacts: The plant role models
Author(s): Frederike Klimm, Thomas Speck, Marc Thielen
Published in: REPORT 2019 FIT FREIBURG CENTER FOR INTERACTIVE MATERIALS AND BIOINSPIRED TECHNOLOGIES, 2020, Page(s) 79-80
Publisher: Freiburg Center for Interactive Materials and Bioinspired Technologies (FIT)

The plant role models: A springdamped adhesive system and self-stiffening braided support structures
Author(s): Frederike Klimm, Michelle Modert, Daniela Neugebauer, Thomas Speck, Marc Thielen
Published in: REPORT 2020 FIT FREIBURG CENTER FOR INTERACTIVE MATERIALS AND BIOINSPIRED TECHNOLOGIES, 2021, Page(s) 40-41
Publisher: Freiburg Center for Interactive Materials and Bioinspired Technologies (FIT)

GROWBOT - Towards a new generation of plantinspired growing artefacts
Author(s): T. Speck, M. Thielen, B. Mazzolai et al.
Published in: REPORT 2018 FIT FREIBURG CENTER FOR INTERACTIVE MATERIALS AND BIOINSPIRED TECHNOLOGIES, 2019, ISBN 987-3-946018-04-9
Publisher: Freiburg Center for Interactive Materials and Bioinspired Technologies (FIT

Tendril coiling in passion flowers
Author(s): Frederike Klimm, Thomas Speck, Marc Thielen
Published in: REPORT 2022 FIT FREIBURG CENTER FOR INTERACTIVE MATERIALS AND BIOINSPIRED TECHNOLOGIES, 2023, Page(s) 36-37
Publisher: Freiburg Center for Interactive Materials and Bioinspired Technologies (FIT)

GROWBOT — TOWARDS A NEW GENERATION OF PLANT-INSPIRED GROWING ARTEFACTS
Author(s): T. Speck, M. Thielen, F. Klimm, B. Mazzolai et al.
Published in: REPORT 2021 FIT FREIBURG CENTER OF INTERACTIVE MATERIALS AND BIOINSPIRED TECHNOLOGIES, 2022, Page(s) 89-90
Publisher: Freiburg Center for Interactive Materials

Datasets

Datasets via OpenAIRE (20)

[DATASET 6] - MICRO-EXTRUSION PROTOTYPE AND FOAMING
Author(s): Neffe, A.T.; Farhan, M.; Bastola, A. K.; Rodriguez, N.; Bäckemo, J.; Liu, Y.; Lendlein, A.
Published in: Zenodo

[DATASET 9] - PLANT-ROBOT INTERFACES FOR ENERGY HARVESTING
Author(s): Fabian, Meder; Mazzolai, Barbara
Published in: Zenodo

Microspines in tropical climbing plants: a small-scale fix for life in an obstacle course
Author(s): Lehnebach, Romain; Paul-Victor, Cloé; Courric, Elisa; Rowe, Nick P.
Published in: Zenodo

Passive Morphological Adaptation for Obstacle Avoidance in a Self-Growing Robot Produced by Additive Manufacturing
Author(s): Sadeghi, A.; Del Dottore, E.; Mondini, A.; Mazzolai, B.
Published in: Zenodo

[DATASET 7] - SOFT "SEARCHER-LIKE" ROBOT
Author(s): Naselli, Giovanna; Visentin, Francesco; Tramacere, Francesca; Mazzolai, Barbara
Published in: Zenodo

[DATASET 1] - BIOMECHANICAL CHARACTERIZATION OF SELECTED CLIMBING PLANTS
Author(s): Fiorello, Isabella; Tramacere, Francesca; Mazzolai, Barbara
Published in: Zenodo

Dataset for manuscript "Responses to single and multiple temperature-, medium-, and pH-stimuli triggering reversible shape shifts in hydrogel actuators"
Author(s): Wang, Xu; Behl, Marc; Lendlein, Andreas; Balk, Maria
Published in: Zenodo

Supplementary material from "Structural performance of a climbing cactus: making the most of softness"
Author(s): Bastola, Anil K.; Soffiatti, Patricia; Behl, Marc; Lendlein, Andreas; Rowe, Nick P.
Published in: The Royal Society

[DATASET 8] - MICROBIAL FUEL CELLS (MFCS)

Author(s): Costa, Ruben; Vidarte, Pablo
Published in: Zenodo

Dataset 3 - Mathematical Modeling of Growth for Climbing Plants
Author(s): Palladino, Michele; Marcati, Pierangelo
Published in: Zenodo

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See all 20 results

Software

Software via OpenAIRE (4)

S4: weightless model
Author(s): Vecchiato, Giacomo
Publisher: Zenodo
DOI: 10.5281/zenodo.8360220; 10.5281/zenodo.8360221

[Supplementary data file] A growing soft robot with climbing plant inspired adaptive behaviors for navigation in unstructured environments
Author(s): Del Dottore, Emanuela; Mondini, Alessio; Rowe, Nick; Mazzolai, Barbara
Publisher: Zenodo
DOI: 10.5281/zenodo.10287323; 10.5281/zenodo.10287322

S4: model simulations, positive delta
Author(s): Vecchiato, Giacomo
Publisher: Zenodo
DOI: 10.5281/zenodo.8360201; 10.5281/zenodo.8360202

S4: model simulations, null delta
Author(s): Vecchiato, Giacomo
Publisher: Zenodo
DOI: 10.5281/zenodo.8359923; 10.5281/zenodo.8359924

Other Research Products

Other Research Products via OpenAire (1)

[Additional Materials] - Characterization of the Growing From the Tip as Robot Locomotion Strategy

Author(s): Del Dottore, Emanuela; Mondini, Alessio; Sadeghi, Ali; Mazzolai, Barbara
Published in: Zenodo

Last update: 22 April 2024

Permalink: https://cordis.europa.eu/project/id/824074/results

European Union, 2025