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Xinhao Xiang

Education

2021-Present **M.S. in Computer Science**,
University of California, Davis, Davis, CA, USA.

2017-2021 **B.E. in Computer Science and Technology**,
Southern University of Science and Technology (SUSTech), Shenzhen, Guangdong, China.
- Overall GPA 3.64/4

Jul 2019-Aug 2019 **EUR Summer Research Program**,
University of California, Irvine, Irvine, CA, USA.
- Overall GPA 3.71/4

Jul 2018-Aug 2018 **Vancouver Summer Program**,
The University of British Columbia, Vancouver, BC, Canada.
- Course (Grades): International Business Management (A-), International Marketing (A)

Publication

[1] Jian Yang[1], Ruilin Xiong[1], **Xinhao Xiang**[1], and Yuhui Shi, "Exploration Enhanced RPSO for Collaborative Multitarget Searching of Robotic Swarms", *Complexity*, vol. 2020, Article ID 8863526, 12 pages, 2020.

[2] Jian Yang[1], Donghui Zhao[1], **Xinhao Xiang**[1], and Yuhui Shi, "Robotic Brain Storm Optimization: A Multi-target Collaborative Searching Paradigm for Swarm Robotics", Advances in Swarm Intelligence, *ICSI 2021*, Lecture Notes in Computer Science, vol. 12690, Springer, Cham.

[3] Caio Batista de Melo[1], Minjun Seo, Marzieh Ashrafiamiri, Haoming Jue, **Xinhao Xiang**, Fadi Kurdahi, and Nikil Dutt, "SAFER: Safety Guanrantees for Emergent Behavior" *(a paper revised for "ACM Transactions on Embedded Computing Systems")*

[Thesis] **Xinhao Xiang,** "Collaborative Multitarget Searching of Robotic Swarms Based on PF and BSO Algorithm" *Undergraduate Thesis*, 2021.
- Advised by *Prof. Yuhui Shi*

Attended Conference

Jul 2021 **The Twelfth International Conference on Swarm Intelligence (ICSI 2021)**,
Qingdao, China.

Grant Proposals

Dec 2019 **Project Manager: Research on Cooperative Motion and Path Planning Methods of Swarm Intelligent Robots**.

- 2020 "Climbing Plan" Special Fund for Science and Technology Innovation Cultivation of College Students in Guangdong Province
- Guangdong Provincial Government
- Funding code: PDJH2020b0522
- Fund received: ¥40,000

Research Experience

Sep 2019- Jul 2021 **Undergrad Student Researcher**, *Southern University of Science and Technology (SUSTech), Shenzhen, Guangdong, China*.

- **Advisor**: *Prof. Yuhui Shi* and *Prof. Jian Yang*
- **Funding**: As the **Project Manager**, I am glad that this project is awarded 2020 "Climbing Plan" Special Fund for Science and Technology Innovation Cultivation of College Students in Guangdong Province (Funding code: PDJH2020b0522, Percentage: 10/400+, Fund received: 40,000 RMB, 12/2019)

General Research Process:

- Employed the strategy of collaborative motion and multi-target searching of swarm intelligent robots under the condition of decentralized topology architecture and limited sense of perception and info-communication ability;
- Established the corresponding simulation and experiment system using mobile robot simulation platforms like MATLAB and Webots as well as real robots like E-Puck and TurtleBot to verify the effectiveness of relevant methods.

Achievements:

