In the spotlight

Electropermanent Magnetic Muscles: Power-Efficient, Low-Voltage, Compact Magnetic Actuators to Power Wearables and Untethered Robots

Advanced Intelligent Systems
SUTD Author: Arturo Castillo Ugalde

Wearable devices and robots need actuators that are safe, compact, and energy-efficient — especially when they interact closely with people. During my PhD at SUTD, I developed Electropermanent Magnetic Muscles, a new type of artificial muscle that can contract, hold loads, and relax using short electrical pulses, while consuming zero energy when holding forces and position. Many existing artificial muscle technologies rely on external pumps, high voltages, or temperature cycles, which can introduce safety risks, slow response times, and integration challenges for wearable and human-interactive devices.

This work demonstrates how the technology can power a low-energy prosthetic hand capable of maintaining a grasp without energy consumption, as well as an untethered salamander-inspired robot that crawls and swims using compact onboard electronics. By combining low-voltage operation, high portability, and fast, muscle-like behaviour, this approach opens new possibilities for wearable assistive devices and autonomous robots designed to operate longer, safer, and closer to people.

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- Arturo Castillo Ugalde
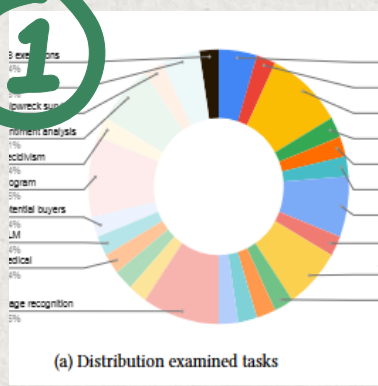
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Software Fairness: An Analysis and Survey
ACM Computing Surveys
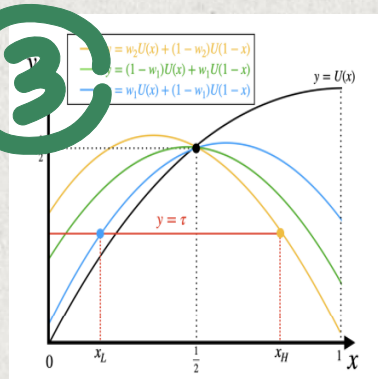SUTD Author: Ezekiel Soremekun
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②

'Sweating the small stuff': investigating robot ethics in ordinary but complex interactions of the Ubi Problem
AI & Society
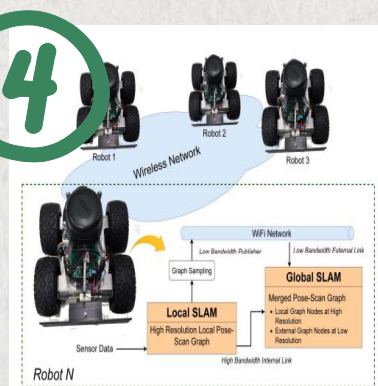SUTD Authors: Jeffrey Chan Kok Hui, Jiang Zhuoqun
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③

Incentivizing Social Information Sharing Through Routing Games
IEEE Transactions On Networking
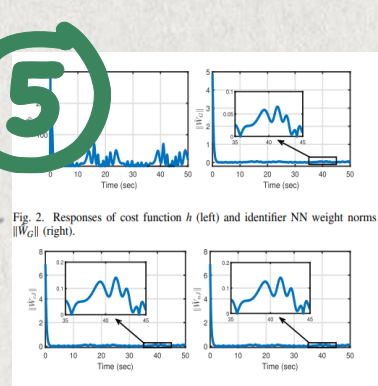SUTD Author: Li Songhua
ISTD

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Multi-Robot Collaborative SLAM (Multi-SLAM) With Distributed Lightweight Predictive Frontier Exploration (LPFE)
IEEE Robotics And Automation Letters
SUTD Authors: Achala Athukorala, Tan U-Xuan
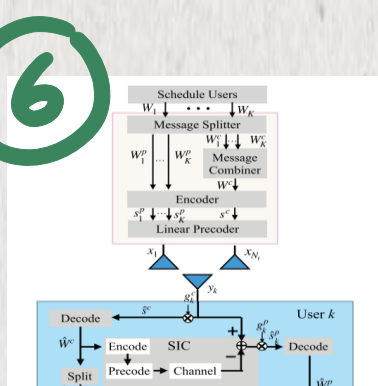*Temasek Lab, EPD*

⑤

Optimal Tracking Control of Uncertain Nonlinear Systems Using Simplified Reinforcement Learning
IEEE Transactions On Cybernetics
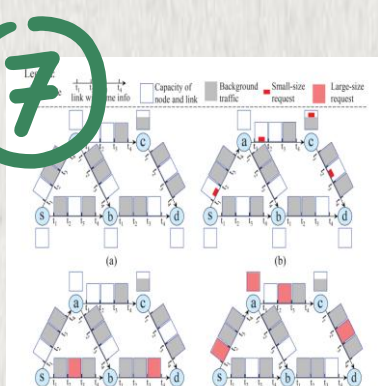SUTD Author: Ning Pengju
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Fast-Adaptive Beamforming for Rate-Splitting Multiple Access-Aided Space-Air-Ground Integrated Networks With Few-Shot Samples
IEEE Transactions On Wireless Communications
SUTD Authors: Zhang Shengyu, Wang Feng, Yang Huiting
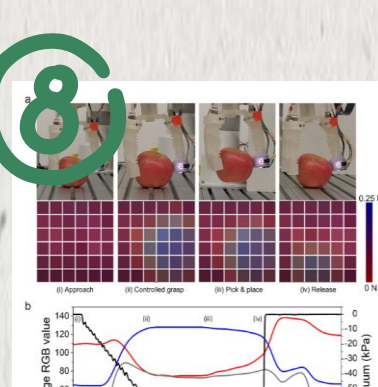*Future Communications Connectivity Lab, ISTD*

⑦

FlexSatIoE: Flexible Routing and Buffering for Satellite Networks Enabled Internet of Everything Applications
IEEE Transactions On Wireless Communications
SUTD Author: Wang Peng, Chen Binbin
ISTD

⑧

Visuo-Tactile Sensor Enabled by Cholesteric Liquid Crystal Elastomer for Soft Robotics
Advanced Functional Materials
SUTD Authors: Chen Lei, Zhang Wang, Teo Rou Yun, John Chan You En, Joel Yang K. W.
EPD