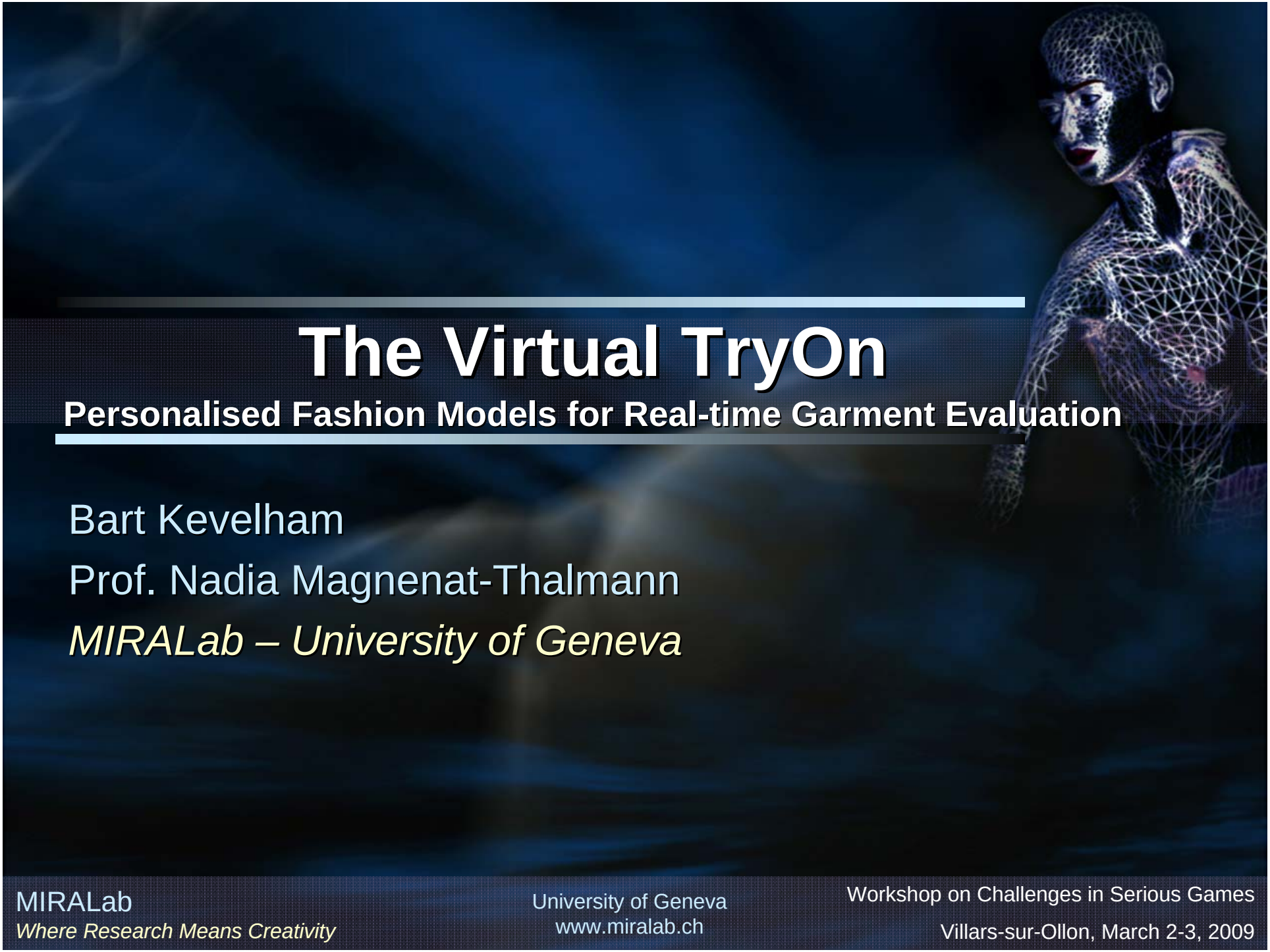

The Virtual TryOn

Personalised Fashion Models for Real-time Garment Evaluation

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What is a “Virtual TryOn”?

- An (online) application, allowing you to try on virtual garments
  - For consumers
    - Online shopping: “I like this garment, but how does it look on my body and will it fit?”
  - For designers
    - Rapid prototyping/evaluation of a design in various sizes and with various fabrics

Available components

- I did not have to develop this from scratch
- Several libraries were available
  - Body Sizing (Mustafa Kasap)
  - Skinning and motion retargeting (Etienne Lyard)
  - Garment Simulation (Pascal Volino)
- And let's not forget the designers
  - They provided the bodies, garments, animations…
- So let's walk through the components

