5^{th} International Workshop on High-Order CFD Methods

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WiFi: AIAAScitech. Password: 2018scitech

History of High-Order Workshops

Workshop	1^{st} Jan 2012	2^{nd} May 2013	3^{rd} Jan 2015	4^{th} Jun 2016	5^{th} Jan 2018
Contributors	35	31	35	16	17
Test Cases	15	14	13	11	7

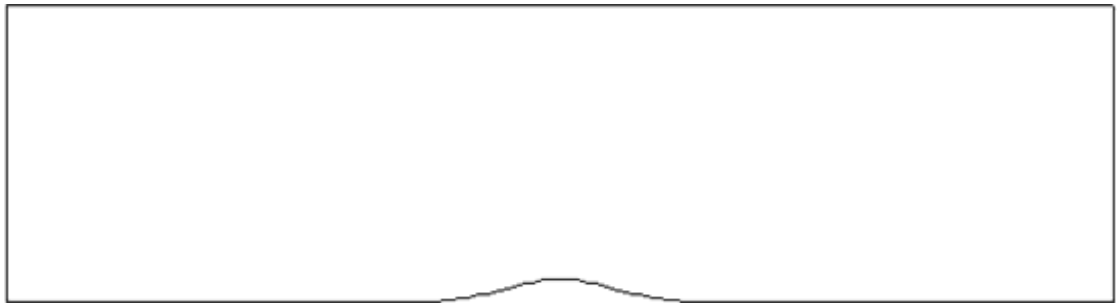
- Roughly every 1.5 years
- Alternated between AIAA SciTech and Europe

- 1^{st}, 2^{nd}, 3^{rd} Workshops: Easy, Intermediate, and Hard
  - High-order methods beneficial for LES/DNS, hp-adaptation
  - Comparisons are difficult
  - Tuning test cases, e.g. requiring specific grids
- 4^{th} Workshop: Baseline, Advanced, and Challenge
  - Focus on more difficult problems
- 5^{th} Workshop: V&V, Advanced, and Challenge
  - Each test case paired with a verification or validation case
  - Grids suitable for verifying order of accuracy

Is Verification Needed?

OVERFLOW 2.1h: Smooth Gaussian Bump

- Highly reputable workhorse CFD code (old version)
- Considered to be well *validated*



- Inviscid Mach 0.5
- Analytically constant Entropy
- Entropy L^2-norm error: $O\left(h^{P+1}\right)$

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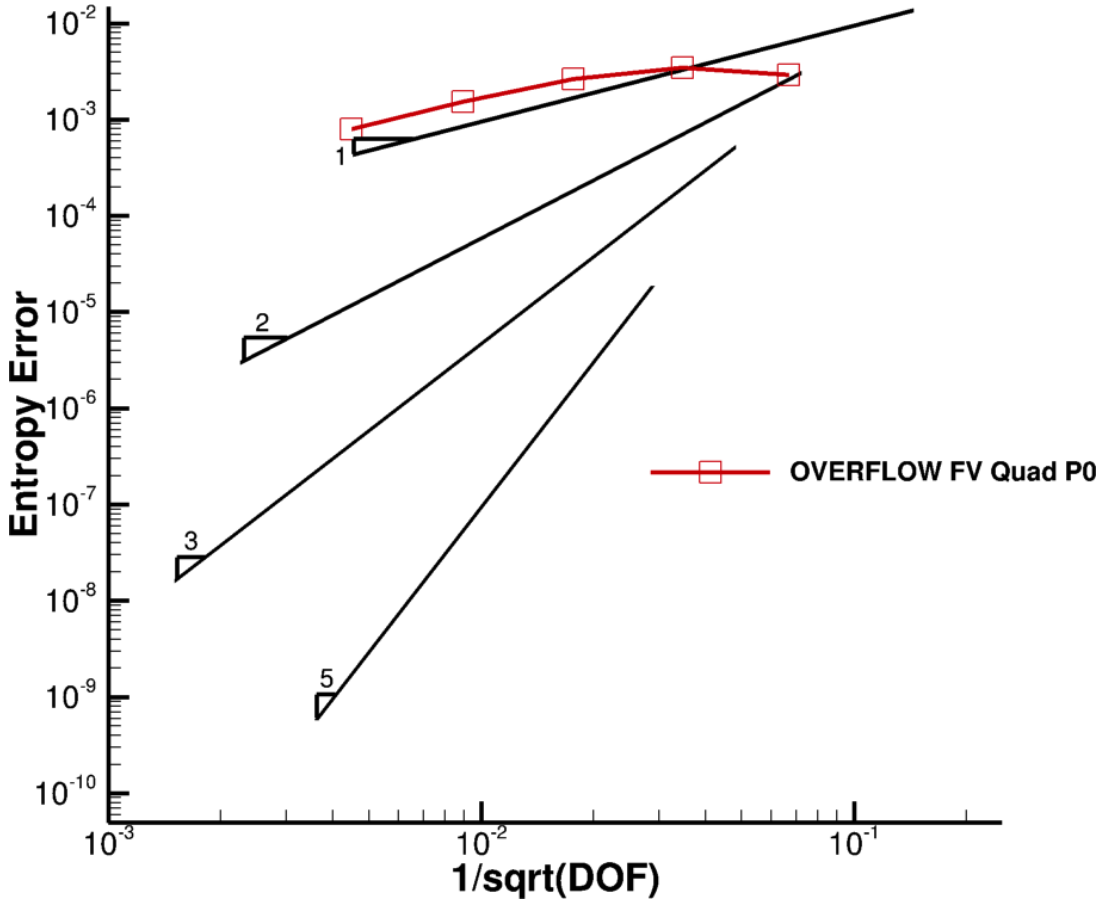

