

3D • MAY 2024 Rhinozine

The Carapacks Pavilion

A team of innovators using parametric modeling and digital tools to craft a remarkable structure.

Developers Corner: Debugging Scripts

Learn about
ShapeDiver and Rhino
Tdyn Wind Tunnel.

The White Snake Bridge

Model: A project showcasing
innovative design and engineering.

Predictive Precision in 3D Printing

Through AI: An UCL student master's dissertation

McNeel HQ

Headquarters, North America
& Pacific

146 N Canal St, Suite 320
Seattle, WA 98103 USA

McNeel South East US & Latinoamérica

Southeastern United States
& Latin America

1538 NW 89th Court
Miami, FL 33172 USA

McNeel Europe

Europe, Middle East
& Africa

Roger de Flor, 32-34, bajos
Barcelona, 08018 España

McNeel Asia

146 N Canal St, Suite 320
Seattle, WA 98103 USA

support@mcneel.com





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Image by Kyle Houchens

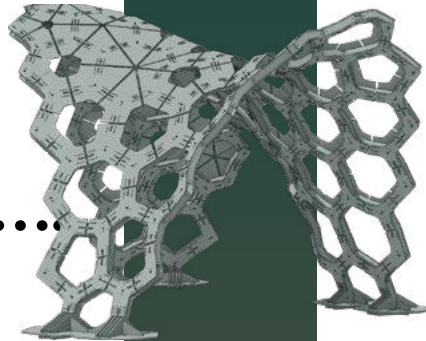
6. Plugins

Learn about ShapeDiver and Rhino Tdyn Wind Tunnel.



8. Developers Corner

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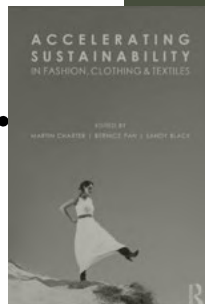


10. The Carapacks Pavilion

Read about a team of innovators using parametric modeling and digital tools to craft this remarkable structure.

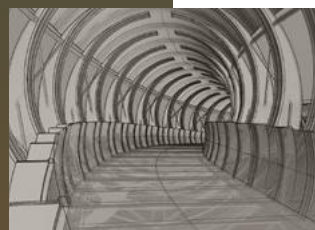
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Rhino^{3D}zine

Share your knowledge.
Expand your network.
Connect with fellow enthusiasts.

Ready to be featured in Rhino3Dzine? Don't hesitate – click [HERE](#) and send us your application today!

If you're eager to showcase your latest **project**, share a groundbreaking **plugin**, promote **courses and events**, recommend must-read **books**, or offer exciting **job opportunities**, we want to hear from you. Your expertise and insights could inspire our diverse readership!

CONTRIBUTORS & ACKNOWLEDGMENTS

Editor

Carola Trozzo

Review Team

Andrés González, Jackie Nasser, Ryan Brown, Dulce Chavez, Wendy Hemmelman, Jody Mills, and Sandy McNeel.

Designer

Carola Trozzo

Production Manager

Paula González

Marketing Coordinator

Lucia Miguel

Other Contributors

Simon Vorhammer, Neelam Chellani, Scott Davidson, Monty Lipphardt, Elizabeth E. Bigger, Tsvetelina Georgieva, Mustafa Dülger, Stephanie Bose, Bob McNeel, and Brian Gillespie.

Acknowledgments

- **The Carapacks Pavillon - (p. 10-11)**

Concept, Planning, and Manufacturing: Prof. i. Vertr. Simon Vorhammer, Prof. i. Vertr. Dr. Ing. Jonas Schikore, Prof. Dr. Christina Jeschke, David Ott / **Assembly Team:**

Alexandra Palesch, Jürgen Pröll, Fabienne Neuf, Katy Guth, Kira Kortländer, Yusuf Cosgun, Lara Wingenfeld, Florian Gärtner, Berkay Mutlu / **Sponsors:** Maurer Holzwerkstoffhandel, Georg Ackermann GmbH, Faust Linoleum

- **Predictive Precision in 3D Printing Though AI- (p. 20)**

Student: Neelam Chellani / Project Guide: Professor Sean Hanna / Technical Guide: Marcin Kosicki

- **The White Snake Bridge Model - (p. 16)**

Students: Benjamin Steffel and Monty Lipphardt / Supervisors: Prof. Julian Lienhard and Prof. Philipp Eversmann / Milling Process Collaborator: Björn Raschper

- **'Accelerating Sustainability in Fashion, Clothing, and Textiles' - (p. 13)**

Editors: Martin Charter, Bernice Pan, and Sandy Black / Contributors: Martin Charter, Bernice Pan, Lilian Sanchez-Moreno, Josephine Riemens, Mathilde Asseman, Andree-Anne Lemieux, Claire Lerpiniere, Angela Davies, Fergus Lyon, Patrick Elf, Robyn Owen, Andrea Werner, Christine Goulay, Mila Burcikova, Dilys Williams, Agnes Rocamora, Ian Vickers, Claudia Eckert, Philippa Crommentuijn-Marsh, Rebecca Earley, Oliver Bealby-Wright, Helena Leurent, Carra Santos, Kadian Gosler, Ann Marie Newton, Elizabeth Bye, Paige Tomfohrde, Lisa Nel, Sage Davis, Miguel Angel Gardetti, Rawan Maki, Shalini Gupta, Sara Cavagnero, Lis Suarez-Visbal, Claudia Stuckrath, Jesus Rosales Carreon, Jacqueline Cramer, Jan Mahy Jens Oelerich, Veronika Kapsali Carolina Roberte De Oliveira, Yoon Jung Choi, Jen Ballie, Alka Puri, Christine Baeza, Samantha Corcoran, Elizabeth S. Quinn, Ulla Rabild, Sabine Lettmann, Karen Marie Hasling, Natasha Bonnelame, Nina Stevenson, Ichin Cheng, Martin Charter, Trevor Davis, Lucy E. Dunne, Elizabeth Bigger, Gozde Goncu-Berk, Emily Rosa Shahaj, Elizabeth E. Bigger, Helga Ahrens-Wels, and Hannah C. Kelbel.

