KINAN DANDAN received his Bachelor degree in Mechatronics from Higher Institute of Applied Sciences and Technology (HIAST), Damascus, Syria in 1999, and his MSC in Mechatronics from Polytech’ Savoie, Annecy, France in 2007. Since 2011, he has been a doctoral student at the Centre of Applied Autonomous Sensor System (AASS) in Örebro, Sweden. His research interests include mechanism design, mobile robotics, control and simulation of mechatronic systems.

Working conditions in the dry cleaning and sanitation of confined interior spaces are often extreme, and workers need overall protection with tight clothing, helmets, face mask, earmuffs, and respirators. The requirements of the EU norms related to hygiene and food quality indicate that silos should be cleaned frequently and cleaning is obligatory after a silo is totally emptied. Therefore, there is an increased societal need for silo cleaning and a natural necessity to replace humans by robot manipulators in executing this risky and dangerous job.

This thesis presents a new concept of a flexible crawling mechanism for an industrial food cleaning robot, which is evaluated from the viewpoint of the capability to work inside a large food silo, scanning the desired surface, and performing the cleaning task. The main research questions investigated in this thesis are about: how to select the most important characteristics in designing a robot to fulfil the surface cleaning operation of a large confined space; how the crawling movement affects the dynamic behaviour of the robot mechanism; how the cleaning process affects the dynamic behaviour of the robot mechanism; how to develop the control of the robot to realize the locomotion and the cleaning process.