5 Reasons Programming Robots is so Hard

READY ROBOTICS

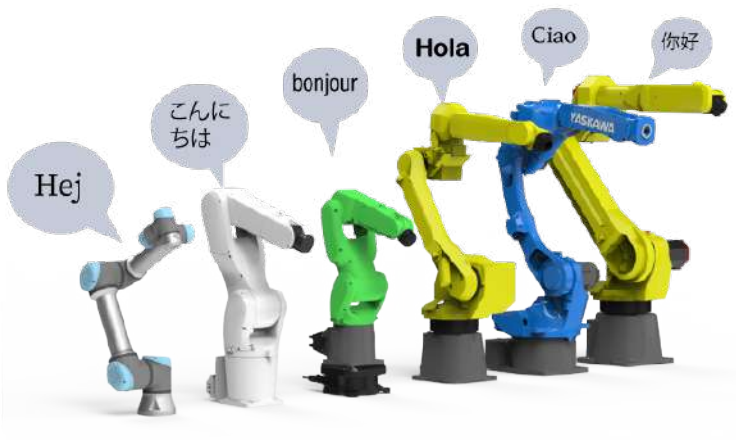
INTRODUCTION

Robot programming is the sole domain of manufacturing engineers and highly trained workers. To make matters worse, there are only 32,000 robotics engineers in the US out of 12.5 million factory workers, which means there is only 1 robotics engineer for every 11 factories. It's no surprise then that there is such a labor gap in manufacturing since there are not remotely enough trained workers to design, install and maintain robotic automation. In addition, the training requirements to learn how to program a robot are very high. As such, there is no chance that as an industry we'll be able to train enough workers to implement the level of automation necessary to solve the overall labor gap without a radical change in how robot programming is done.

Here are the top 5 reasons why programming industrial robots and cobots is so hard today:

1. EVERY ROBOT HAS ITS OWN PROGRAMMING LANGUAGE

When developing robotic automation tasks a complex set of steps is necessary to control the robot and the machine tool and other peripherals it interacts with. The common way programmers develop complex tasks is in the programming language that comes with the robot, and each robot arm manufacturer's programming language is proprietary and unique. For example, FANUC has Karel, Universal Robots has URScript, Yaskawa Motoman has INFORM, ABB has RAPID, and Kuka uses KRL. To make matters worse, there are over 30 robot programming languages today, which is a number that continues to grow as new entrants enter the market.



The result of this proliferation of programming languages is that workers need to learn more than just one robot programming language, a situation made worse by the desire of most factories to use many different robot brands. Factories want to be able to choose the right robot, for the right job at the right price, which means that the workers in the plant need to be able to program every robot, not just the one they were trained in. With the current fragmentation in the market that is an impossible task, especially given the time and cost to learn just one robot programming language.

2. THE PROGRAMING INTERFACES ARE NOT LIKE MODERN DEVICES

While some robot programming can be done offline on a PC, the development of an automated task always requires final changes when the robot has been installed in the plant. In addition, especially with high-mix, low-volume applications, there is no justification for the overhead necessary to setup a simulation of a workcell. It's much more efficient to be able to develop the program right at the workcell.

All robot manufacturers provide a Teach Pendant for programming the robot. The Teach Pendant is a necessary form factor when working near the robot since it has a safety switch that must be depressed

while the robot is in operation. This would be fine if not for the fact that they are all completely different.

The Teach Pendant is necessary for safety, but the programming environment lacks many of the conveniences of modern applications you run on your smartphone, PC or tablet. Conveniences such as multi-touch screens, graphical cues, drag and drop, and even cut and paste are commonly missing features, let alone version control or backing up to the cloud. Because the interface is so different, the developer or other individual who just needs to maintain the program in production, has to adapt to an interface that is neither intuitive or similar to any other applications they use personally or professionally. This lack of familiarity with the programming environment is a significant barrier for developers to learn the language.

