



*Front. Inform.  
Technol. Elec-  
tron. Eng.*

**Administrated by**  
Chinese Academy of Engineering

**Sponsored by**  
Chinese Academy of Engineering  
& Zhejiang University

**Published by**  
Springer & Zhejiang University  
Press

**Edited by**  
Editorial Office of *Journal of  
Zhejiang University-SCIENCE  
& FITEE*

**Printed by**  
Hangzhou Shengyuan Printing  
Services Co., Ltd.

**Publication Date**  
1<sup>st</sup> Week per Month

**Price (Domestic)**  
160 CNY/Issue

**ISSN 2095-9184**  
**CN 33-1389/TP**

# CONTENTS

## Special Issue on Intelligent Unmanned Systems

### Editorial

- 649 Intelligent unmanned systems: important achievements and applications of new generation artificial intelligence  
Cheng WU, Tao ZHANG

### Review Articles

- 652 Survey of autonomous guidance methods for powered planetary landing  
Zheng-yu SONG, Cong WANG, Stephan THEIL, David SEELBINDER,  
Marco SAGLIANO, Xin-fu LIU, Zhi-jiang SHAO
- 675 A survey on multi-sensor fusion based obstacle detection for intelligent ground vehicles in off-road environments  
Jin-wen HU, Bo-yin ZHENG, Ce WANG, Chun-hui ZHAO, Xiao-lei HOU,  
Quan PAN, Zhao XU

### Tutorial

- 693 Warehouse automation by logistic robotic networks: a cyber-physical control approach  
Kai CAI

### Research Articles

- 705 Fixed-time constrained acceleration reconstruction scheme for robotic exoskeleton via neural networks  
Tao XUE, Zi-wei WANG, Tao ZHANG, Ou BAI, Meng ZHANG, Bin HAN

---

### Guest Editors

Cheng WU, Editor-in-Chief, Academician of CAE, Tsinghua Univ, China  
Tao ZHANG, Executive Lead Editor, Tsinghua Univ, China  
Tamer BASAR, Univ Illinois Urbana-Champaign, USA  
Hai-bin DUAN, Beihang Univ, China  
Shuo LI, Shenyang Inst Autom, CAS, China  
Hua-wei LIANG, Hefei Inst Phys Sci, CAS, China  
Zhi-jiang SHAO, Zhejiang Univ, China  
Tian-miao WANG, Beihang Univ, China  
Lihua XIE, Nanyang Technol Univ, Singapore

- 723 An untethered cable-driven ankle exoskeleton with plantarflexion-dorsiflexion bidirectional movement assistance  
Tian-miao WANG, Xuan PEI, Tao-gang HOU, Yu-bo FAN,  
Xuan YANG, Hugh M. HERR, Xing-bang YANG
- 740 Multi-UAV obstacle avoidance control via multi-objective social learning pigeon-inspired optimization  
Wan-ying RUAN, Hai-bin DUAN
- 749 Terrain matching localization for hybrid underwater vehicle in the Challenger Deep of the Mariana Trench  
Jian WANG, Yuan-gui TANG, Chuan-xu CHEN, Ji-xu LI, Cong CHEN,  
Ai-qun ZHANG, Yi-ping LI, Shuo LI
- 760 Novel 3D point set registration method based on regionalized Gaussian process map reconstruction  
Bo LI, Yu ZHANG, Wen-jie ZHAO, Ping LI
- 777 Proximal policy optimization with an integral compensator for quadrotor control  
Huan HU, Qing-ling WANG
- 796 Target detection for multi-UAVs via digital pheromones and navigation algorithm in unknown environments  
Yan SHAO, Zhi-feng ZHAO, Rong-peng LI, Yu-geng ZHOU



*Front. Inform.  
Technol. Elec-  
tron. Eng.*