Images

Gijs de Zwart (p. 2-3); NASA (p. 5); [shapediver.com](#) (p. 6); [compassis.com](#) (p. 7), [rhino3d.com](#) (p. 8); Simon Vorhammer, Jonas Bühler, Nico Schlegel, Lara Wenigerkind (p. 10-11); Karl Singline (p. 10-11); [designmorphine.com](#) (p. 12); Elizabeth E. Bigger (p. 13); Monty Lipphardt (p. 16); Bitá Fakhr, JB (jasongberger), ThomasAn, anon39580149, Eliania Morais Rosetti (p. 18); [learngrasshopper.com](#), [akiyomatsuoka.com](#), [ndar.com](#), [fabfoundation.pl](#) (p. 19); Neelam Chellani (20); [simplyrhino.co.uk](#), [academy.rhinocenter.net](#) (p. 24); NASA (p. 24-25).

On the Cover

The Carapacks Pavilion, a result of collaborative efforts lead by Simon Vorhammer, Dr. Jonas Schikore, Dr. Christina Jeschke, and David Ott at the Architecture Faculty of Biberach University (p.10-11)

Contact Us

carola@mcneel.com
jackie@mcneel.com

Corrections -



ShapeDiver

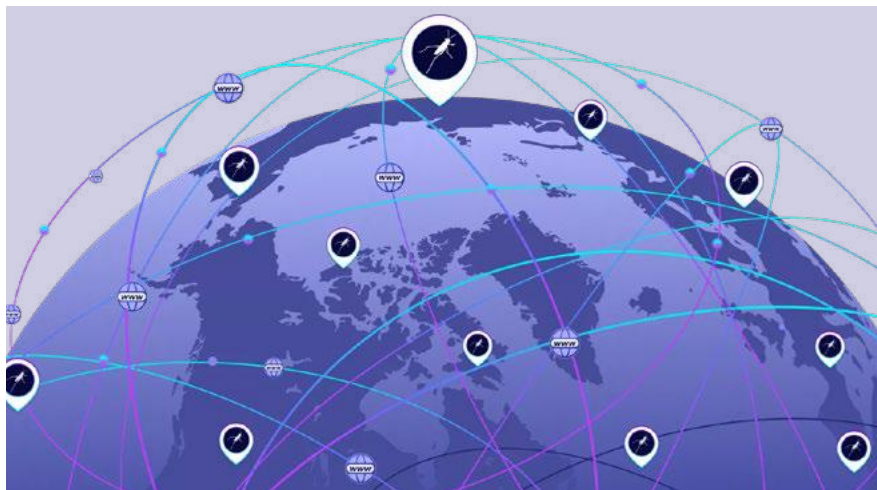
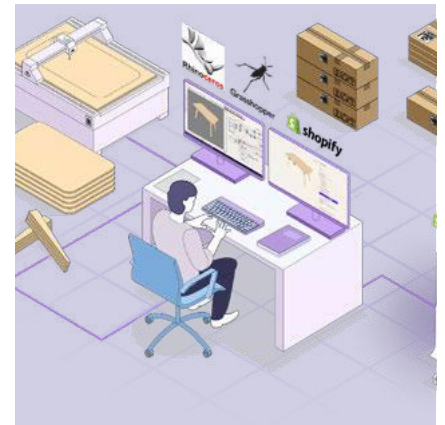
by ShapeDiver

Category: Import/Export, Jewelry Design, Manufacturing, Rendering and Display

ShapeDiver offers a groundbreaking solution for architects, designers, and engineers: transforming Grasshopper files into dynamic online applications. This innovative platform allows users to securely share their design tools without exposing the original code, all from a web browser.

With over 40 supported Grasshopper plugins and scripted components, ShapeDiver enables the creation of tailored applications to meet diverse business needs. Whether it's for eCommerce integration, manufacturing automation, or design strategies, ShapeDiver provides affordable tools and scalable infrastructure.

The platform's capabilities extend beyond mere visualization, offering real-time collaboration and interoperability across various software platforms. From Rhinoceros 3D to Adobe Illustrator, users can seamlessly connect their favorite design software with ShapeDiver, fostering a more integrated design experience.



Since 2016, ShapeDiver has been at the forefront of Grasshopper in the cloud, powering some of the world's most innovative companies. **Start with a free account** today and revolutionize your parametric design workflow with ShapeDiver. Boost your eCommerce strategy, automate online sales, and unlock the full potential of your parametric files.



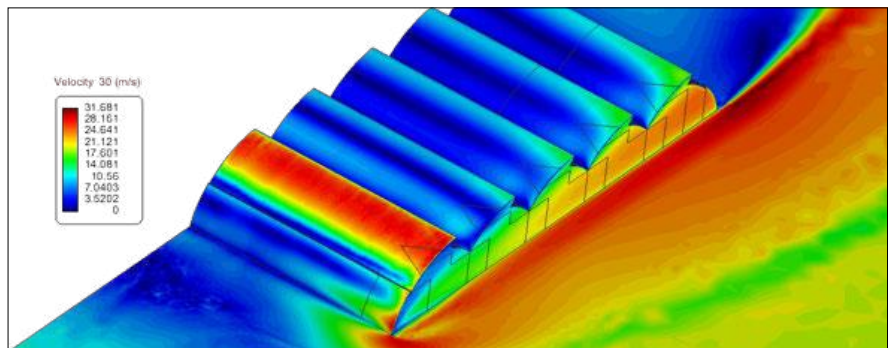
Rhino Tdyn Wind Tunnel

by Compass

Category: Analysis and Simulation, Architecture, Mechanical Design, Structural Engineering

In the realm of aerodynamic analysis, precision, and efficiency are paramount. Enter Tdyn Wind Tunnel, an innovative application designed to revolutionize the process. Powered by the robust Tdyn CFD engine, this tool simplifies aerodynamic analysis, offering swift and reliable results with minimal effort.

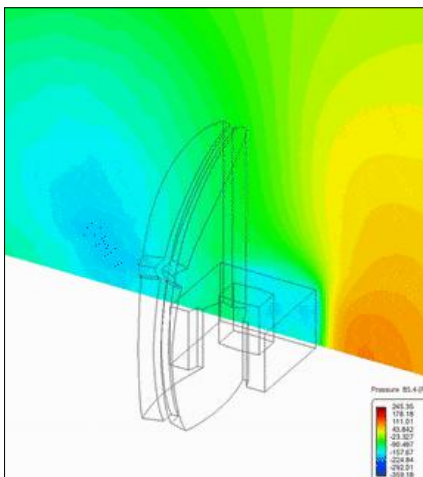
The Tdyn Wind Tunnel plugin, developed in collaboration with Rhinoceros, merges the 3D design capabilities of Rhinoceros with the computational prowess of Tdyn Wind Tunnel. Its intuitive interface and automated algorithms significantly reduce the time and complexity traditionally associated with aerodynamic simulations.