3. GETTING THE ROBOT PROGRAMMING TRAINING CLASS PREREQUISITES IS DIFFICULT

Classes from robot manufacturers, trade school and private training providers often require prerequisites to take a robot programming class. One manufacturer's class for their own programming language lists the following prerequisites:

- Completion of a live, instructor led robot operation and programming course (online learning is not sufficient)
- A "pro" level class (live or on-line)
- Helpful to have had prior programming experience in another programming language like "C" or PASCAL
- A laptop with the robot's programming language already installed since the training does not include the necessary equipment

These prerequisites imply that programming is so complicated it's only capable of being understood by people that already have been trained in programming and have been to basic and advanced classes in robot operations. That's a very high level of expectation for robot application developers. To attend the 40 hour programming class, you will have had to complete 32 hours of coursework, and also traveled to their training center, meaning a lot of time off work.

And finally, when you've completed the 72 hours of training in this example, you are only ready to, in the robot manufacturer's words, "develop simple application programs".

4. TRAINING COSTS A LOT OF MONEY AND TAKES A LOT OF TIME

According to the manufacturer's class we looked at, it takes 72 hours of training to develop a simple application in their programming language. The course costs for the three necessary classes is $5200 just to get the basics. However, if you need the knowledge to handle advanced integrations like cameras, barcode readers or force sensors, you could have hundreds or even thousands in additional classroom costs.

These costs are just for the class itself, so once you factor in travel expenses and lost time at work the fully loaded cost of the courses can exceed $10,000. And, if you are running three shifts, 365 days a year, and want at least one person on-site who can troubleshoot and fix a programming task quickly, then you will

need a minimum of 5 trained employees, bringing the total cost to over $50,000.

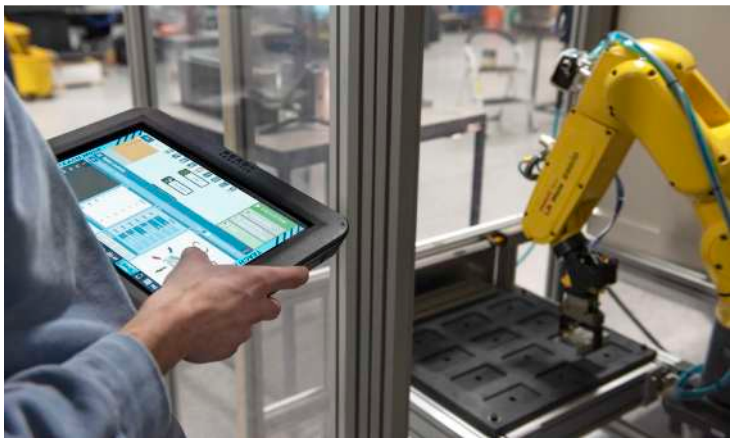
An important thing to remember with these calculations, is that these training costs only support 1 robot brand. What if you have a factory with Universal Robots, Fanuc and Yaskawa and want to consider adding an Omron, Denso or Epson robot? The training costs become prohibitive because each robot brand requires its own training. An option might be to rely on external integrators, but that means you cannot implement manufacturing processes in an agile way, and will also likely have high costs due to downtime waiting for a trained worker to show up and fix the application. In addition, if you have frequent changeover, you will have to bring the integrators back for every part or tool change, a costly proposition.

5. THERE IS MORE IN A WORKCELL TO PROGRAM THAN JUST THE ROBOT

Industrial robot arms do not work in isolation. They must have their movements coordinated with the machine tools or equipment in the cell, as well as control end of arm tooling (EOAT) and other peripherals such as force sensors and vision systems. In many workcells, the coordination is managed via a programmable logic controller (PLC) from OEMs such as Siemens, ABB, Rockwell Automation, Mitsubishi, Allen Bradley and more. The controllers have their own languages, and each peripheral also has its own way of being programmed since there is no common standard for interfacing peripherals. Imagine what it would be like today if the plug and play standards had not been developed for PCs and every mouse, printer and video monitor required each software application to be customized to interface with it. PCs would never have attained the wide scale adoption that we see today.

READY APPROACH

At READY we are solving the problem that robots are too hard to program. Our Task Canvas application, running on Forge/OS, the first enterprise grade cross platform operating system for automation, enables anyone to program a robot intuitively with little to no training. We're also enabling an ecosystem of OEMs and software developers to create a platform where we can make industrial automation easy to design, develop and maintain by everyone in the factory, not just those with advanced degrees and advanced training.



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