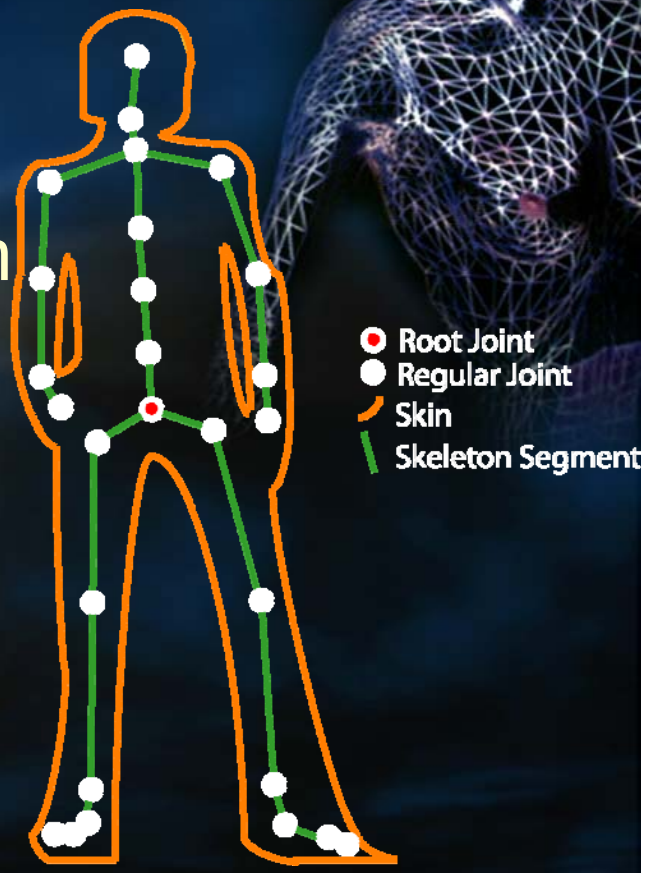
Available: Body Sizing

- An accurate body is essential
  - To “try on” clothing, you need a virtual body that represents your own
- Start from a template body
  - Generate a body with your sizes based on anthropometric data [KMT07]

[KMT07] Parameterized Human Body Model for Real-time Application. M. Kasap and N. Magnenat-Thalmann. *Cyberworlds 2007, International Conference, IEEE, pp. 160-167*, October 2007

Available: Motion Retargeting

- Animation is usually pre-recorded
  - Through the use of motion capture equipment
- Any changes to the body's morphology influence its animation e.g.
  - A heavier set person has a different gait than a lighter person
  - Someone with longer legs will have a longer stride
- The recorded animation needs to be adapted to account for these changes



Available: Garment Simulation

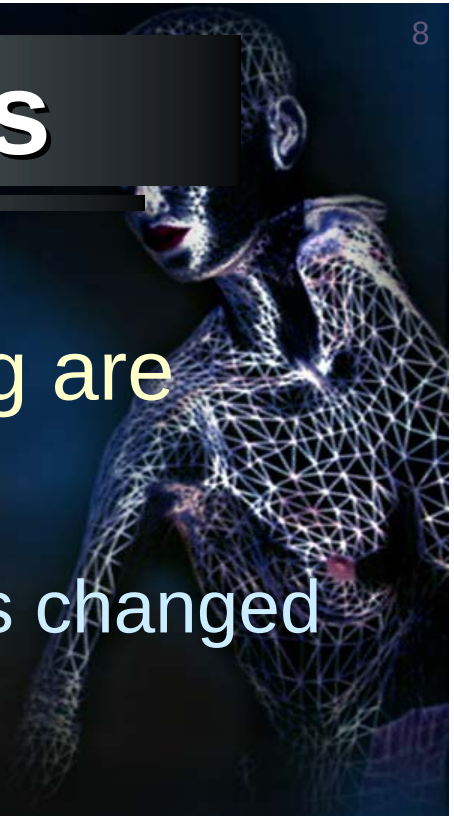
- Physical simulation of garments
  - Simulation based on measured physical parameters of used fabrics
  - Includes grading information
    - Selection of various different garment sizes
    - No need to change to different meshes
  - 2 Simulation modes:
    - Real-time (preview) simulation
    - High-Quality simulation

[MTH08] N. Magnenat-Thalmann, E. Lyard, M. Kasap and P. Volino. Adaptive body, motion and cloth. *Proceedings of Motion in Games 2008, Lecture Notes in Computer Science (to appear)*

What did I contribute so far

- With all the available components, what is my contribution?
  - Integration
  - Built a personalizable dressed virtual human
  - Contained in a simple library that can be used in various contexts
    - VTO, Remote AR, …
- Added functionality of the VTO
  - Make sure we can interface with it from the web
  - Recording of high quality videos

