A Low Cost and Effective Robot: A Four-Wheeled Omnidirectional Robot Equipped With a Multitude of Sensors in Addition to Machine Vision to Successfully Introduce Students to Robotics Through RoboCup

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Over the past decades, robotics has become an increasingly popular method to engage students in the fields of Science, Technology, Engineering, and Math(STEM). However, due to the lack of affordable kits, many interested institutions are required to pay large amounts of money to be able to integrate robotics into their curricula. Additionally, institutions are also limited to the minimal range of abilities the kits' offer due to their limited expandability options. Robocup is one of the largest initiatives with the goal of increasing interest in engineering, however, with the lack of guidance for beginners, it proves to be ineffective. This work builds upon these existing initiatives by providing an educational tool that can be used to introduce and teach students principal concepts about robotics. A custom, multifunctional PCB used in combination with a 3D-printed Chassis and Omni wheels is used to create a powerful and easy-to-use robot. This combination allows the robot to not only be affordable but, also pack a large variety of sensors in a small form factor thanks to the compact nature of the PCB. RoboCup Junior Competition coupled with local students is used in order to evaluate the effectiveness of this tool. The results prove that this robot has the potential to perform successfully as it placed 1st in the US national Competition and placed top 5 at the international level. In the last 3 months, this tool has been used to introduce robotics to 30 new students who have not only shown continued interest but also used this robot as a platform to build and customize their own versions of a competition robot.

Awards Won:
Central Intelligence Agency: First Award: $1000 award