With just three simple steps, users can launch simulations in under a minute: import geometry, define wind speed and symmetries, and initiate the calculation. From structural engineers assessing wind loads to architects optimizing urban designs for comfort, and from vehicle designers refining aerodynamic coefficients to fluid mechanics educators enhancing didactic content, the applications are vast.

Technical features such as automatic domain generation, mesh size definition, and turbulence models further enhance usability. Additionally, CFD experts benefit from accelerated preprocessing and post-processing, minimizing errors and maximizing productivity.

The Tdyn Wind Tunnel Plugin heralds a new era in aerodynamic analysis, empowering users of all backgrounds to unlock insights with unprecedented ease and efficiency.



Developers Corner

Hear it from us.

Debugging Scripts

The script editor **debugs scripts** in any supported language, allowing us to execute line by line or pause at breakpoints to inspect variable values.

Let's add these lines to our script:

```
total = 0
for i in range(5):
    total += i
```



Move your mouse to the left of line 12's number and click to add a red dot, marking it as a **Breakpoint**. Repeat for line 14.

The **Breakpoints** tray at the bottom displays active breakpoints and offers buttons to Clear or Toggle them individually or all at once:



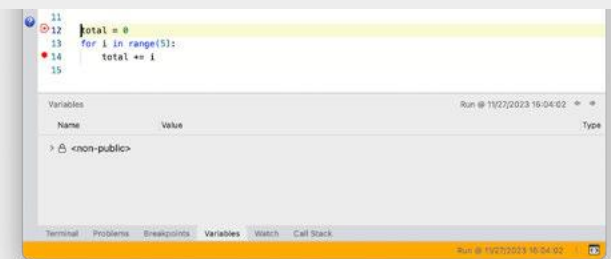
When breakpoints are added, the editor undergoes UI changes and provides additional debugging utilities:

- The **Run** button will change to **Debug**.
- **Variables**, **Watch**, and **Call Stack** trays will be added to the bottom tray bar.

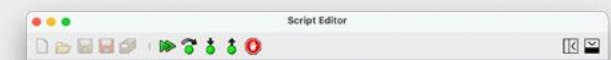
Click the green **Debug** button on the Dashboard. The editor will:

- Stop at the first breakpoint on line 12.

- Highlight the breakpoint line in orange with an arrow on the left.
- Highlight the Status Bar in orange to show we are debugging a script.
- Activate the debug control buttons on the Dashboard.
- Open the **Variables** tray at the bottom to show global and local variables.



We can control the execution of script using the debug control buttons on the Dashboard:



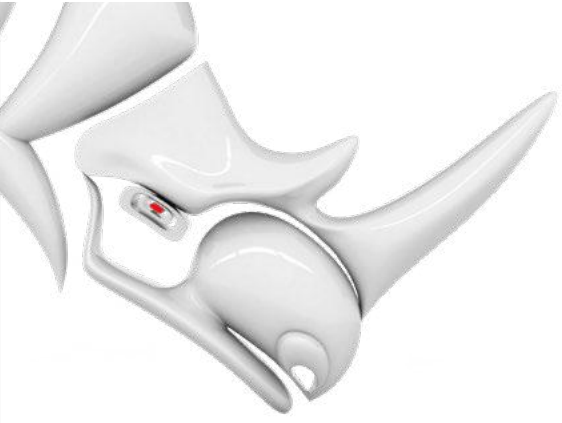
From left to right, they are:

- **Continue**: Runs the script until it encounters another breakpoint.
- **Step Over**: Executes the current line and moves to the next.
- **Step In**: Steps into function code if the current line contains a function call.
- **Step Out**: Continues executing function code until control returns to the calling code.
- **Stop**: Ends script debugging without further execution.

Progressively clicking on **Step Over**, will continue executing the script and modifying the variables.

At any point in time, you can use the **Toggle** button in the **Breakpoints** panel to activate or deactivate the breakpoints.

Sincerely,
The McNeel Development Team.



Tips & Tricks

Elevate Your Rhino Game: Think you know it all? Click now and unravel a collection of game-changing tips & tricks!

Duplicate Edge
Rhino 7+

Duplicate Border
Rhino 7+

Duplicate Face Border
Rhino 7+

Extract Isocurves
Rhino 7+

Extract Wireframe
Rhino 7+

Sections
Rhino 7+

The image shows a screenshot of the Rhino 7+ software interface. A central blue cube is surrounded by several callout boxes, each containing a tool icon and a text label. Lines connect these callouts to their respective tool icons in the software's toolbars. The callouts are: 'Duplicate Edge Rhino 7+' (pointing to the 'Duplicate edge' tool), 'Duplicate Border Rhino 7+' (pointing to the 'Duplicate border' tool), 'Duplicate Face Border Rhino 7+' (pointing to the 'Duplicate face border' tool), 'Extract Isocurves Rhino 7+' (pointing to the 'Extract isocurve' tool), 'Extract Wireframe Rhino 7+' (pointing to the 'Extract wireframe' tool), and 'Sections Rhino 7+' (pointing to the 'Section' tool). The software interface includes a top menu bar, a toolbar, and a multi-view workspace with 'Top', 'Perspective', 'Front', and 'Right' views. A status bar at the bottom shows various settings like 'CPlane', 'Grid', and 'Ortho'.

The Carapacks Pavilion, a Hexagonal Innovation

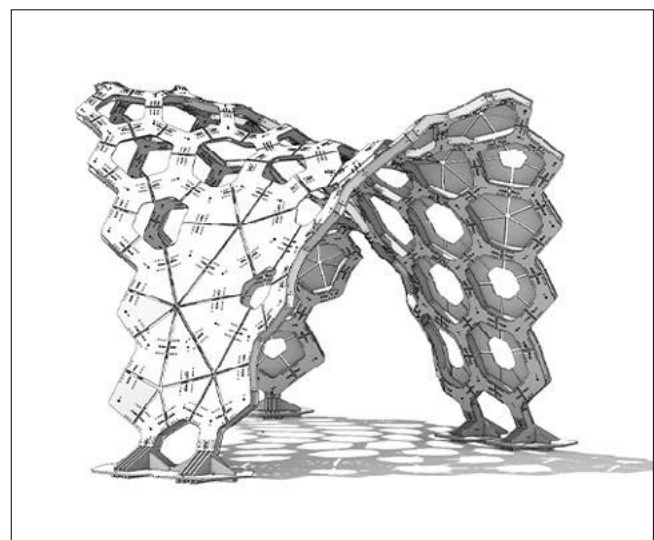
The Carapacks Pavilion, a hexagonal innovation, exemplifies architectural advancement. It resulted from collaborative efforts led by Simon Vorhammer, Dr. Jonas Schikore, Dr. Christina Jeschke, and David Ott. This project, meticulously crafted over multiple semesters at the Architecture Faculty of Biberach University, exemplifies the fusion of creativity, technology, and practicality.



