Curriculum Vitae

Chizhao Yang, *Ph.D.*

Framingham, MA, United States

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Education

Ph.D. in Aerospace Engineering (Robotics)   Jan. 2016 - Dec.2021

West Virginia University, Morgantown, WV

Research Advisor: Dr. Yu Gu

Dissertation: "Localization Algorithms for GNSS-denied and Challenging Environments"

M.S. in Electrical Engineering   Aug. 2014 - Dec. 2015

Stevens Institute of Technology, Hoboken, NJ

B.S. in Electrical Engineering   Sep. 2008 - Jun. 2012

Sichuan Normal University, Chengdu, China

Graduated with highest honors

Research Interests

Robotics: Perception and Localization, SLAM, Path Planning, Multi-agent Navigation;

Sensors: Sensor Fusion, LiDAR-Camera-IMU-based SLAM;

Applications: Autonomous Driving, Service Robots, Warehouse Robots.

Experience

Software Engineer (Team Lead)   Dec. 2021 - present

O-net Communication (USA), Boston

- Vision (lidar and camera) based algorithms development (intrinsic and extrinsic calibration, noise removal, object detection, visual and lidar odometry)
- C++ code implementation and optimization
- Graphical User Interface development
- Leader of lidar R&D team (system design, task assignment, leading code review, code management)

Graduate Research Assistant   Advisor: Dr. Yu Gu

Interactive Robotics Lab., West Virginia University   Jan. 2016 - Dec.2021
- Designed a robust lidar-inertial-based motion estimation system in dynamic environments
- Performed visual-inertial localization using iRobot Create platform
- Designed an algorithm using EKF and particle filter to solve cooperative navigation in GNSS-denied environments (e.g., underwater)
- Developed a localization system (based on LiDAR, IMU, and wheel odometry) for a pollination robot, BrambleBee, which is designed for pollinating bramble plants in a greenhouse
- Developed a 3D LiDAR based SLAM algorithm for Cataglyphis, the robot won first prize in NASA Sample Return Robot Centennial Challenge
- Implemented a local map based collision avoidance system for Cataglyphis
- Applied a navigation framework on the Freight base robot which is designed for the project focused on the human robot collaboration in smart warehouses

Graduate Research Assistant   Advisor: Dr. Narayan Ganesan
HCMM Lab., Stevens Institute of Technology   Apr. 2015 - Dec. 2015
- Implemented a rapid search algorithm in the Apache Accumulo Database

Summer Research Intern   Supervisor: Dr. Yu-Dong Yao
ECE Department, Stevens Institute of Technology   May 2015 - Jul. 2015
- Designed and built a robotic printer

Teaching Assistant   Instructor: Dr. Si Long
Engineering Lab., Sichuan Normal University   Sep. 2009 - Jan. 2012

Skills

Programming: C++, Matlab, Python, Latex, Script, HTML

Software: Robot Operator System (ROS1 and ROS2), Git, Docker, Gazebo

Hardware: Velodyne LiDAR, IMU, Raspberry Pi, Particle Photon

Robot Platforms: Husky UGV, iRobot Create, Turtlebot3, Fetch Freight

Publications

Journal Publications:
- Y. Chen, Y. Luo, **C. Yang**, M. Yerebakan, S. Hao, N. Grimaldi, S. Li, R. Hayes, and B. Hu, "Human Mobile Collaborative Robot Interaction in the Retail Environment," *Scientific Data* 9, no. 1 (2022): 1-10.

- Y. Chen, **C. Yang**, Y. Gu, and B. Hu, "Influence of Mobile Robots on Human Safety Perception and System Productivity in Wholesale and Retail Trade Environments: A Pilot Study," *IEEE Transactions on Human-Machine Systems (2022)*.

- **C. Yang**, J. Strader, and Y. Gu, "A Scalable Framework for Map Matching Based Cooperative Localization," *Sensor*, 21(19), p.6400.

- **C. Yang**, J. Strader, Y. Gu, A. Canciani, and K. Brink, "Cooperative Navigation using Pairwise Communication with Ranging and Magnetic Anomaly Measurements," AIAA *Journal of Aerospace Information Systems* (2020), 1-10.

- Y. Gu, J. Strader, N. Ohi, S. Harper, K. Lassask, **C. Yang**, L. Kogan, B. Hu, M. Gramlich, R. Kavi, and J. Gross, "Robot Foraging: Autonomous Sample Return in a Large Outdoor Environment," *IEEE Robotics & Automation Magazine*, 25(3), pp. 93-101.