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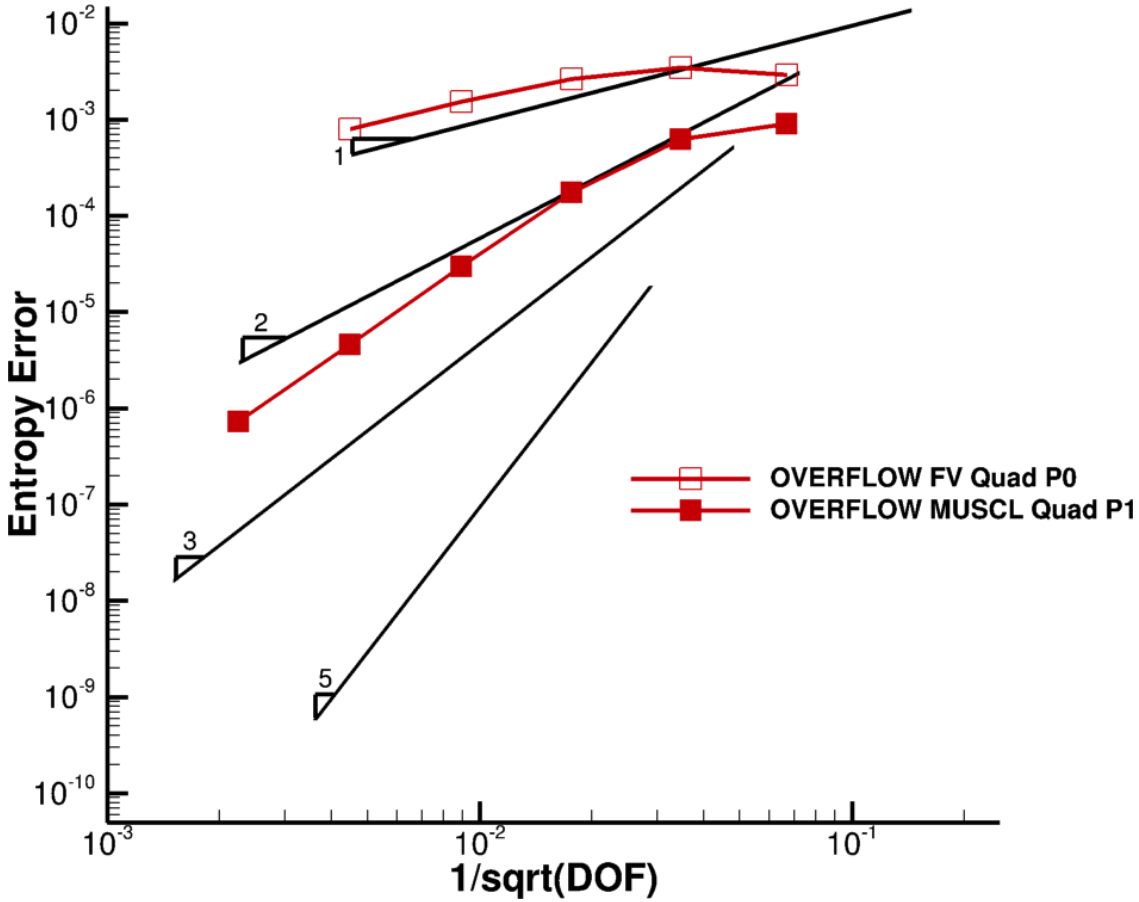

