
Virtual Prototyping for Medical Devices

Speakers:

H. Biral Runesha, Minnesota Supercomputing Institute

Mike Schendel, Medtronic Cardiovascular

Randy Schiestl, Boston Scientific Corp.

Trung Le, Saint Anthony Falls Laboratory, U. of Minnesota

Daniel Keefe, Computer Science & Engineering, U. of Minnesota

April 13, 2011

Virtual Prototyping for Medical Devices: Perspectives from Academia and Industry

"High Performance Computing for Simulation-based design of Medical devices: Trends and challenges"

H. Birali Runesha, Minnesota Supercomputing Institute

"Challenges of Virtual Design: Industry Perspective"

Mike Schendel, Medtronic Cardiovascular

"Virtual Engineering -- An Industry Perspective"

Randy Schiestl, Boston Scientific Corp.

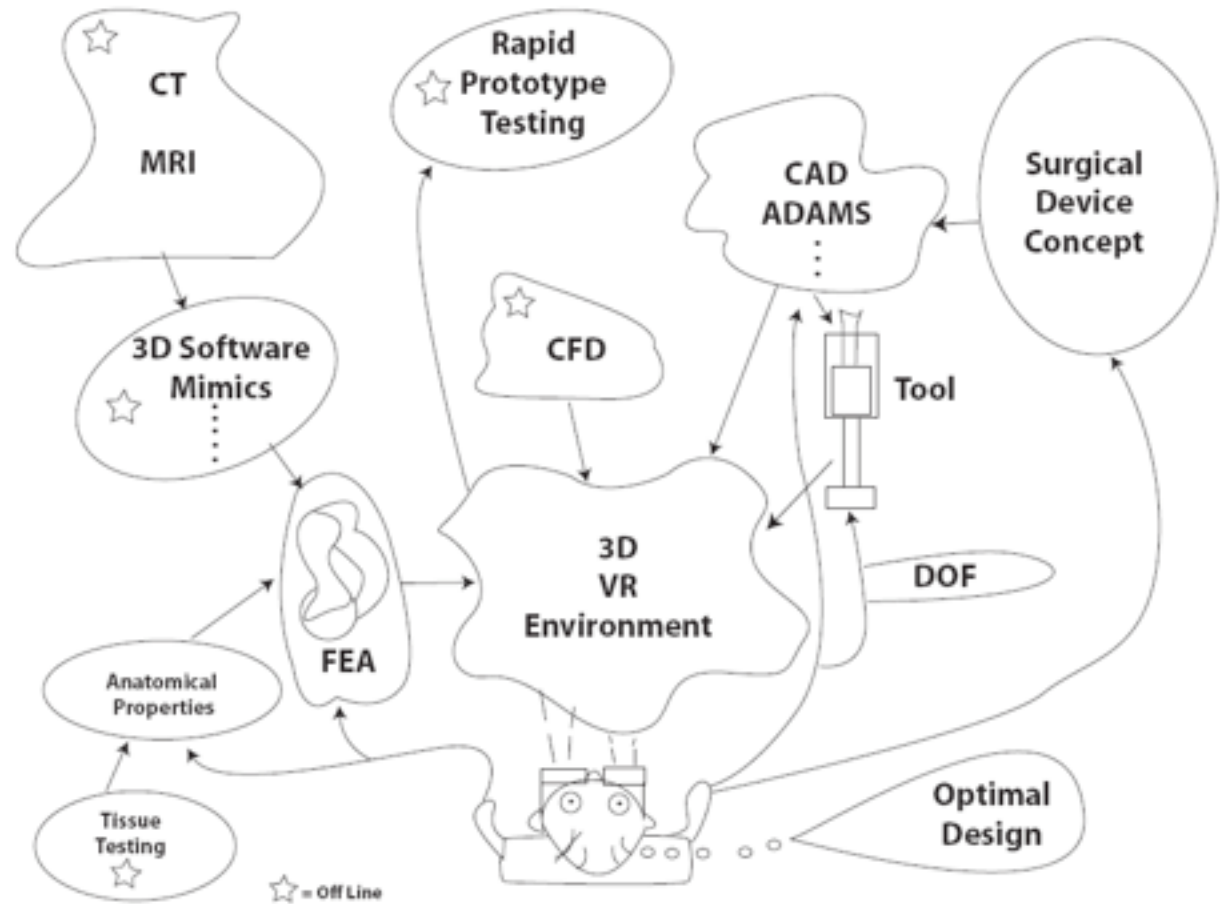
"Evaluation of medical device performances in patient-specific anatomy using high resolution simulation"

Trung Le, Saint Anthony Falls Laboratory, University of Minnesota

Bringing us together...

