Ruslan Guseinov

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Experience

Postdoctoral researcher/Business Fellow, IST Austria Oct 2020—Present

I am a lead researcher and software developer at the spin-off project AutoMold for automatic design of injection molding tools. My contributions:

- Designed and implemented project infrastructure including • C++/Python3 wrappers for geometry processing library Parasolid (with standard C API), • high level algorithmic differentiation module based on CasADi (symbolic differentiation) for rapid development of custom discrete and continuous geometry optimization, • CAD prototyping environment with Parasolid core functionality, Open Cascade visualization, and QT user interface.
- Developed prototypes for geometry optimization approaches to obtain CAD curves and surfaces fulfilling complex design constraints required in molding tool design.
- Carried out technical meetings with potential customers to understand their needs and showcase developed prototypes of automated design tools.

PhD Student, IST Austria Sep 2014—Sep 2020

Worked on algorithms and fabrication techniques for self-transforming mechanical structures and freeform glass façades. The research projects involved • inverse optimization of Physics-based shell models, • implementation of custom FEM simulations, • executing massive computations (HPC/SLURM), • application of deep neural networks to speedup computational design.

Researcher/Software Engineer, OctoNus Software Ltd. Sep 2012—Aug 2014

Developed algorithms for diamond cutting geometry processing and optimization targeted at quick processing of large volumetric data and modification of polyhedral shapes with nonlinear, non-convex, and partially discontinuous constraints and cost functions.

Consultant/Systems Analyst, Sitronics IT Consulting (currently NVision Group) Aug 2010—Aug 2012

Contributed to integration of Oracle Siebel CRM system in international corporations (telecom, banking). Performed Systems Analysis, system testing. Communicated with customers regarding functionality requirements and improvements.

Intern/Analyst, Mobile TeleSystems PJSC Nov 2009—May 2010

Performed forecasting for international mobile telecommunication market.

Tech skills

- Expert C++, Python3
- Eigen, NumPy, Open Cascade, Parasolid, Libigl, QT, Pybind11, IpOpt, KNitro, CasADi, Matlab

OS

- Windows
- Linux
- MacOS

Languages

- **English** Fluent
- **Russian** Native
- **German** B2

Awards

- **Eurographics Best PhD Thesis** 2021 — "For his pioneering contributions to the computational design of curved shells."
- **TWIST Fellowship** 2020 — Tech transfer grant for project AutoMold.
- **SIGGRAPH PhD Thesis Fast Forward** 2020 — Selected as one of 12 presenters worldwide.

Education

PhD in Computer Graphics, IST Austria 2014-2020
Thesis "Computational Design of Curved Thin Shells: from Glass Façades to Programmable Matter".

Specialist in Applied Informatics (eq. MSc), Moscow Institute of Physics and Technology 2005-2010
Diploma with Honors (5.0 of 5.0).

High school, Pushkin Bryansk City Lyceum 1, Russia 2003-2005
Silver medal (4.95 of 5.0).

Publications

1. Computational design of curved thin shells: from glass façades to programmable matter, 2020
   R. Guseinov, IST Austria (PhD thesis).
2. Computational Design of Cold Bent Glass Façades, 2020
   Gavriil*, **R. Guseinov***, J. Pérez, D. Pellis, P. Henderson, F. Rist, H. Pottmann, B. Bickel
   ACM Trans. Graph. 39, 6. (Proc. SIGGRAPH Asia). * joint first authors
3. Programming temporal morphing of self-actuated shells, 2020
   R. Guseinov, C. McMahan, J. Pérez, C. Daraio, B. Bickel
   Nature Communications 11, 237
4. CurveUps: Shaping Objects from Flat Plates with Tension-Actuated Curvature, 2017
   R. Guseinov, E. Miguel, B. Bickel
   ACM Trans. Graph. 36, 4. (Proc. SIGGRAPH)

Teaching

Spring 2018 **Data Science and Scientific Computing**
teaching assistant, IST Austria

Spring 2016 **Computational Aspects of Digital Fabrication**
teaching assistant, IST Austria

Paper reviewing

- ACM Transactions on Graphics (SIGGRAPH)
- Eurographics
- Computer-Aided Design
- Computers & Graphics

Talks and outreach

2020 **Computational Design of Cold Bent Glass Façades**, SIGGRAPH Asia

2020 **Computational design of curved thin shells: from glass façades to programmable matter**, SIGGRAPH, PhD Thesis Fast Forward

2020 **Self-morphing structures**, Max Planck Institute of Colloids & Interfaces

2018 **Doing a PhD in Computational Fabrication**, IST Austria, talk for high school students

2018 **Fabrication of Shells-Transformers aka CurveUps**, BRG Klosterneuburg international school

2017 **Fabrication of Shells-Transformers aka CurveUps**, IST Austria, Think & Drink talk

2017 **CurveUps: Shaping Objects from Flat Plates with Tension-Actuated Curvature**, Geometry Workshop Obergurgl

2017 **CurveUps: Shaping Objects from Flat Plates with Tension-Actuated Curvature**, SIGGRAPH

2016 **A talk to inspire you about science**, IST Austria, talk for high school students