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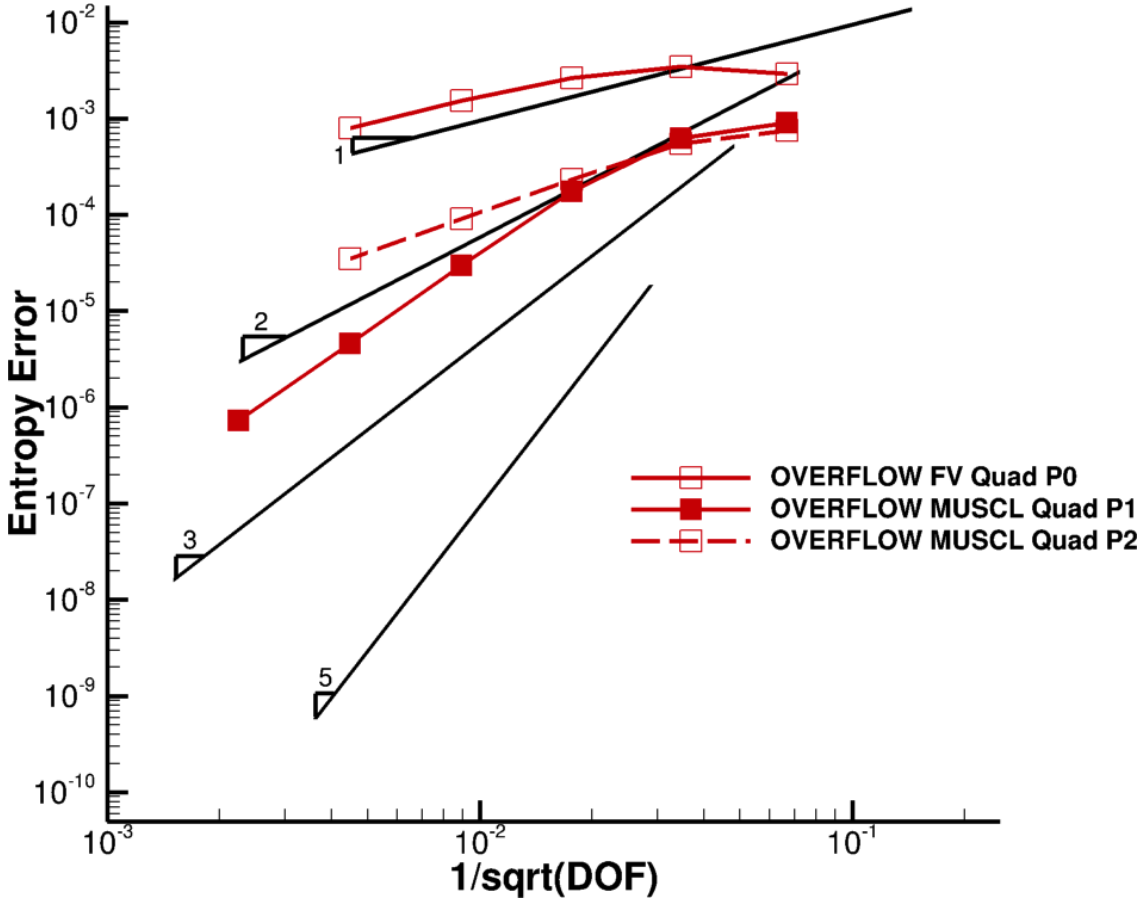