Conference Publications:

- Y. Luo, Y. Chen, M. Yerebakan, S. Hao, N. Grimaldi, **C. Yang**, R. Hayes, and B. Hu, "How Do Humans Change Their Motion Patterns When Sharing Space with Collaborative Robots in The Retail Environment?", Accepted by *3rd IEEE International Conference on Human-Machine Systems*, Orlando, FL, 2022

- Y. Chen, **C. Yang**, B. Song, N. Gonzalez, Y. Gu, and B. Hu, "Effects of Autonomous Mobile Robots on Human Mental Workload and System Productivity in Smart Warehouses: A Preliminary Study." *In Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, vol. 64, no. 1, pp. 1691-1695. Sage CA: Los Angeles, CA: SAGE Publications, 2020.

- **C. Yang**, R. Watson, J. Gross, and Y. Gu, "Localization Algorithm Design and Evaluation for an Autonomous Pollination Robot," *International Technical Meeting of the Satellite Division of The Institute of Navigation (ION GNSS+)*, pp. 2702-2710, 2019.

- J. Strader, J. Nguyen, C. Tatsch, Y. Du, K. Lassak, B. Buzzo, R. Watson, H. Cerbone, N. Ohi, **C. Yang**, and Y. Gu, "Flower Interaction Subsystem for a precision Pollination Robot," *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 5524-5541, 2019

- **C. Yang**, J. Strader, Y. Gu, A. Hypes, A. Canciani, and K. Brink, "Cooperative UAV Navigation using Inter-Vehicle Ranging and Magnetic Anomaly Measurements," *AIAA Guidance, Navigation, and Control Conference*, pp. 1595, 2018.

- N. Ohi, K. Lassak, R. Watson, J. Strader, Y. Du, **C. Yang**, G. Hedrick, J. Nguyen, S. Harper, D. Reynolds et al., "Design of an autonomous precision pollination robot," *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 7711-7718, 2018.

Workshops:

- R. Watson, N. Ohi, S. Harper, C. Kilic, **C. Yang**, J. Hikes, M. De, J. Strader, G. Hedrick, H. Nichols, and E. Uption, "A Rover and Drone Team for Subterranean Environments: System Design Overview," *Robotics: Science and Systems (RSS) workshop*, 2018.

Awards & Honors

Sixth in the Final Round of NASA Centennial Challenge ($30,000 Prize)   Sep. 2021
- NASA Space Robotics Challenge Phase 2 Centennial Challenge
- Team Member (Perception)

Competition Round Qualification Award ($15,000 Prize)   Jan. 2021
- NASA Space Robotics Challenge Phase 2 Centennial Challenge
- Mentor (Localization and Mapping)

WVU Outstanding Merit Fellowship for Continuing Doctoral Students   2017 - 2018

Final Challenge ($750,000 Prize) Winner   Sep. 2016
- NASA Centennial Challenge (Sample Return Robot Challenge)
- Key Team Member (Collision Avoidance, SLAM)

Excellent Undergraduate Student Award in Sichuan Province   2008 - 2012
- Four Consecutive Academic Year from 2008 to 2012
- Top 1% of students in Province

Invited Presentation

West Virginia University, Morgantown, WV   Jun. 2021
"Cooperative Localization with Scalable Group size using Ranging and Scalar Field Information"

West Virginia University, Morgantown, WV   Aug. 2020
"Cooperative Navigation using Pairwise Communication"

West Virginia University, Morgantown, WV   Aug. 2020
"A robust Lidar-based Motion Estimation Algorithm Design"

Sichuan Normal University, Chengdu, China   Mar. 2019
"Robotic Localization"

Robert H. Mollohan Research Center, Fairmont, WV   Oct. 2017
"Cataglyphis: An Autonomous Sample Return Robot"

Professional Activities

Reviewer for the Following Technical Journals:
- IEEE Robotics and Automation Letters (RA-L)
- IEEE Transactions on Mechatronics (TMECH)
- IEEE Transactions on Industrial Electronics (TIE)
- IEEE Transactions on Human-Machine Systems (THMS)
- Applied Sciences
- Autonomous Robots
- Defense Technology
- Micromachines
- Sensors

Reviewer for the Following Technical Conferences:
- 2019 IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM)
- 2019 IEEE International Conference on Advanced Robotics (ICAR)
- 2020 IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM)
- 2020 IEEE International Conference on Automation Science and Engineering (CASE)
- 2020 IEEE International Conference on Robotics and Automation (ICRA)
- 2021 International Conference on Unmanned Aircraft Systems (ICUAS)
- 2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
- 2021 IEEE International Conference on Systems, Man, and Cybernetics (SMC)
- 2022 IEEE International Conference on Robotics and Automation (ICRA)
- 2022 IEEE International Conference on Human-Machine Systems (ICHMS)
- 2023 IEEE International Conference on Robotics and Automation (ICRA)
- 2023 AIAA SciTech Forum (GNC)
- 2023 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)

