Next-Level Robotic Intelligence

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Abstract: Recent advances have been effective for progressing the state of robotics toward its next level of intelligence. At this stage, further advancement is needed with sharper focus on increased robustness, cognitive facilities, and more sophisticated behavior. Advances to date are impacting individual elements of what would become a robotic intelligence pipeline but the paths to effective integration of those elements that will realize practical intelligent robots and robotic systems are unclear. This talk offers thoughts and considerations for active researchers to ponder and appreciate in the context of their research programs. From a perspective on current stages of technology development, and looking toward the progress horizon from that vista, the talk discusses a number of topics within the SACI 2019 scope using examples from research projects and deployed systems. Aspects of intelligent robotics associated with different domains and applications are discussed such as planetary robotics, disaster response and wearable robotics. Also addressed are future considerations for the evolution of related technology toward increased robotic autonomy and advanced intelligence for robotic systems. Motivating this discourse are multiple considerations for next-level robotic intelligence such as enhancing perception capabilities beyond the visual modality, moving beyond object recognition and grasping to knowledge and reasoning about object properties, enabling smart human-collaborative robots that are responsive to intuitive, physical, and brain-interfaced interaction, advancing from robot learning for X (perception, control, etc.) to autonomous or developmental learning and knowledge or skill transfer, the need to realize smart behavior for not only singular robots but for multi-robot systems, and some of the related systems engineering considerations. The aim is to broaden the thinking of current researchers leading to the collective leverage that will boost robotic intelligence to the next level enabling robots that are multi-functional in the real-world.