Research Engineer in Production Robotics (24 months)

Context and environment
---------------------------------
The French government has decided to invest over 2 years 10 million Euro for the equipment of national research platforms in various domains of robotics. (investissements d’avenir). This national network of platforms is called ROBOTEX. The main goal of ROBOTEX is to setup coherent infrastructures of technical equipments in order to:

- Promote scientific exchange and development of collaborative work between academic research teams, companies and end-users, and provide durable and reusable expertise and know–how,
- Give researchers high-level equipments with a facilitated access,
- Increase the visibility of the French robotics academic research and its international impact. It particularly concerns the strengthening of its European scientific leadership, and the increase of collaborative works with leading European countries as well as at an international level,
- Boost the competitiveness of French companies and open new markets based on robotic technologies.

The experimental platforms of the ROBOTEX national network mostly belong to joint CNRS-university laboratories with strong research and development activities in robotics, and having the necessary human resources to give access and provide optimal exploitation of the platforms. This national network links together most of the leading academic robotics research teams in France.

Robotics Team at IRCCYN is organized around 4 main research areas: Mobile Robotics, Production Robotics, Humanoid Robotics, Bioinspired Robotics. The team is involved in the national robotics research network ROBOTEX through 3 sub networks:

- Humanoid robotics and Natural Interaction
- Production Robotics
- Mobile Robotics

Missions
-----------
Robotics team has bought a KUKA KR3900 industrial robot that will be mounted on a mobile platform commercialized by BA Systemes Company. As a consequence, the research engineer will work in IRCCyN and on the foregoing experimental platform. The research activities of the candidate will deal with: (i) the development of a toolbox for the geometric and elastic calibration of industrial robots mounted on a mobile platform and dedicated to the machining of large metal and composite parts; (ii) experimental validations using the RobModProd cell. The corresponding research activities are detailed thereafter:

1. Development of stiffness models of industrial robots dedicated to the machining of metal and composite parts with large dimensions. These models should take into account the robot / process coupling. The developed models should be suitable for the error compensation of geometrical parameters and elastic parameters of the system under study. These models should be suitable for industrial robots including gravity compensators. The
machining efforts, the forces due to gravity and additional equipments mounted on the robot should also be considered in the stiffness models.

2. Development of a methodology for the calibration of the elastostatic parameters of industrial serial robots with or without gravity compensator. The developed methodology will be applied to the KUKA KR3900 robot mounted on the mobile platform commercialized by BA Systems illustrated in Figure 1. Design of experiments will be used to improve the identification accuracy of elastostatic geometric parameters of the overall system.

3. Development of a toolkit (a graphical user interface) incorporating the main theoretical results. This toolkit will help the user generate optimal measurement configurations for a given robot cell while considering the environment constraints. The developed toolkit should also help the user generate corrected machining paths with the identified geometric and elastic parameters of the overall system.

4. Experimental validations: the developed methodology for the calibration of elastostatic and geometric parameters and error compensation will be applied to the RobModProd cell. Corrected machining paths will also be tested for pre-defined machining operations.

---

Skills

- Good knowledge in modeling and identification of industrial robots

Figure 1: KUKA KR3900 robot mounted on a mobile platform
• Good knowledge in programming languages (C, C++, Matlab, Simulink)
• Good knowledge in robotics, mechanics and control
• Teamwork, manual work, creativity, rigorous, autonomous
• Should be able to write scientific reports and papers

Background
-------------
• PhD thesis in Robotics

Contact
--------
Anatol PASHKEVICH <anatol.pashkevich@mines-nantes.fr>  phone (+33) 0 2 40 37 69 68