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Yordan Tsvetkov

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EXPERIENCE

Undergraduate Researcher **University of Edinburgh** **Summer 2021 - ongoing**

- Developed a four-legged robot with manipulators in its front legs, capable of advanced unimanual and bimanual whole-body manipulation.
- Optimised leg design for FDM 3D-printing, resulting in a 45% weight reduction compared to existing designs.
- Implemented jerk-limited trajectory generation for low-level control for synchronous movement of multiple joints with minimal acceleration-induced wear.
- Designed optimal spiral torsion springs using nonlinear constrained optimisation in MATLAB.
- Authored a paper accepted to the 2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2022).
- Currently designing an upscaled version of manipulator for ANYbotics ANYmal, a commercial robotics platform.

Robotics Engineer **Konpanion** **Spring 2021 - ongoing**

- Developed a compliant robot for therapeutic use with off-the-shelf parts, 3D-printing and laser cutting.
- Created a ROS simulation stack and trained locomotion strategies using the CMA-ES genetic optimisation algorithm.
- Wrote an animation keyframe data to PWM converter for easy graphical implementation of expressive motions.
- We have raised £12,000 and developed partnerships with Scottish Care to distribute robot in care homes.

Exoskeleton Team Lead **HumanED Robotics Society** **Fall 2021 - ongoing**

- Mentored a team of 5-10 people in the design of an arm exoskeleton for force amplification.
- Managed team tasks using Trello.
- Worked with FOC-based BLDC motor drivers using CAN-FD for force-sensitive actuation.
- Recorded a tutorial series and led workshops on CAD in Onshape and simulation in Webots.
- Created and managed a society budget plan of £2,000.

PROJECTS

Rough-terrain walking robot **Fall 2019 - Fall 2020**

- Created a four-legged robot capable of perturbation-resistant walking using only IMU data (acceleration, angular velocity, orientation) as input.
- Optimised a neural network with novel architecture in simulation using CMA-ES, PPO and a custom OpenAI Gym environment and implemented network in Arduino. Said neural network was successfully deployed in real world with no sim-to-real adjustments.
- Designed structural parts for 3D-printing and evaluated them via FEA and hand calculations.
- Designed a breakout PCB connecting the microcontroller, motors, sensors and power supply.
- Project won 2nd Prize and was the highest-ranking engineering project in the EU Contest for Young Scientists 2020.

PUBLICATIONS

- Y. Tsvetkov, S. Ramamoorthy. A Novel Design and Evaluation of a Dactylus-Equipped Quadruped Robot for Mobile Manipulation. Presented at IROS 2022. Preprint: https://arxiv.org/abs/2207.08765

EDUCATION

Edinburgh, UK **University of Edinburgh** **Fall 2020 – May 2024**

- BEng Mechanical Engineering
- Predicted degree classification: First (4.0 GPA equiv.)
- Relevant Coursework: Software and Embedded Systems, Engineering Mathematics, Analogue Circuits

LANGUAGES AND TECHNOLOGIES

- **Languages**: Python (TensorFlow, PyBullet, ROS, Gazebo); C; C++; MATLAB; Arduino
- **Software**: Fusion 360, Solidworks, Onshape, Webots, V-REP, EasyEDA, Blender API