- **1.** Proposed a new potential field (PF) based multi-robot movement strategy for it, where Brain Strom Optimizing (BSO) algorithm plays an important role in contributing to local area potential field, and applied the strategy to detect the pollution source;:
- Under the same map condition, my strategy performs a generally higher performance on multi-target searching in MATLAB multi-robot environment, compared to other classic multi-robot movement strategies.
- **My Undergraduate Thesis:** "Collaborative Multitarget Searching of Robotic Swarms Based on PF and BSO Algorithm"
- **2.** Assisted to propose an exploration enhanced Robotic Particle Swarm Optimization (E2RPSO) method for multi-target searching problems on robotic swarms;
- The proposed method modifies the third item in the RPSO as an additional attraction term, not only enables the robot to avoid collisions but also guides the swarm to search unexplored regions as much as possible. This operation increases the swarm's task-specific (top-down) diversity, making the system cover a broader search area and avoid falling into local optimums.
- **Publication:** Jian Yang, Ruilin Xiong, **Xinhao Xiang**, and Yuhui Shi, "Exploration Enhanced RPSO for Collaborative Multitarget Searching of Robotic Swarms", *Complexity*, vol. 2020, Article ID 8863526, 12 pages, 2020.
- **3.** Assisted to propose a BSO-based collaborative searching framework for swarm robotics called Robotic BSO;
- The simulation results show that the proposed method can simulate the BSO's guided search characteristics and has an excellent prospect for multi-target searching problems for swarm robotics.
- **Publication:** Jian Yang, Donghui Zhao, **Xinhao Xiang**, and Yuhui Shi, "Robotic Brain Storm Optimization: A Multi-target Collaborative Searching Paradigm for Swarm Robotics", Advances in Swarm Intelligence, *ICSI 2021*, Lecture Notes in Computer Science, vol. 12690, Springer, Cham.

Jun 2020- Oct 2020 **UCInspire Research Intern**, *University of California, Irvine, Irvine, CA, USA*.

- **Advisor**: *Prof. Fadi J. Kurdahi*
  Research Process:
- Employed the Carla simulator to perform real-time vehicle driving simulation;
- Aggregated data from different types of sensors by attaching these sensors in the ego car and implemented the callback function;
- Filtered data to extract features that are mostly relative to collision anomaly detection and then trained models;
- Applied outlier detection algorithms (e.g. KNN, VAE, PCA) in Python Outlier Detection (PyOD) to detect abnormal situations.
- **Achievement**: Designed a new strategy for anomaly detection and identified VAE as the best algorithm for this detection
- **Publication:** Caio Batista de Melo, Minjun Seo, Marzieh Ashrafiamiri, Haoming Jue, **Xinhao Xiang**, Fadi Kurdahi, and Nikil Dutt, "SAFER: Safety Guanrantees for Emergent Behavior" *(a paper submitted to "ACM Transactions on Embedded Computing Systems")*

Jul 2019- Aug 2019 **EUR Summer Research Program**, *University of California, Irvine, Irvine, CA, USA*.

- **Advisor**: *Prof. Saleem M. Yamani*
  Research Process & Achievement:
- Built a SMART sensor Car Kit (PiCar-S) using the Raspberry Pi single-board computer;
- Applied a Python-based IDE to design better movement strategies for obstacle avoidance, line following, and light following;
- Designed a creative-looking car and put PiCar-S in it;
- Implemented the strategies into PiCar-S and won the 3rd group in the final car-performance competition.

Selected Awards

Jun 2021 Excellent Graduate for Exceptional Performance in the SUSTech.

- Top 5% in the University

May 2021 Highest Honors in Computer Science and Engineering for outstanding achievement in the undergraduate program (2017-2021).

May 2021 Shuren College Outstanding Graduates for Exceptional Performance in the SUSTech.

2017-2021 Merit Student Scholarship for Exceptional Performance for four consecutive academic years at SUSTech.

Skills

Languages	Python, MATLAB, JAVA, SQL, C/C++
Frameworks	PyTorch, Tensorflow, Keras
WebD	HTML/CSS, JavaScript, Hugo
Utilities	Linux, Git, Latex
Communication	English(Proficient), Chinese(Native)

References

Yuhui Shi,
Chair Professor,
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Jian Yang,
Research Assistant Professor,
Department of Computer Science and Engineering,
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Fadi J. Kurdahi,
Associate Dean for Graduate and Professional Studies,
Dean's Office
Professor
Department of Electrical Engineering and Computer Science
Professor(Joint Appointment)
Donald Bren School of Information and Computer Science,
University of California, Irvine.
kurdahi@uci.edu