

CFD-based Optimization: Vectis coupled with HyperWorks

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Abridged Form of the EHTC 2008 presentation!



CFD-based Optimization



$$F(\dot{y}(t), y(t), u(t), p, t) = 0, \quad t \in [0, T]$$

Flow Solution



$$J(y, u, p) := \int_0^T j(y(t), u(t), p, t) dt$$

Object Value



$$\min_{y, p} f(y, p)$$

Goal

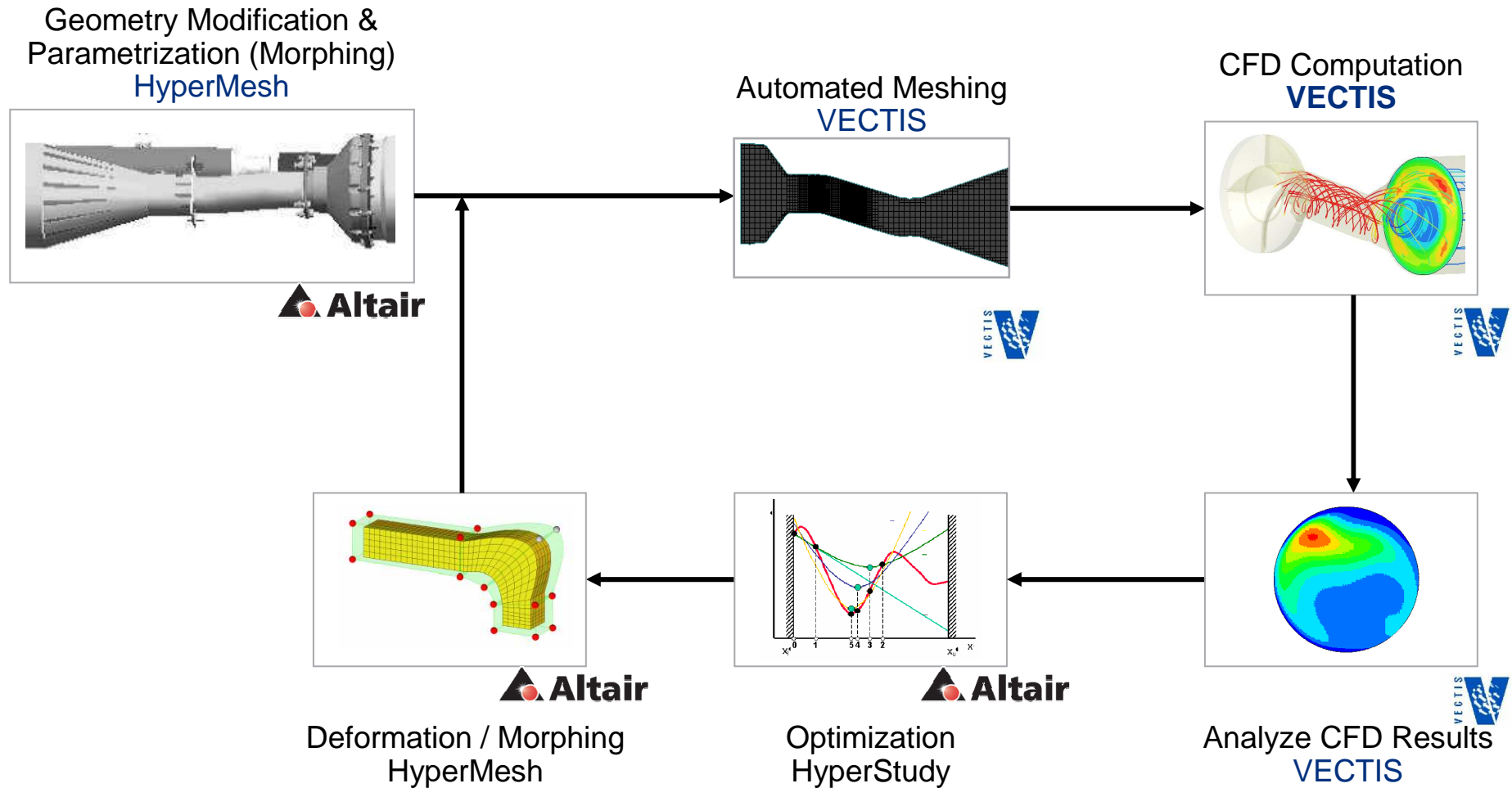
$$h(y, p) \geq 0 .$$

Constraint



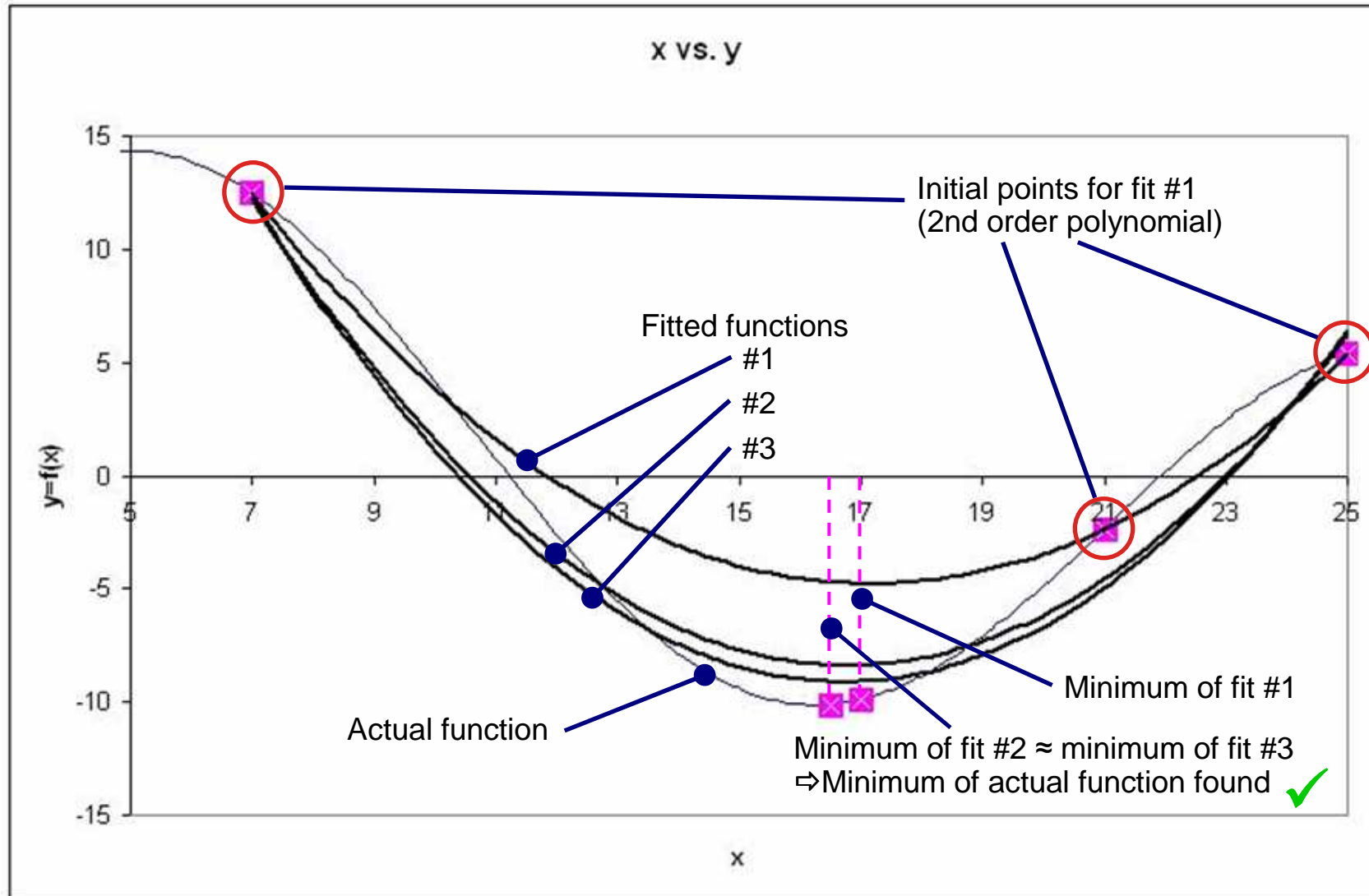
- Optimization Tasks:
 - Parameter estimation
 - Design of experiments
 - Shape optimization

