Development of an Affordable Submarine Robot for College Engineering Education

Diego Santillan, Joseph Iorio, Sidra Gibeault, He Shen, Mark Tufenkjian

**Abstract**: Radical changes can happen and have been happening in the labor market due to the impact of robotics and artificial intelligence. Many people might be concerned that close to half of all jobs will be taken over by robots in the next 25 years; however, robots will also help create as many and maybe even more new jobs while. This revolutionary change in the demand of new positions on the job market will lead to new skill requirement from job seekers. The best way to prepare the workforce is to face the upcoming changes and adapt robotics into engineering education. However, robotics is a very broad and interdisciplinary filed, and it needs collaboration between multiple departments to create an effective program that can benefit all stakeholders. Most of the time, it is very challenge to incorporate the resource demanding robotics program into an existing curriculum. Moreover, although there is a variety of commercially available robotics packages to select for robotics related education, they are normally very costly, and students miss many chances to acquire practical skills from the design and developing processes.

This paper talks about the development of an affordable submarine robot for engineering education. First, the whole submarine robot development process is introduced, followed by the design and implementation on robot Nellie. Then, the mapping of the knowledge and skills used in developing the robot to the core engineering courses is discussed. These courses are widely spread across almost all engineering and computer science majors. Furthermore, the effective utilization of the robot for student learning in an informal learning environment at California State University, Los Angeles will be explained. In addition, student learning outcomes will be discussed.