The ideation and design phase of Carapacks Pavilion focused on implementing arbitrarily curved freeform surfaces as double-shell interlocking systems. The hexagonal system, devoid of curvature and torsion, enables efficient and cost-effective manufacturing through 2.5-axis CNC laser or water jet cutting technology. The team employed digital parametric modeling to define various input parameters, allowing for the rapid generation of manufacturing-ready kits for diverse geometries.

A key feature of Carapacks Pavilion is its straightforward assembly process, requiring no heavy machinery. Each component is meticulously labeled and positioned for easy assembly, similar to solving a puzzle. This approach simplifies construction and facilitates space-saving stacking, with all parts fitting into the trunks of two station wagons.

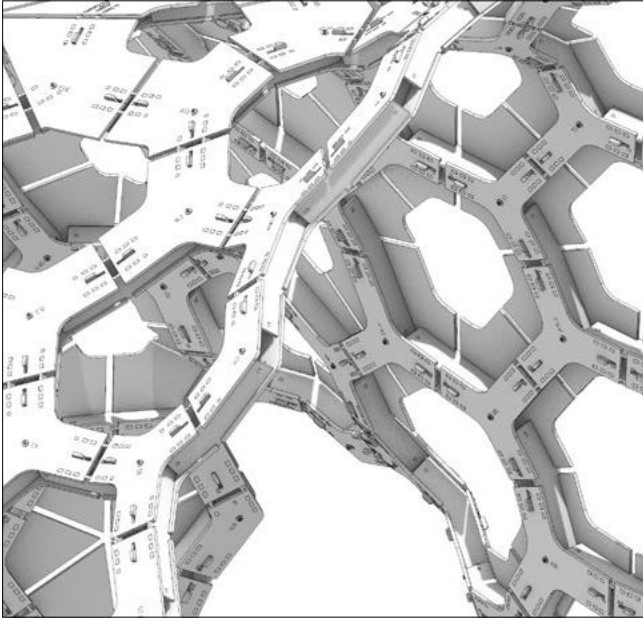
The project faced challenges, such as determining the assembly sequence and



addressing issues related to CNC laser cutting, such as soot formation on cut edges. To overcome these obstacles, the team used a hybrid assembly method and post-processing techniques like sanding and priming to improve durability and aesthetic appeal.

The successful completion of Carapacks Pavilion relied on utilizing software tools like

Rhino and **Grasshopper**, alongside plugins such as **Elefront**, **Human**, **Pufferfish**, and **Karamba3D**. These digital platforms enabled comprehensive planning, structural analysis, and fabrication of data derivation within a unified digital environment. Additionally, **OpenNest** optimized part distribution for CNC cutting, streamlining the manufacturing process.



The structural behavior of Carapacks Pavilion showcases its innovative design approach. The lattice structure, primarily carrying loads within its plane through compressive forces, encourages shell behavior regardless of the loading situation. Parametrically organized dimensioning of rod widths, informed by static analysis, ensures optimal structural integrity while responding to external forces.



Carapacks Pavilion extends beyond its architectural significance to demonstrate the versatility of its design, applicable not only to wooden pavilions but also to roofs and facades. Material durability and weather resistance are paramount considerations, with options ranging from outdoor-grade wood to weather-resistant sheet-like materials.



The project acknowledges the support of its sponsors — Ackermann GmbH, Maurer Holzwerkstoffhandel, and Faust Linoleum — whose contributions were integral to its success. Carapacks Pavilion showcases the transformative potential of architectural exploration and collaboration through innovative design and seamless integration of digital tools.

Learning



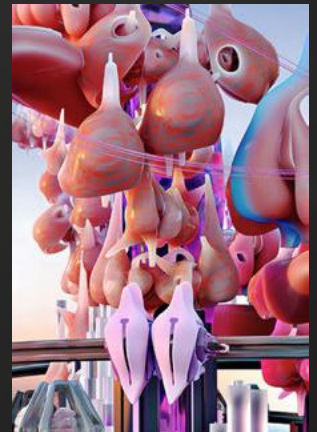
DesignMorphine is a global educational institution propelling design progress worldwide. It fosters collaboration across diverse disciplines and embraces cutting-edge technologies like advanced and computational design. The team's mission is to democratize these practices, empowering designers worldwide.

With a decade of experience, they've mentored specialists from 84 countries, guiding them to success in top companies. Led by fearless innovators, the team delivers dynamic education through workshops, webinars, and now university-level programs.

DesignMorphine Masters Y24/25 - Degree

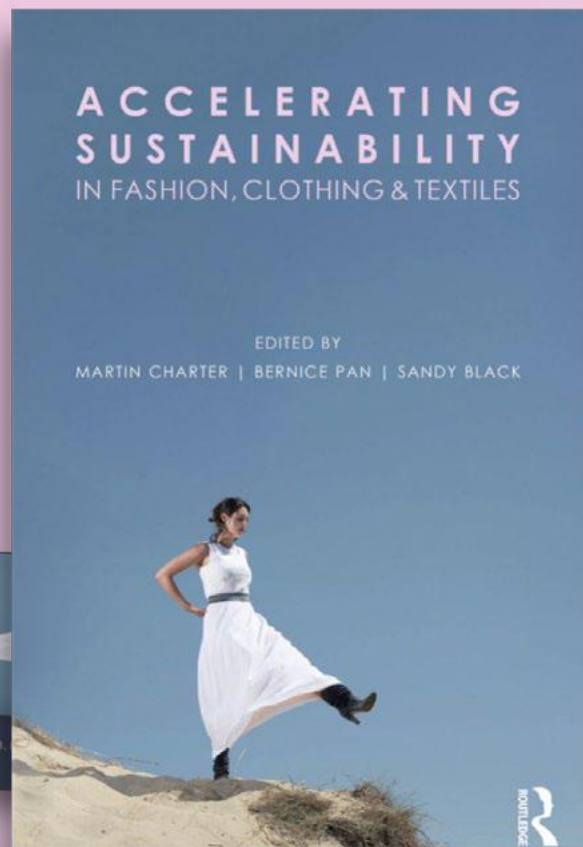
DesignMorphine proudly offers a 9-month online Master of Science program, accredited by the University of Architecture, Civil Engineering, and Geodesy (UACEG) in Sofia, Bulgaria. The program is designed to meet the demands of those aspiring to excel in advanced and computational design globally.

