

# A program to compute compressor blade geometries from multiple-circular-arc parameters with sweep and lean (v1.0)

## About

This repository contains the source code used to generate compressor blade geometries for the following publication (currently under minor revisions):

[1] Piollet, E., Nyssen, F. and Batailly, A. (2019) "Blade/casing rubbing interactions in aircraft engines: numerical benchmark and design guidelines based on NASA rotor 37", Journal of Sound and Vibration

This code computes the cross-section coordinates of a compressor blade composed of multiple-circular-arc elements including variable sweep and lean. It is a translation, adaptation and extension of a 1969 Fortran IV code provided in the following NASA report:

[2] Crouse, J. E., Janetzke, D. C. and Schwirian, R. E. (1969). "A computer program for composing compressor blading from simulated circular-arc elements on conical surfaces."

This source code should be cited as follows:

[3] Piollet, E. and Batailly, A. (2019) "A program to compute compressor blade geometries from multiple-circular-arc parameters with sweep and lean (v1.0) [source code]", available at [hal.archives-ouvertes](https://hal.archives-ouvertes.fr/)

For more details, see **docs/documentation.pdf**

## Use

A typical use would follow these steps:

1. write multiple-circular-arc parameters for each profile in a csv file in the folder input/profiles
2. write sweep and lean parameters in two json files in the folder input/angles with file names blade\_name\_sweep.json and blade\_name\_lean.json, where blade\_name is the desired blade name
3. write parameters in parameters.ini: section [main] allows choosing which module should be run (depending on whether the user wants parameter smoothing or not, or has access to Salome or not for example); sections [parameter\_smoothing], [profile\_coordinates] and [blade\_cad] include parameters for the modules of the same name
4. run main.py

## Prerequisites

- Python 2.7
- Salomé: the program was tested with versions 8.2.0, 8.3.0 and 8.4.0

## Provided files

All input and output files related to the seven blades studied in publication [1] (see above) are provided along with the program. This includes:

- input parameters: multiple-circular-arc profile parameters in folder input/profiles, and sweep and lean parameters for all seven blades in input/sweep\_lean,
- output for all seven blades:
  - (x, y, z) coordinates of the suction side and pressure side for each stacked profile, as well as leading edges and trailing edges, in output/coordinates/blade\_name,
  - CAD (Computer-Aided Design) files in STEP format in output/CAD/blade\_name,
  - finite element mesh files in output/mesh/blade\_name.

## License

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