

Nr.crt.	Titlu lucrare	Scurta descriere	Cerinte	Nivel
1	Grapsing strategies for a smart actuated grapple	This thesis is connected to the SEACLEAR2 project (https://seaclear2.eu), and our involvement in developing a smart grapple for handling heavy underwater litter. Our current design allows for complex grasping techniques, which requires defining grasping strategies based on the shape, size, and weight estimation of the object. This work would be able defining the grasping strategies and testing them in a simulated environment.	Robotics ROS	Licența
2	Imitation learning for robotic applications	The goal of this thesis project is to develop an application that would replicate the movements of a human on a robot manipulator, using a depth camera and/or a motion capture system, so that the robot learns to execute new tasks through imitation.	Robotics, ROS	Licența
3	High level coordination of heterogeneous robot systems	This thesis is connected to the SEACLEAR2 project (https://seaclear2.eu), and our involvement in developing the MAESTRO system which orchestrates the mission execution for underwater litter collection. This can be extended to other types of robots and	Robotics, ROS, Programming	Licența
4	Piece detection for a Lego sorting machine	The topic of this thesis relates to the construction and operating a sorting machine for Lego pieces. The task of sorting lego pieces can be a tedious one, as there are countless different types of lego pieces in a variety of colours. However the benefits from having the pieces sorted are numerous, since this allows children to express their creativity faster and easier. The goal of this project is to develop a piece detection and classification algorithm that can work along side a hardware solution for sorting that we currently have in our laboratory.	Robotics, Computer Vision, Machine learning	Licența
5	Path planning optimization for mobile robots	This thesis is connected to a possible participation at the European Rover Challenge (https://roverchallenge.eu/en/erc-robotics-competition/). The challenge is about designing an autonomous rover that explores Mars. This subtask is about optimizing the trajectory planning of a mobile robot to reduce energy consumption and avoid dangerous terrain.	Robotics ROS	Master
6	Formal verification and compensation for Behavior	Behavior Trees are a common alternative to Finite State Machines that provides significant benefits in Human Robot Interaction applications.	Robotics	Master

	Trees	However, as their complexity increases, it is more and more difficult to maintain them and ensure proper fallback scenarios. The goal of this project is to develop a framework for defining commitment for given Behaviors, and compensations that will run if a part of the Tree fails. This will ensure that each trees results in a safe state for the system		
7	Reinforcement learning for design optimization of a piece singulation mechanism	A typical problem in the industry is that of piece singulation: when many pieces are produced and process in mass, but need to be separated so that they can be counted, sorted, and stored more efficiently. There are many solutions for performing singulation on homogenous types of objects (e.g. screws, nuts, pills, boxes), however there are several challenges when the objects are heterogeneous (different shape and size). The goal of this project is to investigate whether reinforcement learning techniques can be used to optimize the design of singulation mechanisms in order to improve its singulation capabilities	Machine Learning, Mechanical Design	Master
8	Online intention prediction of upper limb motion	With the advent of collaborative robots, the opportunity to use robotic arms in the vicinity of humans has emerged. Human-robot collaboration is a rapidly developing field for industrial applications, but can also have significant impact on healthcare related applications, such as rehabilitation. However, in order to implement human-robot collaboration, there has to be real-time and objective communication to the robot about the intentions of the human. The goal of this project is to implement in ROS an already existing algorithm for the prediction of the intention of motion. The training of the algorithm is happening currently offline, but it would be very beneficial to perform this online and in real-time.	Python Signal processing ROS	Master
9	Torque control of a BLDC for haptic applications	Traditionally, electrical motors are controlled either in position or in velocity mode, since we usually want to implement robots that follow predefined positions. However, there are numerous advantages to torque control of electric motors, since that can affect the amount of force they deliver to the environment. Using devices that can be controlled under	Microcontrollers System theory	Licența

		torque we can implement more advanced control strategies (e.g. impedance control), that are safer and more compliant than traditional position or force control. Furthermore, we can explore haptic feedback to humans.		
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