A vision of virtual engineering that leverages high-performance computing and interactive immersive computing environments.

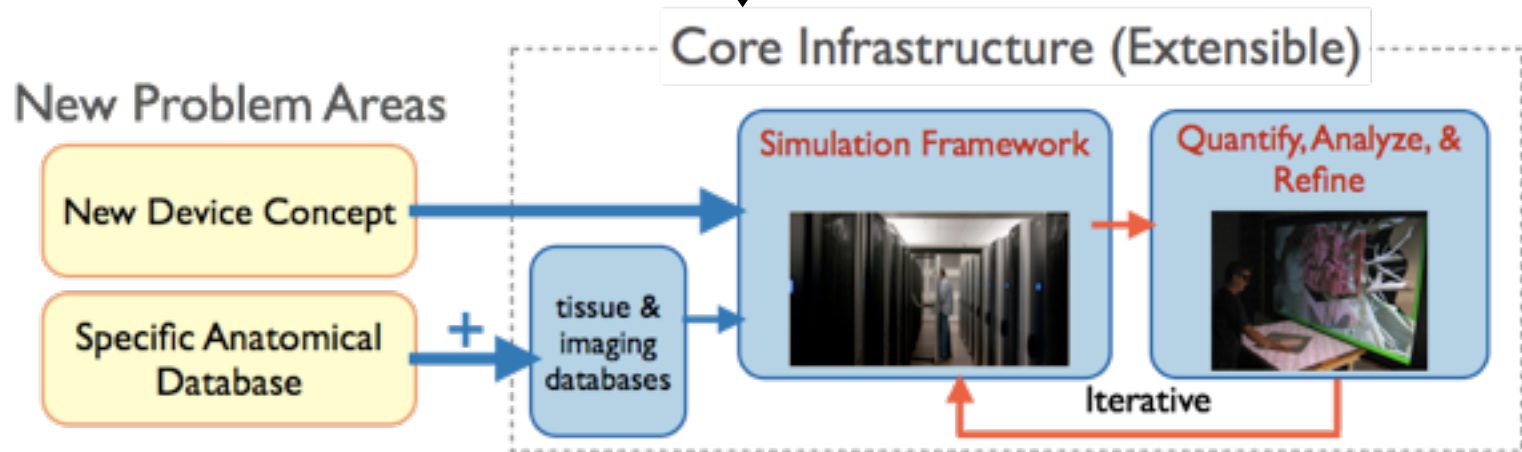
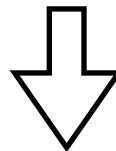
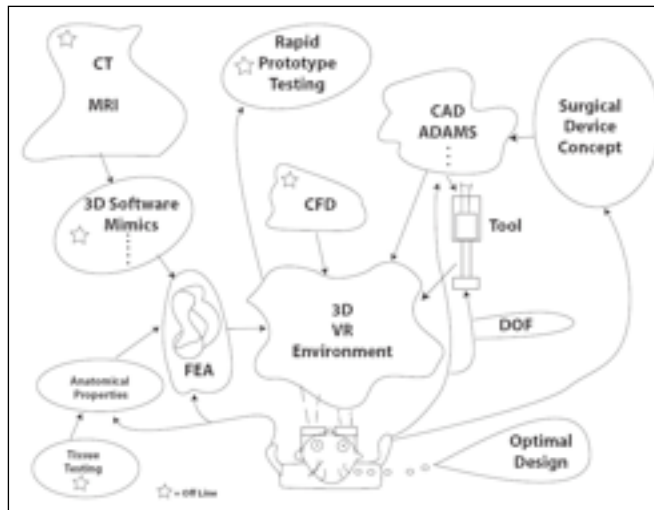
Erdman et al.



