

**Theme 1-1: Robotics and Intelligent Autonomous Systems - 2023**

Title	Name of the PI	List the Names of the Co-Is	Department	Abstract	Starting Date	Ending Date	Funding	Amount of Funding
Modeling, Design, and Implementation of a Bio-inspired Propulsion Mechanism for Underwater Vehicles	Mehdi Ghommem	Muhammad Hajj (External)	MCE	The main goal of the project is develop and analyze the performance of an underwater vehicle equipped with a transformable tail with the capability to mimic the locomotion modes of different fish species.	01/06/2019	31/05/2021	FRG	140000
Fully Digital Multiple Antenna Frequency Diverse Array Receiver	Hasan Mir	N/A	ELE	In the context of the prevailing global security challenges, portable surveillance applications are becoming increasingly important. In the GCC countries, monitoring applications like shoreline policing, desert surveillance, traffic safety monitoring, and airport security are particularly relevant. The field of multiple antenna technology is arguably at the forefront for enabling such applications. Indeed, security applications have become one of the main segments in 5G/6G concepts. In this proposal, a novel software defined radio architecture for a frequency diverse array transceiver architecture will be investigated. This architecture will involve addressing several important challenges including optimizing the array geometry for 3D target localization as well extending the receive architecture to include multiple antennas and developing adaptive beamforming algorithms that can be used to reject both passive and active forms of interference. This project will involve a careful study of the signal processing architecture in order to confirm its viability to become a key element in enabling a variety of security applications. Such an architecture will form the basis of a proposal to build a future hardware prototype that is expected to be of much interest to local industries and organizations such as Tawazun. The proposed research will benefit the Master of Science in Electrical Engineering program at AUS and will certainly be useful in training students who will graduate with experience directly relevant to local and regional needs.	01/06/2023	01/05/2025	FRG	10,000
Implementation of a Miniaturized Frequency Diverse Array Radar Transceiver	Hasan Mir	Lutfi Albasha	ELE	In the context of the prevailing global security challenges, portable surveillance applications are becoming increasingly important. In the GCC countries, monitoring applications like shoreline policing, desert surveillance, traffic safety monitoring, and airport security are particularly relevant. The field of radar technology is arguably at the forefront for enabling such applications. Indeed, security applications have become one of the main segments in the fifth generation (5G) Internet-of-Things and the year 2020 50-Billion connected devices concept. In this proposal, a novel chip-level implementation of a radar transceiver architecture will be designed and fabricated. This architecture is based on the frequency diverse array concept, which allows for beamforming in both the range and angle dimension compared to traditional phased array systems that can only perform angular beamforming. This project will involve a careful study of the system-on-chip and signal processing architecture, following which the developed hardware prototype will be tested in a setting that demonstrates its efficacy in relevant scenarios and can confirm its viability to become a key element in enabling a variety of security applications. The proposed research will benefit the Master of Science in Electrical Engineering program at AUS and will certainly be useful in training students who will graduate with experience directly relevant to local and regional needs.	01/06/2021	01/05/2024	FRG	150,000
Design and Implementation of a Cable Robot for Movement Training of the Head-Neck Joint	Lotfi Romdhane	Mohammad Jaradat	MCE	This project has two objectives: <ul style="list-style-type: none"> <li>• design, analysis and prototype development of a cable-driven robot for the rehabilitation of the Head-Neck joint.</li> <li>• conduct fundamental analysis that could be transferred to a practical application related to the rehabilitation of human joints, such as the Head-Neck joint.</li> <li>• Conduct experimental testing on the designed cable robot.</li> </ul>	01/06/2020	31/05/2023	FRG	246000
Implementation of Experimental Framework for Mobile Manipulator for UAV (MM-UAV)	Mohammad Jaradat	Lotfi Romdhane, Khaled Hatamleh	MCE	Implementation of Experimental Framework for Mobile Manipulator for UAV (MM-UAV)	06/01/2018	06/01/2022	FRG	130,370
Design and Implementation of an Artificially Intelligent Machining System for Quality 4.0	Noha Hussein	Mahmoud Awad	INE	One of the biggest challenges encountered by manufacturing industries throughout history is obtaining high-quality products to ensure customer satisfaction and eliminate the high cost of poor quality (COPQ). High COPQ can range from economic losses costing companies billions of dollars due to recalled defective products or more severe disasters leading to loss in human lives. Inspection techniques are used to minimize the variations by the comparison between components, subassemblies, or starting materials to their design specifications detecting poor quality products. Process optimization was dually used to determine optimum process parameters that enhances the surface finish, reduces tool wear during machining operations. Few researchers recently implemented machine learning techniques mainly classification algorithms to categorize products as conforming or non-conforming. Based on the surveyed literature hardly any researchers integrated the real-time collected data with an algorithm to allow for corrective actions in subsequently produced parts. The objective of this research is to design an expert respondent machining system that can identify problems that may result in defective products and take corrective actions to rectify them maximizing the yield of acceptable products. The system to be developed will consist of three modules a knowledge database, an inline monitoring module and an artificial intelligent (AI) module.	01/06/2023	31/05/2025	FRG	337,700