In collaboration with industry leaders like The Microsoft Garage, Logitech, and Pininfarina, their program combines theoretical learning with hands-on experience. Through five Design Chapters and Technical Labs, students learn from world-renowned designers and architects, mastering software tools like Maya, Rhinoceros, and Houdini.



At the end of each monthly cycle, students present their work to a panel of experts, receiving mentorship and feedback. Graduates emerge with versatile skills, ready to succeed in diverse design careers, from leading companies to academia or entrepreneurship.





Accelerating Sustainability in Fashion, Clothing and Textiles edited by Martin Charter, Bernice Pan, and Sandy Black

This comprehensive volume tackles the pressing issue of sustainability within the fashion industry, deemed a 'wicked problem' due to its multifaceted challenges. Edited by Martin Charter, Bernice Pan, and Sandy Black, it offers strategic solutions to expedite sustainability efforts.

Drawing from global research and industry expertise, the book presents a holistic view of sustainability, encompassing policy, business practices, innovation, consumer activism, and education. Through practical chapters and case studies, it navigates topics ranging from supply chain transparency to circular economy initiatives.

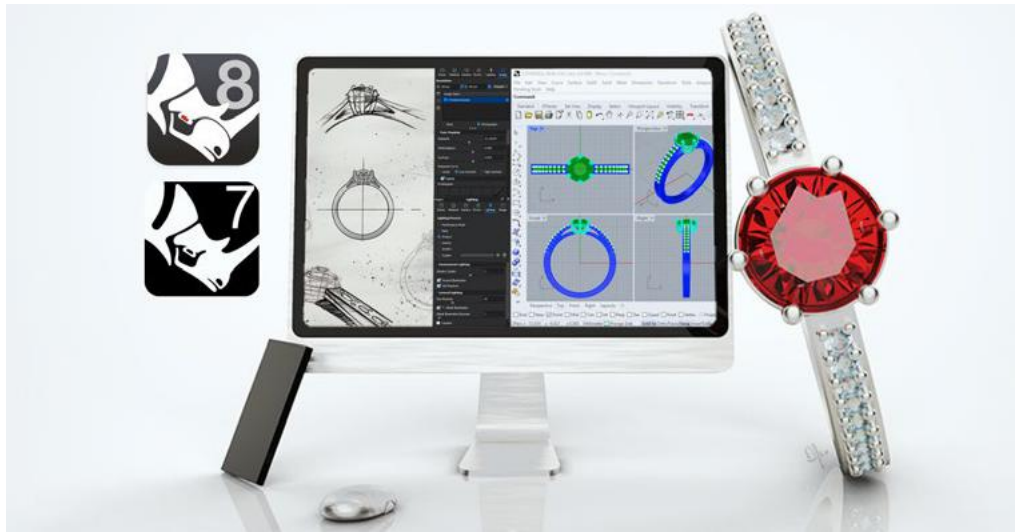
Of particular note is Chapter 31, "Fashion Ex Machina," authored by Elizabeth Bigger et

al., which delves into the realm of sustainable bespoke production and human-machine collaboration. Using innovative technologies like Grasshopper and Galapagos, the chapter explores how design optimization can address the environmental impacts of garment production.

"Accelerating Sustainability in Fashion, Clothing, and Textiles" serves as a vital resource for industry professionals, policymakers, educators, and researchers seeking actionable insights to propel the fashion sector towards a more sustainable future.



Modeling 3D Jewelry with Rhino 7 & 8



Fee: \$US ~~104.95~~ **Use Rhino3Dzine's Coupon Code for a 40% discount!**

Explore the captivating world of jewelry design!

Whether you're a seasoned artist or just starting out, this course invites you on a transformative journey – from design concepts to stunning digital reality.

Immerse yourself in the course using your preferred language!

Available in English and Spanish,
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Embark on a 6-hour adventure filled with engaging videos, insightful lectures, and interactive quizzes. No prior experience? No problem! We welcome everyone eager to explore the artistry of jewelry making and 3D modeling.

Discover the secrets of the design process, delve into manufacturing techniques, and master the art of modeling iconic rings adorned with gems. With Rhino 7 or 8 as your trusted companion, unlock a world of possibilities and elevate your skills to new heights.

After purchase, this course will be available for two years!

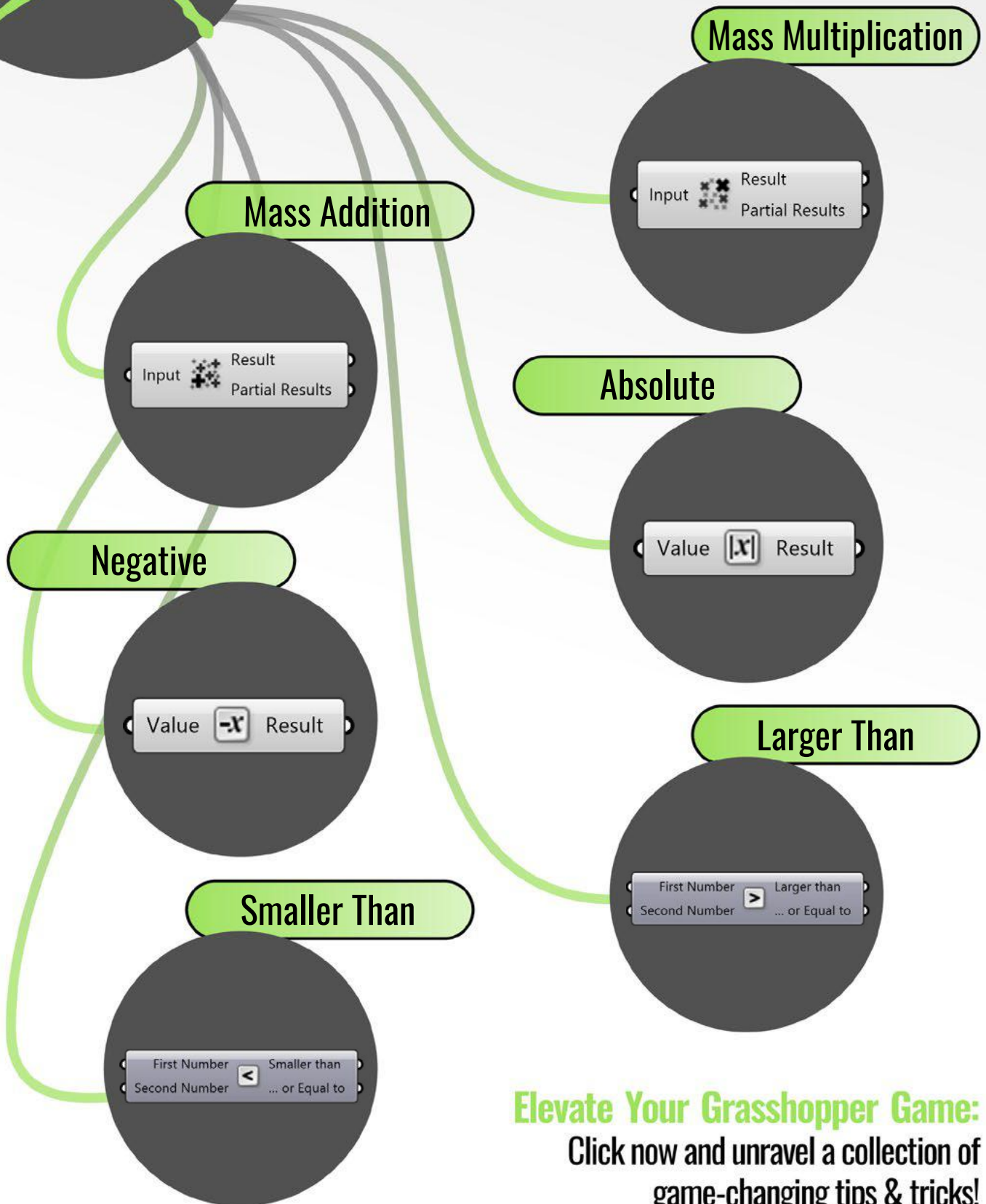
Ready to unleash your creativity?

