

Mathematical Opportunities in Robotics

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ABSTRACT:

As modern technology advances at a very rapid pace, the need for properly integrating technology into the mathematics curriculum and the constructivist approach of learning and teaching have been addressed frequently. However, the major effort to integrate technology into the mathematics classroom has been focused on the scientific calculator, Computer Algebra System (CAS) and other teaching aids such as Blackboard and Smart Board, and the implementation of constructivism in the classroom has been stagnated by bureaucracy and unwilling teachers. Robotics is a fast-rising technology field, and robots have been significant contributors in automating various manufacturing processes for production cost reduction and efficiency. Robots are becoming more relevant to our lives. Robotic toys are very popular amongst children. Some robots vacuum-clean carpeted floors, mow lawns, or clean swimming pools. Industrial robots increase precision and efficiency in electronics and automotive industries. Security robots monitor and patrol warehouses and residences. First responders employ urban search and rescue robots to save lives. In military, they are a significant component of the Army's Future Combat Systems (FCS), and many research efforts are underway to develop robotic functionalities. Lego Mindstorm NXT is a robot development kit for recreational and educational purposes. With a proper software package, it is a stable robotic development platform with a rich set of sensors, on which powerful algorithms can be implemented. Currently, the packages in Java, C-style languages, and Microsoft Robotic Studio, and Labview are available. Many scientists and engineers use this platform to develop prototype robots, simulate new robotic functionalities, and research innovative algorithms. Integrating robots into an undergraduate mathematics classroom can help us create an environment that fosters mathematics, science and engineering, and the constructivist approach in learning and teaching. In this paper, we explore mathematical opportunities in robotics by demonstrating how small robotic development kits can enhance learning mathematics and promote the constructivist approach in learning.

KEYWORDS: robotics, education, constructivism,

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