

Making Science Fiction an Engineering Reality Using Biologically-Inspired Technologies

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Humans throughout history have always sought to mimic the appearance, mobility, functionality, intelligent operation, and thinking process of biological creatures. This field of biologically inspired technology, having the moniker biomimetics, has evolved from making static copies of human and animals in the form of statues to the emergence of robots that operate with realistic behavior. Imagine a person walking towards you where suddenly you notice something weird about him – he is not real but rather he is a robot. Your reaction would probably be “I can’t believe it but this robot looks very real” just as you would react to an artificial flower that is a good imitation. You may even proceed and touch the robot to check if your assessment is correct but, as oppose to the flower case, the robot may be programmed to respond physical and verbally to your astonishment. This science fiction scenario could become a reality as the current trend continues in developing biologically inspired technologies. Technology evolution led to such fields as artificial muscles, artificial intelligence, artificial vision as well as capabilities in materials science, mechanics, electronics, computing science, information technology and many others. Toys that appear and behave like biological creatures, including dogs, cats, birds, frogs and others, are now part of many toy stores. For many years, engineers developed automatic processes in order to increase the efficiency of performing redundant tasks. This effort led to the emergence of production lines with significant reduced manufacturing cost and highly consistent product appearance and performance. The quality of produced parts has increasingly improved as new methodologies and inventions were conceived and implemented. Realizing that some parts are too complex to handle with a simple automatic system, robotic mechanisms have emerged. Some of the limiting factors that hampered the wide use of robotics were economical issues. Generally, robots were considered bulky machines with large arms that are used to process complex parts. As the technology evolved and powerful computers as well as effective control methodologies have been introduced, robots became more sophisticated and the possibilities of emulating biological systems became more feasible. Autonomous robots were developed and successfully demonstrated to operate like human with the superiority of functioning at harsh or hazardous environments that are too dangerous for human presence. This paper will review the state of the art and challenges to biologically-inspired technologies and the potential impact on the field of NDE.