Fan Yang

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EDUCATION

Doctor of Philosophy, Mechanical Engineering, GPA: 3.88/4.0
Minor area: Applied Mathematics and Statistics
Stony Brook University, Stony Brook, NY   2015-2020
Advisor: Nilanjan Chakraborty
Thesis: *Algorithms for Chance-constrained Multi-robot Task Allocation*

Master of Science, Mechanical Engineering, GPA: 3.96/4.0
Stony Brook University, Stony Brook, NY   2014-2015

EXPERIENCE

Research Assistant: June 2018 – August 2020
(A brief summary of my research is provided here: `https://yangfan.github.io/research/`)
- Develop distributed algorithms for multi-robot task allocation with uncertain payoffs and resource consumption.
- Study simultaneous task allocation and path planning for multi-robot system under highly uncertain open environment.

Review Service:
- IEEE Robotics and Automation Letters (RA-L)   2020
- IEEE International Conference on Robotics and Automation (ICRA)   2018-2021
- IEEE International Conference on Automation Science and Engineering (CASE) 2018
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2018

Teaching Assistant:
- MEC 325 Manufacturing Processes   Spring 2020
- MEC 411 Control System Analysis and Design   Fall 2019
- MEC 203 Engineering Graphics and CAD   Spring 2016, Spring 2017
- MEC 310 Introduction to Machine Design   Fall 2015, Fall 2016
- MEC 410 Design of Machine Elements   Spring 2016

Mentorship: Simons Summer Research Program on Novel Distributed Algorithm for Optimally Selecting Leaders in Supervisory Robotic Swarm Control.   2018
Volunteer: ICRA 2020 workshop on Foundational Problems in Multi-robot Coordination under Uncertainty and Adversarial Attacks.   2020

EXPERTISE

Programming Languages: C++, Python, Matlab, HTML.
Packages & Tools: OpenCV, Keras, Tensorflow, Simulink, Stateflow, CMake, Boost Library, Google Test.

ROS: Navigation-Stack, Slam_gmapping, m-explore, cv_bridge, robot_state_publisher, Gazebo, RViz.
Hardware: Pioneer mobile robot, Turtlebot3, Baxter Robot.
Engineering Softwares: PTC Creo, Solidworks, Abaqus, LabVIEW.

PROJECTS

(Project descriptions and source codes are provided on my website: `https://yangfan.github.io/projects/`)

Multi-robot system:
- Simulate package delivery of multiple robots in the distribution center using Simulink.
- Design a collision avoidance scheme that enables robots to avoid uncontrolled obstacles.
- Develop a task allocation system that sends commands to robots to pick up and deliver packages by state machines and flow charts in Stateflow.

ROS:
- SLAM simulation of TurtleBot3 in Gazebo using move_base and Slam_gmapping ROS packages.
- Build global occupancy grid map by merging maps from multiple robots.
- Multi-robot navigation in Gazebo using ROS navigation stack and robot_state_publisher.

Machine Learning:
- Develop a strategy for mobile robots to avoid obstacles using deep deterministic policy gradient.
- Learn a policy for mobile robot navigating to the target pose without collision using deep reinforcement learning algorithm.

Computer Vision:
- Real-time object detection for the autonomous vehicle using YOLO model.
- Feature-based observation matching for mobile robot by the bag-of-visual-words model implemented in C++.

SLAM:
- Implement online SLAM systems using extended Kalman filter and unscented Kalman filter.
- A FastSLAM algorithm is implemented to estimate the entire path of mobile robot and compute a feature-based map based on range-bearing sensor data.
- Compute a set robot poses of mobile robot and maximum likelihood map by implementing a least-squares method that optimizes the nonlinear constraints in GraphSLAM.
- Build an occupancy grid map based on the laser rangefinder data.

Planning:
- Implement Dijkstra and A* algorithm to compute the shortest path between two points in an occupancy grid map.

C++ Programming:
- Build a route planner that computes a path between two positions on a real-world map using Open-StreetMap data and the IO2D visualization library.
- Create a system monitor that provides the information of the Linux system, such as CPU and memory usage, processes, and system up time.

- Optimize a Chatbot code using modern C++ memory management techniques such as smart pointers and move semantics.

PUBLICATIONS

Published/Accepted

[1] **Fan Yang** and Nilanjan Chakraborty. Chance Constrained Simultaneous Path Planning and Task Assignment with Bottleneck Objective. In *2021 IEEE International Conference on Robotics and Automation (ICRA)*, May 2021. Note: accepted.

[2] **Fan Yang** and Nilanjan Chakraborty. Algorithm for multi-robot chance-constrained generalized assignment problem with stochastic resource consumption. In *2020 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pages 4329-4336, October 2020.

[3] **Fan Yang** and Nilanjan Chakraborty. Chance constrained simultaneous path planning and task assignment for multiple robots with stochastic path costs. In *2020 IEEE International Conference on Robotics and Automation (ICRA)*, pages 6661-6667, May 2020.

[4] **Fan Yang** and Nilanjan Chakraborty. Algorithm for optimal chance constrained knapsack problem with applications to multi-robot teaming. In *2018 IEEE International Conference on Robotics and Automation (ICRA)*, pages 1043-1049, May 2018.

[5] **Fan Yang** and Nilanjan Chakraborty. Algorithm for multi-robot chance-constrained linear assignment. In *2017 IEEE International Conference on Robotics and Automation (ICRA)*, pages 801-808, May 2017.

Abstract/Poster

[1] **Fan Yang** and Nilanjan Chakraborty. Multirobot simultaneous path planning and task assignment on graphs with stochastic costs. In *2019 International Symposium on Multi-Robot and Multi-Agent Systems (MRS)*, August 2019.

[2] **Fan Yang** and Nilanjan Chakraborty. Multi-robot team formation under uncertain environment. In *Northeast Robotics Colloquium (NERC)*, October 2018.

[3] **Fan Yang** and Nilanjan Chakraborty. Algorithm for optimal chance constrained knapsack with applications to multi-robot teaming. In *27th Fall Workshop on Computational Geometry (FWCG)*, November 2017.

Under review/preparation

[1] **Fan Yang** and Nilanjan Chakraborty. Algorithm for optimal chance constrained multi-robot task allocation with stochastic payoffs. *IEEE Transactions on Robotics*.

[2] **Fan Yang** and Nilanjan Chakraborty. Chance constrained knapsack and related problems. *SIAM Journal on Optimization*.

[3] **Fan Yang** and Nilanjan Chakraborty. Optimal solution of chance constrained simultaneous path planning and task assignment. *IEEE Transactions on Automation Sciences and Engineering*.