A Graphical-oriented Approach to Improve the Programmability of a Robotic System

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Industrial manufacturers are constantly looking to increase the degree of automation of their plants by searching for valid alternatives and supports for human workers. One of the most important aspects is the interaction between robot and its environment and implicit the flexibility/modularity of robot programming. Although the new type of robots (i.e. collaborative robots) are designed to physically interact with humans while still providing a safe environment, the robot programing still requires experts and a-priori knowledge in order to complete the programming work. Due to the increasing need for automated and flexible manufacturing in the last few years, tremendous research is carried out to simplify the robot programming and to reduce the expertise required in robot programming. Learning from demonstration is one popular flexible robot programming approach in which the robot end effector is dragged manually by an operator to desired waypoints in order to teach the tasks. Although the process of learning by demonstration is efficient, it was designed particularly for collaborative robots. However, more than 80% of the manufacturing industry makes use of the industrial robots and therefore a solution available for all type of robots is needed. A key to improve the programmability of the control code is to investigate the possibility of robot programming by using drawings or images. In fact, using a graphic oriented programming method can save programming time and allow to perform highly elaborated trajectories. The main idea introduced here is to compute a goal-path for the robot using visual features extracted from an image. Using object features from an image is an extremely powerful tool to improve the degree of automation of a robotic system and to enable a ’free’ motion planning phase.