Let's analyze: bottlenecks



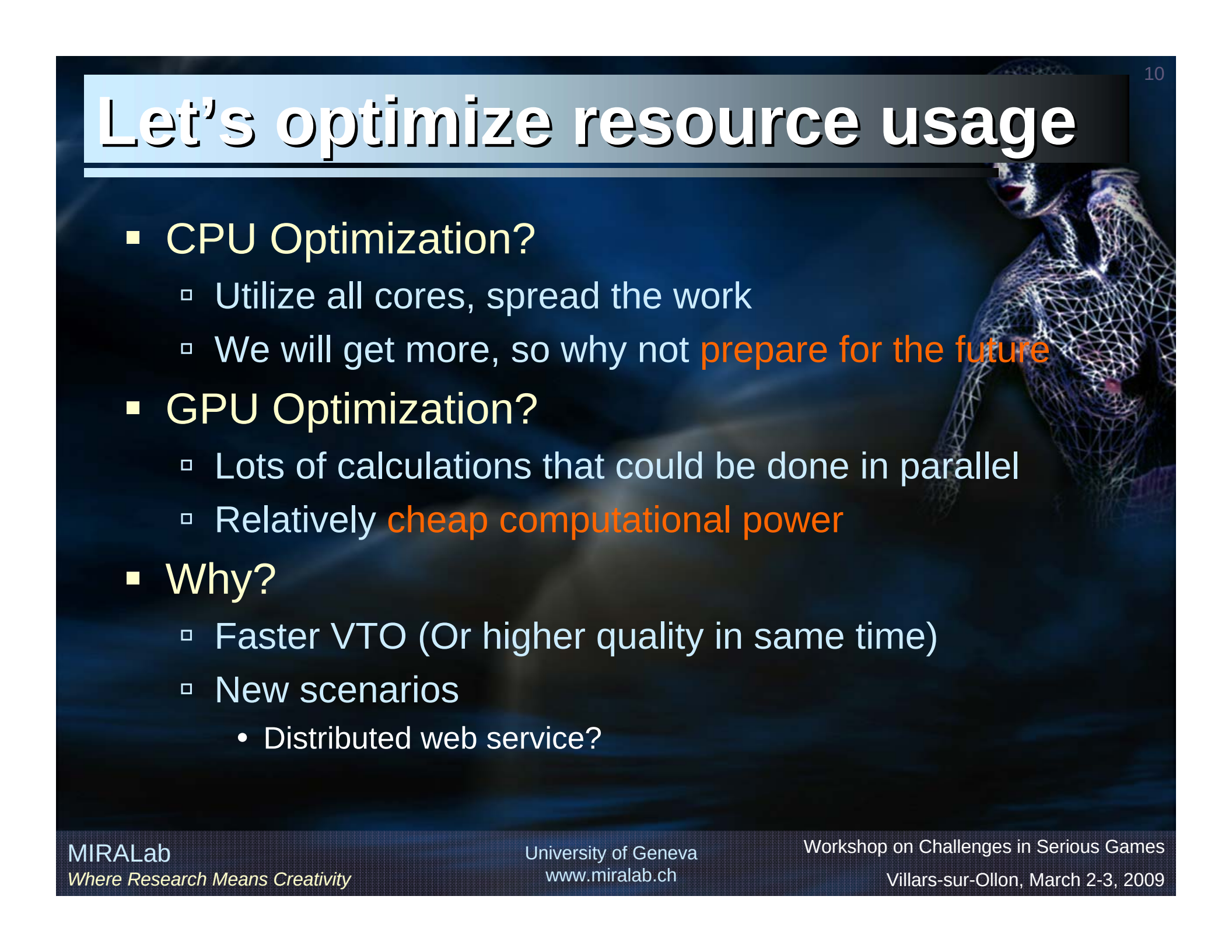
- Body sizing and motion retargeting are not the bottlenecks
  - They only compute when the body is changed
  - They do so quite fast
- The major bottlenecks are:
  - Garment simulation
    - Resolution of garments is limited (*)
  - Collision detection
    - Currently a simple scheme

Let's analyze: the reason

- Of course simulation is a "hard" problem
  - Our demands don't help
  - Accuracy is important to us
- We don't use the resources at our disposal
  - 4-core Intel Xeon E5410 @ 2.33GHz
    - We only use a single core
    - The others are idling
  - GeForce 9800 GX2
    - Merely used for relatively simple rendering tasks
    - 768GFlops of computational power barely used

I could contribute here!

