Introduction

1. TiGL Workshop, September 11 / 12, Cologne

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Welcome!
Goals of this workshop

• We want to get to know you, the users
  • We don’t know all our users and their use cases

• We want to show you our new features
  • There have been many new developments in TiGL, some of which you may be unaware of
  • There are new ways to use TiGL, giving you greater flexibility → Internal Python API

• We want to identify problems
  • Are there any current issues that we should know about?
  • Are there any features that would really simplify your life with TiGL?
Agenda

Sept. 11.
13:00 – 13:15  Introduction
13:45 – 14:15  Agostino De Marco - Aircraft design tools developed at the University of Naples Federico II and their integration with DLR software
14:15 – 14:30  Coffee Break
14:30 – 16:00  Python API + Hands On: Basics
16:00 – 16:30  Coffee Break
16:30 – 17:00  Python API + Hands On: Customization and Visualization
17:00 – 18:00  TiGL Viewer Scripting API + Hands On
19:30  Social Event Eltzhof

Sept. 12.
09:00 – 09:30  Sebastian Deinert - Descartes – Parametric Analysis Model Generation Using CPACS and TiGL
09:30 – 10:00  Merlin Pelz - Curve Network Interpolation with Gordon Surfaces
10:00 – 10:15  Coffee Break
10:15 – 11:00  Python API + Hands On: Custom Geometry
11:00 – 12:30  How to Contribute + Hands On
12:30 – 13:30  Lunch
13:30 – 14:00  Individual Q&A
14:00  Wrap-Up
CPACS + TiGL Ecosystem is growing

Descartes, *Airbus + RISC*

CPACS Creator, *CFS Engineering*

JPAD, *de Marco et. al.*

Pandora, *Petsch, Kohlgrüber*
TiGL Geometry Library - Current Status

- Many new geometries:
  - Flaps and Control Surfaces
  - Wing structural elements
  - Wing cells
  - Engine nacelles (WIP)
  - Engine pylons (WIP)
  - Fuselage structural elements
  - Rotors (e.g. for Helicopters)
  - Wing Cells

- Large parts developed by Airbus Defence & Space and RISC Software GmbH

- Automatic C++ code generation from CPACS schema

- CPACS 3 support und cpacs2to3 converter tool
TiGL 2.2.2 + 2.2.3 Release

- Implemented control surfaces devices
  - Trailing Edge devices
  - Leading Edge devices

- New API functions to move flaps

- TiGLViewer:
  - Angle of perspective can be adjusted using the scripting API with `setCameraPosition` and `setLookAtPosition`. This allows e.g. to create videos of the geometry.
TiGL 3.0 Release Candidate

TiGL 3.0 depends on CPACS 3.0!

- TiGL 3.0-RC1 Release Date: 12/17/2017
- CPACS 3.0 Release Date: 31/07/2018
- TiGL 3.0 Release Date: expected end 2018

- Not backwards compatible to TiGL 2:
  - Cannot read CPACS 2 files
  - API changes

- New Component Segment (CS) definition and associated API functions

- Guide curve support for wings and fuselages for high-fidelity surface modeling according to the CPACS 3 definition.

- Alternative positioning of geometries either in CS coordinates or in segment coordinates
TiGL 3.0 Release Candidate

• **Improved speed** of `tiglFuselageGetPoint` function.

• Fully **automatic code generation** for CPACS reading and writing (in cooperation with Airbus D & S and RISC)

• The **wing structure is not yet adapted** to CPACS 3 but uses the 2.3 definition. This will be updated in the next release.

• Control surfaces not yet included

• **TiGL Viewer:**
  • New design
  
  • Display of **reflection lines** to inspect surface quality.
  
  • Display of **textured surfaces**.
CPACS 2 to 3 Converter

- A python script available on Github and via our conda repository

```bash
cpacs2to3 myaircraftv2.xml -o myaircraftv3.xml
```

- Currently the script
  - increments the version number to 3
  - adds uiDs that are now required in CPACS 3
  - transforms eta and xsi coordinates to new CPACS definition
  - converts guide curve points to the new CPACS definition

- Geometry related conversions on the To-Do list:
  - Wing Structure

- Everyone is welcome to participate!
  - If you need to convert something during your transition to CPACS 3.0, please
    1. Check here if someone else has already implemented this conversion.
    2. Else: Contribute!

- Ideally, the tool is as complete as it can be.
Guide Curves Support
Curve network interpolation with Gordon Surfaces

- Given network of profile and guide curves: Find surface that interpolates these curves

- Problem: No free library available for curve network interpolation!
- Custom development from OpenCASCADE for DLR based on Coons-patches showed poor results

- An algorithm based on Gordon Surfaces is much more promising (Merlin Pelz)
Mesh Creation with TiGL

- Current student project (Paul Putin)

- Investigate the possibility of implementing mesh-export functionality

- Goal: Robustly generate a mesh with few options
  - for radar-control analysis
  - for low- to mid-fidelity CFD simulations (e.g. in TAU, OpenFOAM …)
  - as an initial mesh for a commercial meshing tool

- Write wrapper for OpenSource Mesher (Smesh+NetGen, GMsh, …)
Roadmap

**TIGL 3.0**
- CPACS 3 compatible wing structure
- Replace Coons patch algorithm with Gordon surfaces

**TIGL 3.1**
- Re-introduce control surfaces from TiGL 2
- Modelling of Nacelles + Pylon

**Future**
- Helper geometries for Mesh generators
- Own meshes for mid-fi simulations
- Variable geometries
- Modelling of intakes and channels
Course Material Online

- Download / git-clone the TiGL workshop material from
  
  - https://github.com/rainman110/tigl-workshop
Social event today

Dinner at Restaurant Eltzhof, Köln-Wahn:

- With Bus 162 from DLR or Bus 160 from Scheuermühlenstr to Wahn Kirche. Then about 300m walking to the Eltzhof restaurant.
Introduction of the participants

• Who are you?

• What are you working on?

• How is your work related to TiGL or CPACS?

• What are your expectations of the next 2 days?