Enroll now and let your imagination soar!

Rhino3Dzine has launched a new community.
Join us and share your updates!



Tips, Tricks & resources about Grasshopper

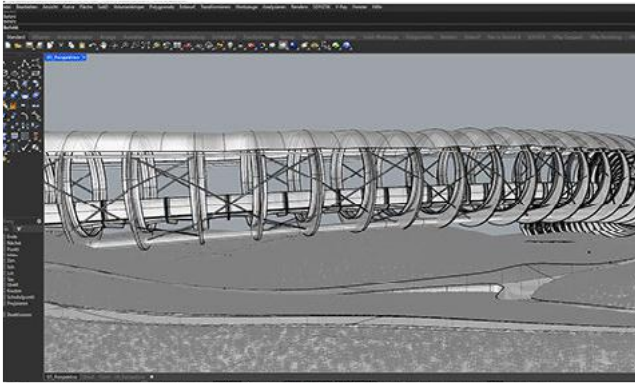


Elevate Your Grasshopper Game:
Click now and unravel a collection of
game-changing tips & tricks!

The White Snake Bridge Model

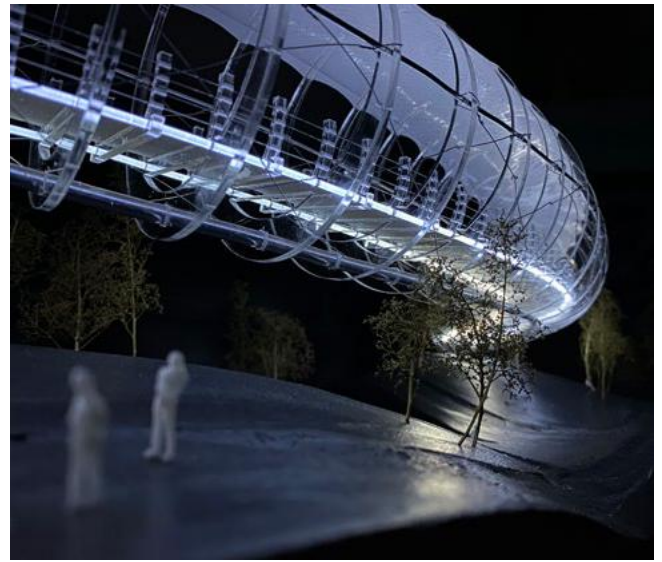
- Digital Fabricators Project

The White Snake Bridge Model, conceived by Monty Lipphardt and Benjamin Steffel as their Master thesis at the University of Kassel, showcases innovative design and engineering prowess. Designed for use near Moganshan Town in China, this structural marvel draws inspiration from the sinuous form of a snake, seamlessly blending into its surroundings while providing essential connectivity within the community.



The journey from ideation to realization was marked by meticulous planning and strategic design decisions. Leveraging parametric techniques facilitated by **Rhino** and **Grasshopper**, the team envisioned a load-bearing system spanning approximately 1 km. The design process involved crafting a framework that elegantly integrated with the local landscape – addressing social, natural, and commercial focal points along the riverbed.

One of the project's pivotal challenges lay in simplifying the intricate design for efficient production without compromising its integrity. Through innovative approaches, such as abstracting ribs and **employing Python scripting**, the team succeeded in streamlining the manufacturing process while maintaining structural integrity.



Additionally, using tools like **Archicad** and **Kivi!3D** facilitated seamless integration between parametric modeling and traditional CAD software, ensuring consistency and compatibility throughout the design phase.

The production phase saw the utilization of advanced laser cutting technology to fabricate acrylic glass ribs meticulously assembled onto aluminum base beams. A meticulous approach to detail was evident in the hand-cutting and sewing of the membrane, culminating in a visually stunning and structurally sound final product.



Ultimately, the White Snake Bridge exemplifies the harmonious convergence of innovative design methodologies, seamlessly blending parametric modeling techniques with traditional craftsmanship. As a symbol of ingenuity and collaboration, it serves as a beacon of inspiration for future architectural endeavors.



**Rhino
Fab
Studio**

What is a RhinoFabStudio® ?

A RhinoFabStudio® (fabrication studio) is a McNeel-certified digital workshop, which includes a suite of Rhino and Rhino-compatible programs, computer-controlled tools, and training. The tools cover the various cutting-edge industrial methods and materials for designing, analyzing, and manufacturing just about anything.

Advantages

As an Authorized RhinoFabStudio® you will:

- Be recognized as a leading-edge industrial-grade digital design, analysis, and fabrication expertise provider.
- Have all of your events and activities published to a worldwide audience.
- Have access to specialty digital design, analysis, and fabrication experts.
- Have direct access to many digital design, analysis, and fabrication product development teams.

Once approved:

- You can log in and post your RhinoFabStudio events on the event schedule.
- Your details and event schedule will be posted on the Rhino News Blog.
- Your event schedule will be announced in the RhinoFabStudio News e-mails monthly.

