

Parameters and signal estimation in a robotized incremental forming process

I – Topics of the internship

In the framework of the French ANR TOMORO project (Tool-material interaction-based robotic incremental forming), we are seeking for a intern fellow to work on the estimation of parameters and of signal during a robotized incremental forming process.

Incremental Sheet Forming (ISF) process consists in locally and gradually deforming a blank using a tool that imposes a forming series of small incremental deformations on the sheet metal. The tool path, guided by a machine, gives the final shape of the workpiece. The robotization of this process is an innovative forming technology: the tool is placed as end-effector of the robot and the latter is controlled in order to apply a desired force to the workpiece while following certain desired trajectory. However, several phenomena make challenging the control of the robot, mainly related to the workpiece behavior (springback effects during and after forming, temperature change between the tool and the workpiece, workpiece behavior variability) but also due to the difficulty to directly put sensors between the tool and the workpiece,

The aim of this internship is to study and develop estimators of parameters and of the force involved during a robotized incremental forming. Overall, the tasks can be decomposed into several steps:

- setting up a robotized incremental forming experimental benchmark on the basis of one of the robots available at the Laboratoire Génie de Production (LGP) of the National School of Engineering in Tarbes (ENIT),
- modeling of the interaction robotic-tool-workpiece,
- experimental characterization and nominal parameters identification,
- development of estimators and experimental tests.

II – Practical information

The internship will take place at the SYSTEMS department of the Laboratoire Génie de Production (LGP) of the National School of Engineering in Tarbes (ENIT, University of Toulouse), in Tarbes city. Some travel to LCFC laboratory of ENIM/University of Lorraine are planned as part of the project. The supervisors are:

Farid Nouredine, *associate professor*

SYSTEMS department, LGP laboratory, ENIT, University of Toulouse

Mourad Benoussaad, *associate professor*

SYSTEMS department, LGP laboratory, ENIT, University of Toulouse

Thibaut Raharijaona, *full professor*

LCFC laboratory, ENIM, University of Lorraine

Micky Rakotondrabe*, *full professor*

SYSTEMS department, LGP laboratory, ENIT - University of Toulouse

*: contact for more information and for applications, Prof Micky Rakotondrabe, email : mrakoton@enit.fr
Applications should be sent by email to the above contact along with CV and cover letter.

Starting date: February or March 2022 ; Duration: 5/6 months

Candidate profile: The topics is for MSc level in robotics, control or mechatronics. Last year of French Ecoles d'Ingénieurs are also eligible. Background on robotics is mandatory.

Link: <http://m.rakoton.net/proposals.php>