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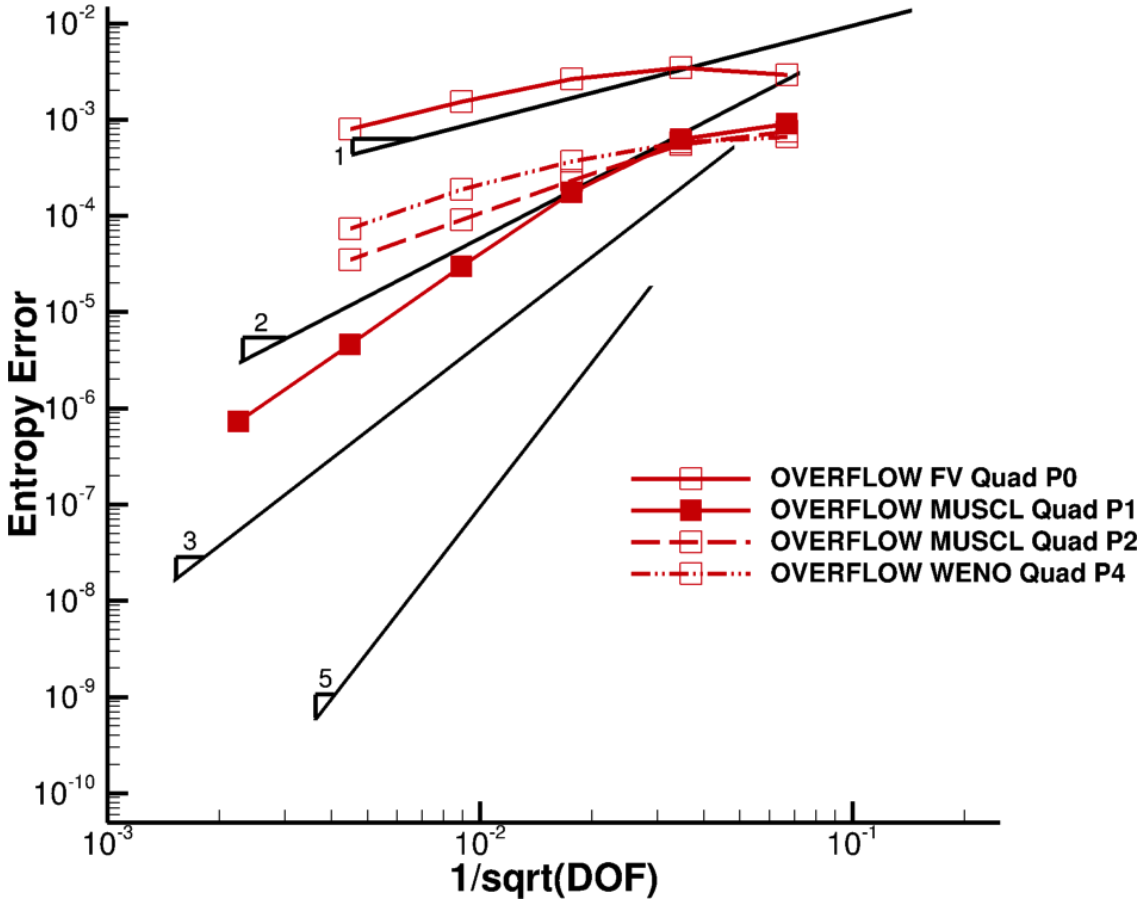

Test Cases

- CI1: Inviscid bow shock
  - VI2: Smooth Gaussian bump
- CI2: Inviscid Strong Vortex-Shock Wave Interaction
  - VI1: Vortex transport
- CL1: Heaving and pitching airfoil
  - VL1: Laminar Joukowski

- CR1: Common Research Model
  - VR1: RANS Joukowski
- CS1: Tandem Spheres Re=3900
  - WS1: Taylor-Green vortex
- CS2: T106 LPT Cascades
  - WS2: LES Channel
- MC1: High-Lift CRM
- MC2: NASA Rotor 67

- Test case leaders introduce case
- Participant presentations
  - Emphasis on both success as well as challenges and unsolved problems
- Summaries include open discussion
- Presentations available at how5.cenaero.be

NOT Particularly Useful:

"Comparison of Code A, algorithm B, run by user C, with Code D, algorithm E, run by user F, on problem G."