University Services

Visitors Services Volunteer
Watts Museum, WVU   Aug. 2017 - Apr.2018
Special Advisor
WVU Chinese Students and Scholars Association   Dec. 2016 - Mar. 2018
Volunteer
SIT Chinese Students and Scholars Association   Aug. 2014 - May. 2015
President
Student Union in College of Engineering, SNU   Sep. 2010 - Jun. 2011
Outreach Activities:
Help students with Lego Robot Competition
Robot display during MAE Pumpkin Drop event

Presentations at Day in the Park event in Fairmont (NASA IV&V)
Robot demonstration at WVU Nursery School
Robot and UAV demonstrations to Cub Scout Pack 60
Robot demonstration during Black Bears baseball game
Annual WVU IRL Open House

Media Coverage

Television and Online Videos:
- "NASA competition winners develop AI for future rovers," NASA 360, Nov 2019.
- "NASA Challenge winners develop robots for earth and rovers for space," NASA 360, Aug 2019.
- "As bees die NASA-inspired robot could fill the pollination void," NASA 360, Aug 2019.
- Daily Planet, Discovery Channel Canada, April 2017.
- "What Happened This Year @ NASA," NASA, Dec 2016.
- "This Week @ NASA," NASA, Sept. 9, 2016.

Article:

- "WVU engineers creating software for aerobots to explore Venus," WVUToday, Dec 2021
- "Teams Develop Code to Coordinate Robots, Win $535,000 in Space Robotics Challenge," NASA, Sep 2021
- "WVU robotics team places 6th in final round of NASA centennial challenge," WVU press, Sep 2021
- "Shooting for the moon: WVU qualifies for final round of NASA Centennial Challenge," WVUToday, Jan 2021
- "22 Teams Crack Code, Qualify for Final Stage of NASA Space Robotics," NASA, Jan 2021
- "The BrambleBee robot promises to help honeybees pollinate flowers," DigitalTrends, Sep 2018
- "This robotic pollinator is like a huge bee with wheels and an arm," Wired, May 2018
- "This robot could help pollinate crops if we kill all the bees," Fast Company, May 2018
- "Could robots replace honeybees as pollinators?" Vegetable Growers News, June 2017
- "Video Friday," IEEE Spectrum Robotics Blog, April 2017.
- "From a Massachusetts Field to the Plains of Mars," Air & Space Smithsonian Magazine, Nov 2016.
- WVU Magazine, Spring 2017.
- "US Team Wins USD 750k NASA Award for Sample-Retrieving Robot," Business Standard, Oct 2016.
- "NASA's Mars Rover Prototype Challenge Ends; $750K Awarded for Autonomous Technology," Top Examiner, Oct 2016.

- "NASA Awards $750K in Sample Return Robot Challenge for Autonomous Technology," NASA, Sep 2016.
- "West Virginia University Students Win Robotics Competition," The Associated Press, ABC News, The Washington Post, The New York Times, Yahoo Tech, USA Today, ASEE, CNS News, News Times, The Hour, the News & Observer, Midland Daily News, Las Vegas Sun, Seattle Pi, SFGATE, WTOP, The State Journal, Neuron, among others, Sep 2016.
- "West Virginia University's Cataglyphis Robot Wins NASA Robotics Mission," Nature World News, Sep 2016.
- "Determined WVU Students are First, and Now Only, Winners of NASA Robot Competition," WVU Today, Video, Sep 2016.
- "After 5 Years, NASA has a Centennial Challenge Winner," WPI News, Sep 2016.
- "WVU Team Wins NASA Robot Challenge," Herald Standard, The Dominion Post, Sep 2016.
- "Robots Take Over WPI; One Leaves with $750,000 and Technology that Could Get to Mars," MassLive, Sep 2016.
- "NASA Awards $750K at WPI to Winner of Robot Competition," Telegram, Sep 2016.
- "NASA Ran a Treasure Hunt for Robots to Develop Space Exploration Tech," Motherboard, Sep 2016.
- "WVU Team Preps for Upcoming Sample Return Robot Challenge," WVU Today, Aug 2016.

Personal Interests

Computer Builder; Photography; Cooking; Economics; Travel; Basketball.