Hany Hamed Aly

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Interested in Robot Learning, Multi-Robot Systems & Sim2Real

Education

Innopolis University — Innopolis, Russia
Bachelor of Computer Science (Robotics track) — *Aug 2018 – June 2022*
CGPA: 4.545/5

Research Experience

Bachelor Thesis | *In progress* — Oct 2020 – June 2022
- Topic: Learning the behavior for N pursuer vs M evaders in complex environment with realization using drones
- Keywords: Reinforcement Learning, Evolutionary algorithms, Pursuit & Evasion Games, Competitive coevolution
- Supervised by: Prof. Stefano Nolfi & Prof. Alexandr Klimchik

Undergraduate Research Assistant — Aug 2019 – Present
Center for Technologies in Robotics and Mechatronics Components, Innopolis University — *Innopolis, Russia*
- Developed a gym environment for a Tensegrity hopper
- Developed experiments using ARS (RL algorithm) to learn a stabilizing control policy for the tensegrity hopper
- Implemented a simple contactless differentiable physics simulator for tensegrity robots using Taichi
- Developed experiments to teach different tensegrity robots to learn reaching specific configurations

Summer Research Intern — June 2019 – July 2019 – [Doc]
Center for Technologies in Robotics and Mechatronics Components, Innopolis University — *Innopolis, Russia*
- Explored the simulation of different robots in NTRTsim (NASA simulator for Tensegrity Structured robots)
- Implemented an integration between NTRTsim and python to be used with learning algorithms
- Explored the possibility to teach a tensegrity robot to perform rolling locomotion using Reinforcement Learning
- Developed a CAD model for a simple tensegrity prototype

Publications

- V. Kurenkov, H. Hamed, and S. Savin, "Learning stabilizing control policies for a tensegrity hopper with augmented random search," in *2020 International Conference on Industrial Engineering, Applications and Manufacturing (ICIEAM)*, pp. 1–5, IEEE, 2020 (code, paper)
- L. Vorochaeva, S. Savin, H. Hamed, and A. M. Leon, "Analysis of algorithms for controlling the length of crawling robot modules," in *2020 4th Scientific School on Dynamics of Complex Networks and their Application in Intellectual Robotics (DCNAIR)*, pp. 257–260, IEEE, 2020 (paper)
- L. Vorochaeva, S. Savin, and H. Hamed, "Lateral gait analysis of a crawling robot by means of controlling the lengths of links and friction in the supports," in *2020 International Conference Nonlinearity, Information and Robotics (NIR)*, pp. 1–6, IEEE, 2020 (paper)
- H. Hamed, V. Kurenkov and S. Savin, "Sim2Real for Tensegrity Robots" [Manuscripts in preparation]
- H. Hamed and S. Savin, "A Survey On Different locomotion control methods for crawling robots" [Manuscripts in preparation]

Working Experience

Technical Intern — July 2019 – Aug 2019 - [Doc]
Copter Express — *Moscow, Russia*
- Had a training about main components and construction of drones
- Had a training on COEX's autonomous drones (ROS, PX4 and indoor navigation by Aruco markers)
- Developed a human pose estimation with a webcam using Tensorflow.js to control a drone
- Integrated RTAP-Map SLAM algorithm with COEX's drone (Clever 3) using Intel Real-Sense T265 and D435 cameras

Projects

Human Pose Estimation Drone Control | *Python, TF.js, ROS* July 2019

- Explored and tested different human pose estimation modules
- Integrated a drone controller with human pose estimation module built with TensorFlow.js

Automated 3D Scanner (Team Project) | *Python, ROS, Gazebo* Jan. 2019 – May 2019

- Reviewed different existing solutions for 3D scanners
- Collaborated on developing the base idea for the 3D scanner
- Collaborated on developing a simulation for the 3D scanner
- Integrated a keyboard teleop with the simulator using ROS to control the motion of the 3D scanner
- Explored the usage of Open3d for colored point cloud registration

Extra Courses

Winter School on Machine Learning in Robotics | *Certificate of Participation* Dec 2020

[Coursera] Modern Robotics, Course 1: Foundations of Robot Motion | *License* Jan 2019

[Coursera] Modern Robotics, Course 2: Robot Kinematics | *License* Jan 2019

Extracurricular activities

Leader for RoboCup Small Size League (SSL) Innopolis team July 2020 – Present

- Constructed a team for participation
- Reviewed the existing solutions from different teams
- Constructed the bill of materials for team's equipment
- Supervised, guided and helped other members in the sub-teams (Mechanical, electrical and control)
- Prepared plans and tasks for the team's members
- Developed a basic controller for the robots in the simulation

Judge at WRO International Finals [Advanced Robotics Challenge - ARC] 2019

- Developed the game rules for the international competition
- Judged the Russian qualifications as the Head judge
- Judged the International competition
- Collaborated in the development of a playground generator for the competition using C++ and Javascript

Participant in RoboCup Junior Egypt Open Weight Soccer Category 2018

- Developed a colored ball detection software using OpenCV
- Developed PCB boards for the robot
- Developed the game controller for the robots
- Won 2nd place