–Anonymous NASA Langley Employee

NOT Particularly Useful:

"Comparison of Code A, algorithm B, run by user C, using mesh D, with Code E, algorithm F, run by user G, using mesh H, on problem K."

–Marshall C. Galbraith

NOT Particularly Useful:

"Comparison of Code A, algorithm B, run by user C, using mesh D, with Code E, algorithm F, run by user G, using mesh H, on problem K."

–Marshall C. Galbraith

IS Useful:

Gathering leading experts in a field to talk to each other.

NOT Particularly Useful:

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Taking notes...

Exit Survey

1. What workshop test cases were the most valuable and informative, and why?
2. What type of applications do you think benefit from high-order methods and why?
3. Where do you think research for high-order methods is still needed?
4. What type of test cases would you like to see in a future workshop?
5. How could the workshops' technical programs be improved?
6. How soon would you like to see another workshop?
7. Would you be interested in participating in and/or organizing another workshop?

Summarized Tuesday Jan 9 2018 in "Palm Beach" at 6 pm

Agenda

5th High-Order Workshop Agenda

Day 1: Saturday, 6th January 2018		
7:15 - 08:30	Continental Breakfast	
08:00 - 08:15	**Welcome to the workshop: Marshall Galbraith**	
08:15 - 08:40	V&V - Farshad Navah	McGill
08:40 - 10:00	**CI2 - Chongam Kim**	
	Hojun You	Seoul National Univ.
	Philip Johnson	U of Michigan
	ZJ Wang	Kansas Univ.
	Summary/Discussion of CI2	
10:00 - 10:30	Break	
10:30 - 12:00	**CI1 - Scott Murman (presnted by Marshall Galbraith)**	
	Ben Couchman	MIT
	Jean-Marie Le Gouez	Onera
	Andrew Corrigan	Naval Research Laboratory
	Matthew Zahr	UC Berkeley
	Summary/Discussion of CI1	
12:00 - 01:45	Lunch on own (not provided)	
01:45 - 02:30	**CL2 - Per-Olof Person and Krzysztof Fidkowski**	
02:30 - 03:00	Meshing - Steve Karman	Pointwise
03:00 - 03:30	Break	
03:30 - 05:00	**CR1 - Marshall Galbraith**	
	Ryan Glasby	U of Tennessee
	Behzad Ahrabi	U of Wyoming
	Micheal Brazell	U of Wyoming
	Summary/Discussion of CR1	
05:00 - 05:30	**Future CFD Technologies:**	
	On the Creation of ICASE: A Personal Retrospective View	
	Manny Salas	

Day 2: Sunday, 7th January 2018		
7:15 - 08:30	Continental Breakfast	
08:15 - 09:00	**Future CFD Technologies: Plenary Talk**	
	InfoSymbioticSystems - The Power of DDDAS	
	Frederica Dareema	
	Director, Air Force Office of Scientific Research (AFOSR)	
09:05 - 10:00	**CS2 - Koen Hillewaert**	
	Pablo Fernandez	MIT
	Summary/Discussion of CS2	
10:00 - 10:30	Meshing - Peter Eiseman	GridPro
10:30 - 11:00	Break	
11:00 - 12:30	**CS1 - Ryan Glasby**	
	ZJ Wang	Kansas Univ
	Johan Jansson	KTH/BCAM
	Marian Zastawny	Siemens
	Philip Johnson (WS1)	U of Michigan
	Summary/Discussion of CS1	
12:30 - 02:00	Lunch on own (not provided)	
02:00 - 03:00	**MC1 - Behzad Ahrabi**	
	Micheal Brazell	U of Wyoming
	Ryan Glasby	U of Tennessee
	Summary/Discussion of MC1	
03:00 - 03:30	**Open Discussion and Conclusion of the Workshop**	
03:30 - 04:00	Break	
04:00 - 05:30	**Future CFD Technologies: Discussion/Panel**	
	Panelists : Mike Rogers (NASA), Fariba Fahroo (DARPA),	
	Durrell Rittenberg (Siemens PLM),	
	Sharath Girimaji (Texas A&M), David Keyes (KAUST)	

Overlap with Future of CFD Technology talks. The Reception...