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TOWARDS SMARTER, SAFER, MORE RELIABLE AND MORE RESILIENT AUTONOMOUS ROBOTIC SYSTEMS

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ABSTRACT

Although the concepts and developments on Fault Detection and Diagnosis (FDD) and Fault-Tolerant Control (FTC) have been progressively and extensively investigated worldwide since the 1970's and 1980's, respectively, the two recent catastrophic accidents induced by the crashes of two Boeing 737 MAX8 airplanes have highlighted again the necessity and urgency for FDD and FTC research & development and their industrial applications. On the other hand, benefited from technical advances in new materials, mechatronics, communication, computation, control, sensors, actuators and new/smart designs, Unmanned Aerial Vehicles (UAVs), Autonomous Cars (AVs), and other robotic systems on the space, land, on/under the water are gaining more and more attention and rapid development during the last few years due to their relatively easy and cost-effective uses in various application tasks such as automated operations, surveillance, sensing, search and rescue, agriculture, forest, environment, pipelines, powerlines, military and security applications. In this Abstract presentation, brief overall view on the challenges and latest developments on making these autonomous/unmanned robotic systems *smarter*, *safer*, *more reliable* and *more resilient* in terms of Guidance, Navigation, and Control (GNC) of robotic systems (in particular UAVs) by integrating with Remote Sensing (RS) techniques for autonomous, efficient and reliable applications to forest and environment monitoring and fires/damages/risks detection and suppression will be presented first, then some of new developments and current research works being carried out at Concordia's Networked Autonomous Vehicles Lab (NAVL) will be introduced as the second part of the presentation. In particular, new developments on autonomous control, FDD, FTC, and Fault-Tolerant Cooperative Control (FTCC) techniques towards autonomous, safe and secure operations and applications of autonomous/unmanned systems (UAVs and AVs) to the forest fire monitoring and fighting tasks, as well as safe and resilient control of autonomous/unmanned systems in the presence of both physical-faults and cyber-attacks in the general framework of cyber-physical systems will also be presented.