**Want to become an authorized
RhinoFabStudio®?**

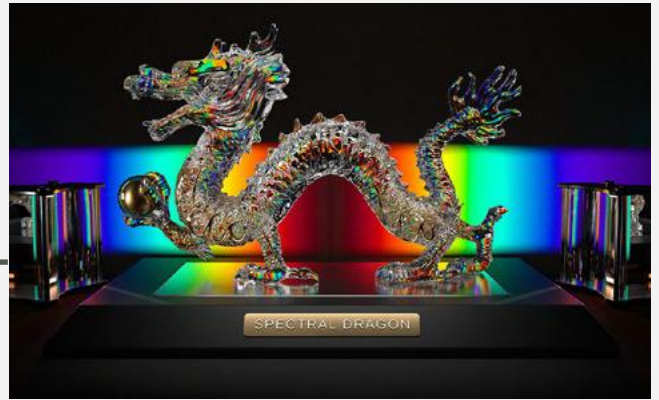


FormaFauna

- Compilation

A dragon render (while exploring Rhino's mesh options)

Posted by ThomasAn



Lynx Spyder

Posted by anon39580149



Copilot helping me with coding

Posted by JB (jasongberger)



Peacock Pendant

Posted by
Bita Fakhr

Jewelry design

Posted by Eliania
Morais Rosetti



Gallery

Explore a showcase of inspiring projects from the Rhinoceros Forum's Gallery as captivating images bring to life the creativity, innovation, and artistry behind each posted masterpiece.

Click, like, and support the creators behind these fantastic posts!

Upcoming Events

Hone Your Skills With Rhino



GRASSHOPPER FOR TEKLA ONLINE

HOSTED BY LEARNGRASSHOPPER - MAY 8, 2024

Planning on using Grasshopper in conjunction with Tekla? There are a number of amazing ways to get the full potential out of this software collaboration, and you can learn several of them for free in this helpful online course from LearnGrasshopper.

WHERE: Online **TIME:** 2 - 4 PM CEST
COST: Free **LANGUAGE:** English

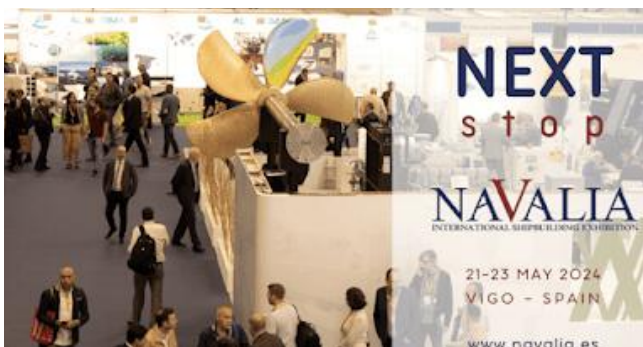


INTERNATIONAL RHINO USER MEETING

HOSTED BY FAB FOUNDATION - JUNE 7, 2024

Get together with the greater European Rhino community for a day of talks, networking, and exhibitions in beautiful Wrocław. Expert designers, as well as McNeel staff, will be in attendance sharing their knowledge and the latest design tools.

WHERE: Wrocław **TIME:** 10 AM - 9:30 PM GMT
COST: zł380.12 **LANGUAGE:** English

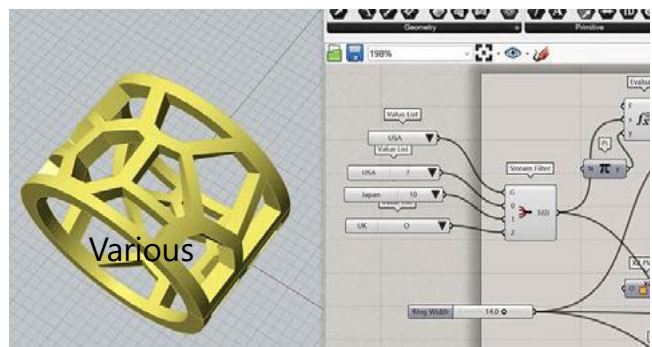


NDAR @ SHIPBUILDING TRADE SHOW

HOSTED BY NAVALIA - MAY 21-23, 2024

The NDAR team will be situated in Booth D16 at the Navalia Shipbuilding Trade Show this year, sharing their Rhino-centric design solutions with the greater shipbuilding community. Mark your calendar if you'd like to stop by and chat!

WHERE: Vigo, Spain **TIME:** Various
COST: Free **LANGUAGE:** English, Spanish



INTRO TO GRASSHOPPER

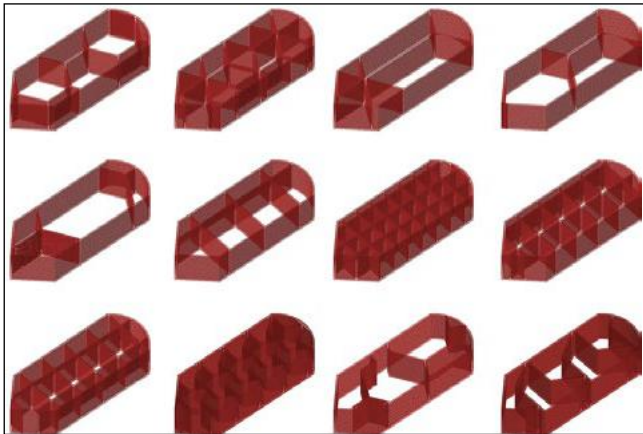
HOSTED BY AIKIYO MATSUOKA - MAY 14 - JUNE 11, 2024

Looking to gain a functional understanding of Grasshopper concepts and parametric design? This is the class for you. Learn how to tackle complicated designs with ease and speed all from the comfort of your home.

WHERE: Manhattan, US / Online **TIME:** Various
COST: USD 565 **LANGUAGE:** English

Predictive Precision in 3D Printing Through AI

Neelam Chellani's master's dissertation at **UCL** delves into the realm of 3D printing, focusing on the pivotal aspect of shrinkage prediction, which is vital for achieving optimal dimensional accuracy and efficiency in manufacturing. Under Professor Sean Hanna's guidance and with Marcin Kosicki's technical expertise, Chellani embarked on this academic journey.



Geometry exploration and dataset generation

The core objective of her research was to refine the prediction of deformation in clay 3D printing by leveraging convolutionally-equipped cGANs. By adapting methodologies from previous studies, Chellani aimed to explore machine learning's capability to anticipate deformation in 3D-printed clay objects, particularly when represented as binary-occupied voxels.