Shape Optimization with Vectis and HyperWorks



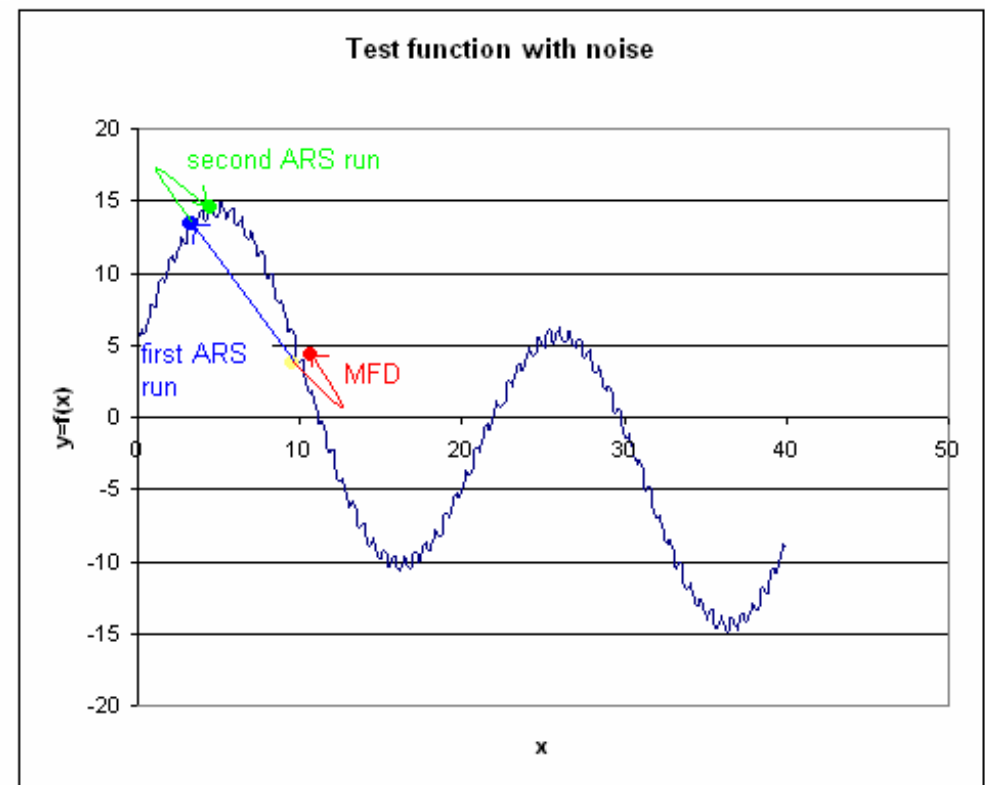
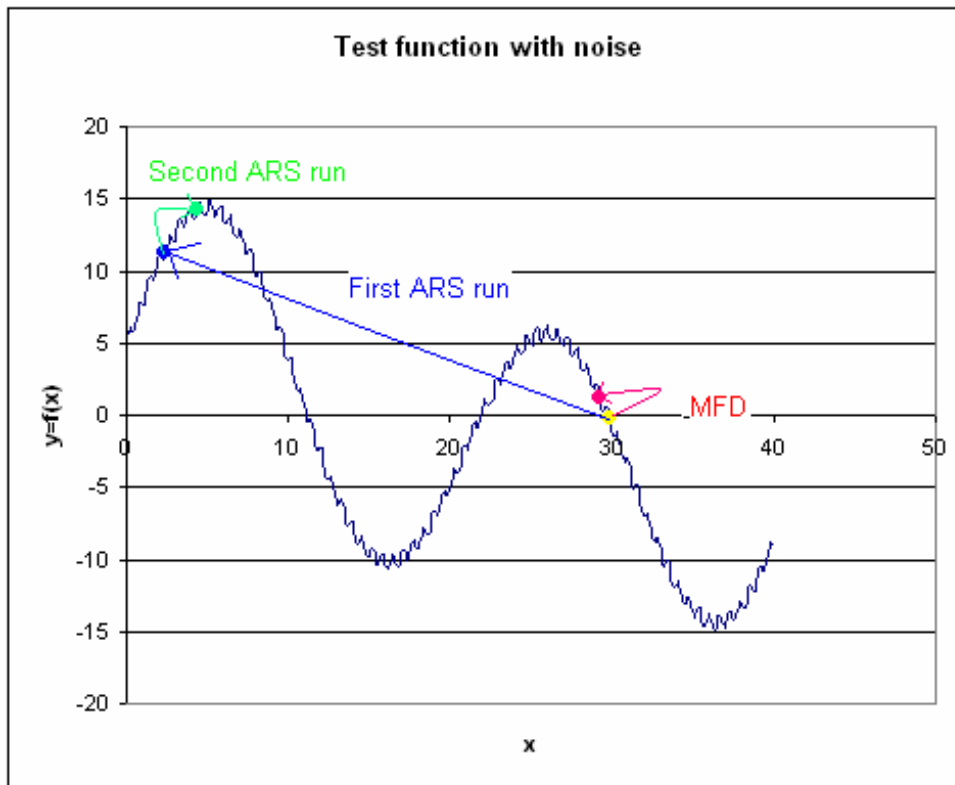
- Application
 - Intake Duct / Runner
 - Cooling Jacket
 - Catalyst Flow Distribution
 - Piston Shape

Optimization Process: Adaptive Response Surface



Optimization Strategy: Analysis

- ARS: Adaptive Response Surface
- MFD: Method of Feasible Directions (gradient based)



- MFD detects local maximum only
- Due to 2nd order polynomial curve fit, the accuracy of ARS is limited. However, starting a 2nd ARS run initialized with the result of the 1st run shows improvement.

Thank you!

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