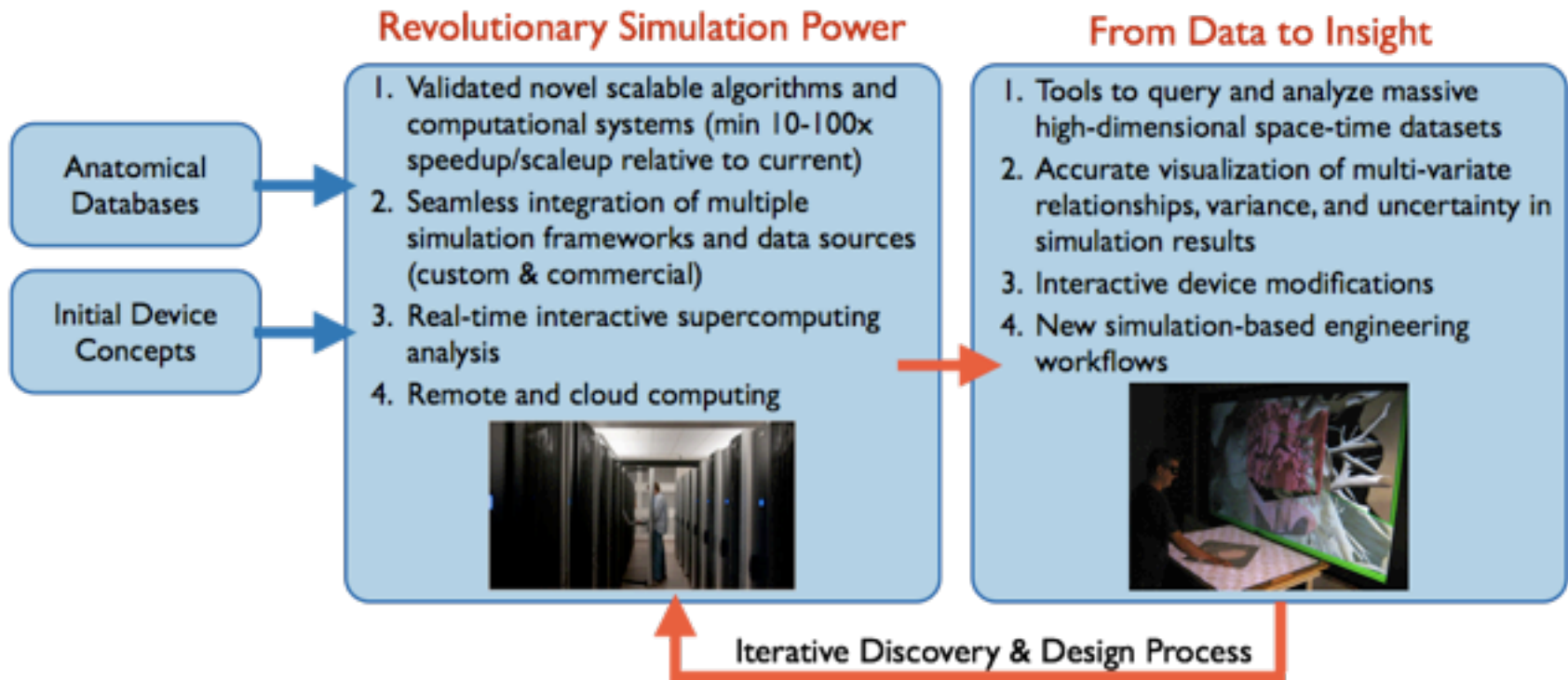
Goal: Couple high-performance computing, modeling and simulation, and interactive immersive design environments to speed the design process and develop better solutions.

■ A Collaboration Between the U of M, the Medical Devices Industry, and FDA

- ❑ U of M: Medical Devices Center, Computer Science & Engineering, Saint Anthony Falls Lab, and Minnesota Supercomputing Institute
- ❑ BSC, Medtronic, J&J Ethicon Endo Surgery
- ❑ Five meetings with the FDA
- ❑ Additional Collaboration with OSTP, NIH, NSF and NIST



Virtual Prototyping Core Infrastructure



An Interdisciplinary Approach, Academia + Industry

Device Design & Manufacture



Erdman
UMN
Mech. Eng.



Schendel
Medtronic



Schiestl, Merdan
Boston Scientific



Long
Ethicon
Endo-Surgery

- anatomical & tissue databases
- interface of devices with anatomy
- real-time parameter optimization
- focus on industry-driven problems

Interactive Scientific Visualization



Keefe
UMN
Computer Science

- quantifying and visualizing uncertainty
- large-scale, ensemble visualization
- real-time 3D and haptic interfaces for data querying and modeling



Immersive Computing

Interrante, UMN Computer Science

- perception and cognition in immersive environments
- accurate perception of spatial data
- multi-variate visualization

High-Performance Computing



Runesha
UMN
Minnesota Supercomputing
Institute

- interactive supercomputing
- scaling applications to massively parallel computers
- remote and cloud computing
- computational steering

Validated Custom Simulation



Sotiropoulos
UMN
Computational Cardio-Fluid
Dynamics

- fluid-structure interaction algorithms
- high-performance computing
- image-based modeling of physiologic cardiovascular flows

Integrated
Knowledge
& Tools

And, many students and staff across disciplines at the University of Minnesota.

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