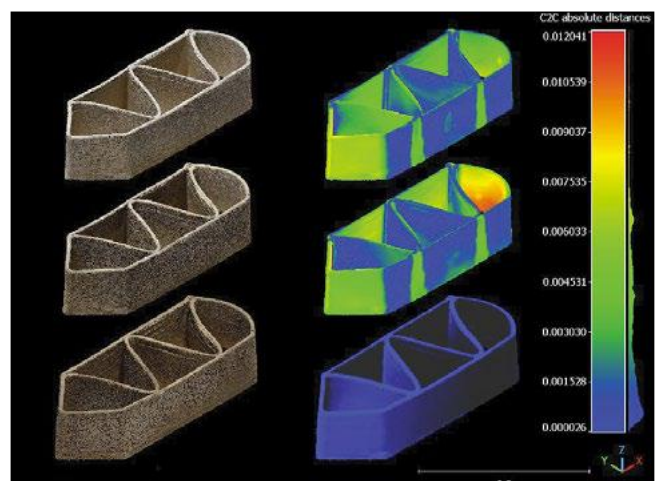
Chellani's work holds immense potential to revolutionize 3D printing processes, fostering innovation in design possibilities across various industries. Her approach extends beyond clay materials, encompassing a spectrum of substances like polymers, metals, ceramics, and biomaterials, opening up a world of possibilities for the future of 3D printing.



Noteworthy are the tools and plugins instrumental in streamlining Chellani's processes. Grasshopper, coupled with the Kangaroo plugin, facilitated experimentation with object shapes and simulation of output datasets. Moreover, Grasshopper proved invaluable in generating geometry datasets, a crucial component for machine learning models.

Throughout her project, Chellani encountered and successfully surmounted challenges, employing a meticulously structured methodology spanning six key phases. From geometry exploration to machine learning model implementation, each phase contributed to the project's success.

Chellani's research marks a significant stride in the convergence of architectural design and cutting-edge technology. She contributes to a new era of precision manufacturing and design innovation by advancing shrinkage prediction.



Scanning and comparison



SAVANNA3D for Rhino 7


SAVANNA3D



A library containing over 1,600 detailed 3D architectural models in the 3DM file format, plus a few parametric Grasshopper definitions to create parametric models.

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All these blocks are 100% NURBs, SubDs, or GH Parametric definitions made in Rhino 7. PLUS, discover the new blocks created for you; all are SubD models included in Chapter 7, which provides for cocktail glassware and lounge chairs.



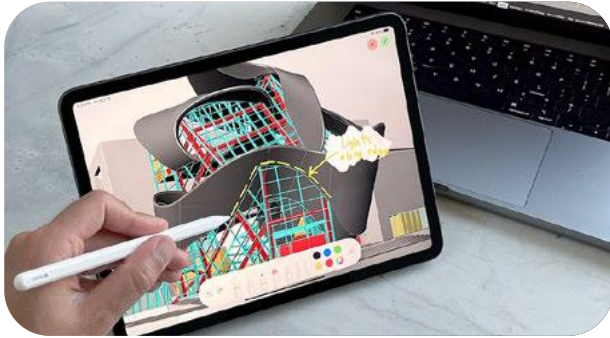
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iRhino3D

The official Rhino 3dm viewer for iOS.
View and present your work on your iPhone or iPad.



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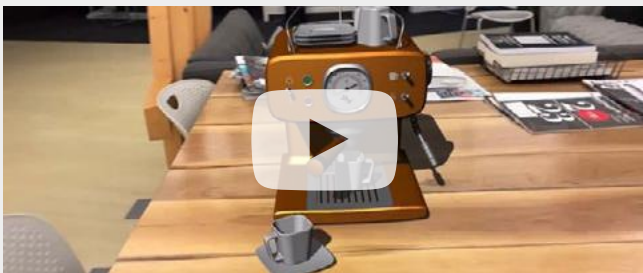
- Rewritten from the ground up, the new iRhino 3D performs and feels exactly like Rhino.
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- Conveniently load models from your device or any cloud storage using a built-in file browser.
- Use the AR mode to see your model in space.
- Integrated markup tool lets you draw on top of a view.

Supports Many File Formats

- Open/Import many formats including: Rhino 8, dwg, dxf, glb, gts, iges, lwo, usd, usdz, off, ply, points, raw, slc, stl, vrml, wamit and x.
- Save to Rhino 8 and Rhino 7 3dm file format.

Augmented Reality

View your models in the real world. AR-enabled display modes allow you to see your model quickly in the camera feed. Choose from available anchor modes to fine-tune the placement of your model.



Features



Augmented Reality Mode

Markups

Navigate your model and draw on any view without leaving the app.



Scan A Room

Quickly generate a Rhino model from an interior space. Using **RoomPlan** technology on LiDAR enabled devices, you can scan interior elements such as walls, windows, doors, cabinetry and furniture and get the resulting model in a 3DM format.



Scan An Object

Scan a fully textured mesh of an object using this feature, powered by Apple's **Object Capture** technology.



And Many More ...

Career Corner:

Job Opportunities with Rhino or Grasshopper



Have a job offer or event?
Let us know, and we'll share
it in an upcoming issue.

PROJECT ARCHITECT

LIRO-HILL

WHO: An architecture, engineering, and construction firm that is ranked among the nation's top Construction Managers by Engineering News-Record.

WHAT: Seeking an architect to participate in the design, documentation, and construction administration for a variety of projects for municipal clients.



INDUSTRIAL DESIGNER - LUGGAGE

RICARDO BEVERLY HILLS

WHO: A travel lifestyle company with a rich history, specializing in the design, innovation, and marketing of luggage and travel accessories

WHAT: Seeking an experienced product designer with a passion for travel. Must have experience with Rhino and a keen eye for style. Some travel necessary.



SENIOR FULL STACK DEVELOPER

VOYANSI

WHO: A global leader company with 20+ years of experience that excels in the digital transformation of assets by applying BIM technology to the Design, Architecture, and Construction industries

WHAT: Seeking a Grasshopper developer with full-stack skills who can take an active role in building and shaping Software team procedures, methods, tools, and resources.



ASSISTANT DESIGNER

WILLIAMS-SONOMA, INC.

WHO: The premier specialty retailer of high-quality products for the kitchen and home in the United States.

WHAT: Looking for a professional to design and develop products consistent with seasonal trends and concepts, and customer/business needs. Under the leadership of senior team members, you will support the development process for each product from sketch to approval. This role based in NYC and focused on the West Elm Kids brand.



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Education

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with Rhino 7 & 8

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