Let's optimize resource usage

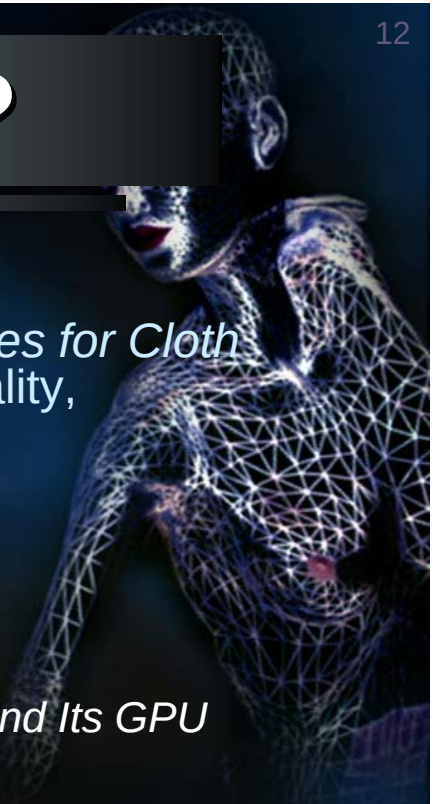


- CPU Optimization?
  - Utilize all cores, spread the work
  - We will get more, so why not prepare for the future
- GPU Optimization?
  - Lots of calculations that could be done in parallel
  - Relatively cheap computational power
- Why?
  - Faster VTO (Or higher quality in same time)
  - New scenarios
    - Distributed web service?

CPU: What is happening?

- Extensive research in parallelization of cloth simulation
  - M. Keckeisen and W. Blochinger, “Parallel implicit integration for cloth animations on distributed memory architectures,” EG Symposium on Parallel Graphics and Visualization, 2004.
  - B. Thomaszewski and W. Blochinger, “Parallel simulation of cloth on distributed memory architectures,” EG Symposium on Parallel Graphics and Visualization, 2006.
  - B. Thomaszewski, S. Pabst, and W. Blochinger, “Exploiting parallelism in physically-based simulations on multi-core processor architectures,” EG Symposium on Parallel Graphics and Visualization, 2007.
  - *“Robust High-Resolution Cloth Using Parallelism, History-Based Collisions and Accurate Friction.”* Andrew Selle, Jonathan Su, Geoffrey Irving, Ronald Fedkiw. *IEEE Transactions on Visualization and Computer Graphics*, vol. 15, no. 2, pp. 339-350, Mar./Apr. 2009

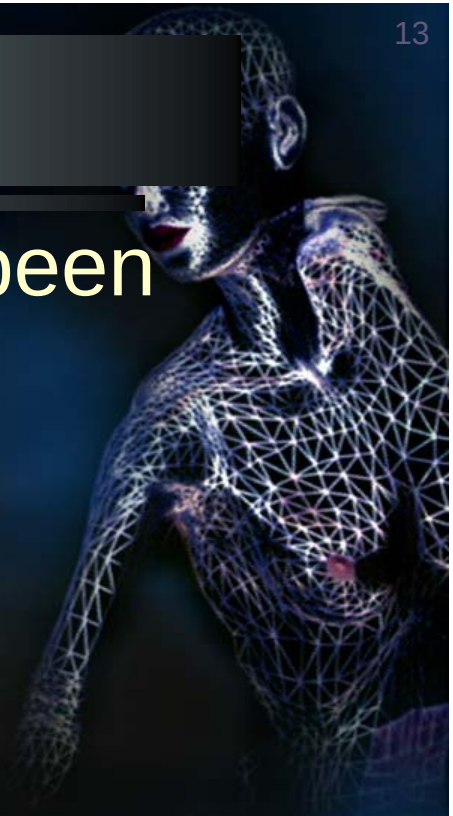
GPU: What is happening?



- Garments
  - J. Rodríguez-Navarro and A. Susín.*Non Structured Meshes for Cloth GPU Simulation using FEM.* 3rd. Workshop in Virtual Reality, Interactions, and Physical Simulations (VRIPHYS'06).
- Haptics quite strongly represented
  - Sofa framework (http://www.sofa-framework.org)
    - Focus on medical
    - [CTA08] *Efficient Nonlinear FEM for Soft Tissue Modelling and Its GPU Implementation within the Open Source Framework SOFA*
- Commercially available
  - Physx SDK
    - Taken over by Nvidia. Ported to CUDA
    - Nurien (Dressed avatars. Focus on social networking)
- Collision detection limited

[CTA08] Olivier Comas, Zeike A. Taylor, Jérémie Allard, Sébastien Ourselin, Stéphane Cotin and Josh Passenger *Efficient Nonlinear FEM for Soft Tissue Modelling and Its GPU Implementation within the Open Source Framework SOFA* Lecture Notes In Computer Science; Vol. 5104 Proceedings of the 4th international symposium on Biomedical Simulation London, UKSection: Finite Element Modelling Pages: 28 - 39 2008

My plans?



- The main VTO development has been done
  - Improvements are always possible
  - But now we can start to optimize
- Focus on GPU optimization
  - Cloth simulation
    - Port current simulation to the GPU
    - Adapt, improve, innovate
  - Collision detection
    - Current scheme translates nicely
    - Investigate other more accurate schemes

Conclusion

See you next year with some results!

Questions are welcome