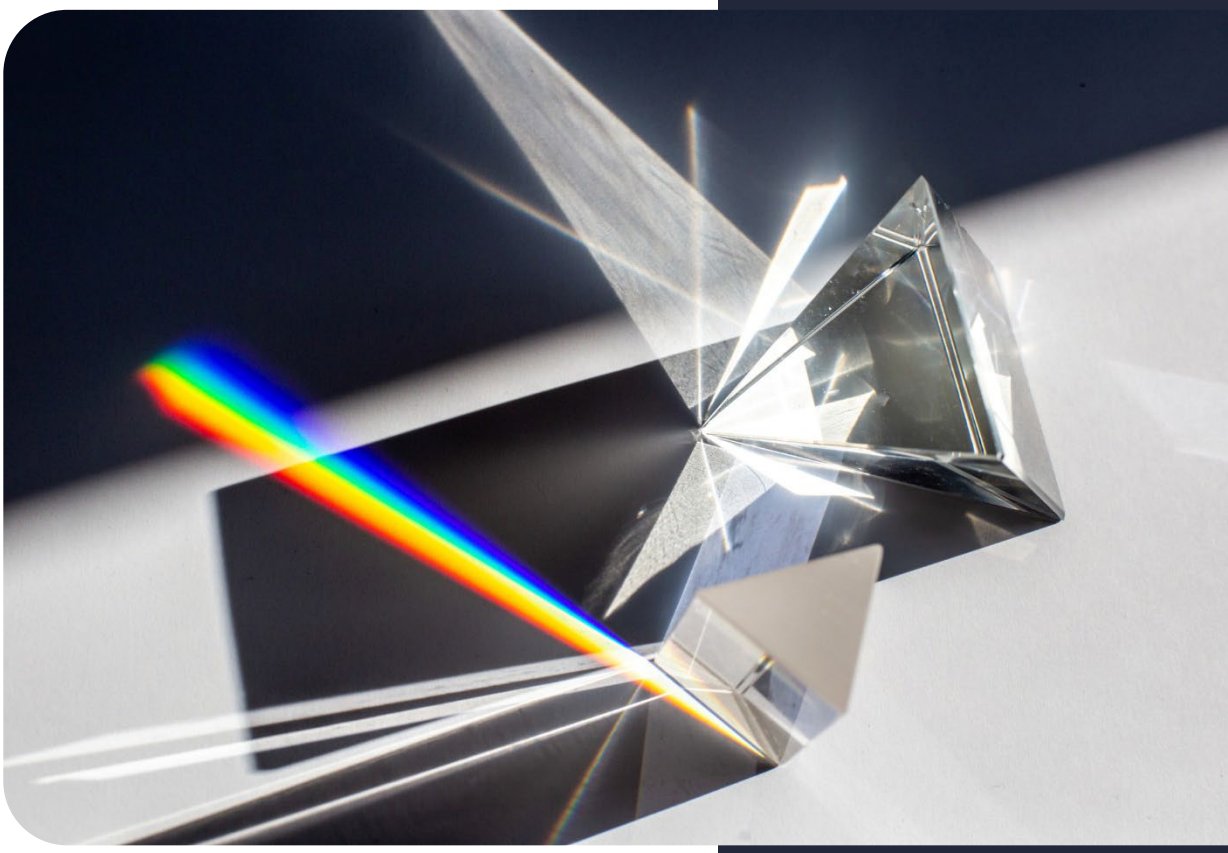
ECLAT DIGITAL

VIRTUAL PROTOTYPING

FOR PRODUCT DEVELOPMENT AND MATERIALS RESEARCH



Accurate appearance simulation through lighting and optical engineering.

ECLAT DIGITAL

lraimbault@eclat-digital.
www.eclat-digtal.com

ABOUT ECLAT DIGITAL & OCEAN™

THE COMPANY

MATERIALS INNOVATION THROUGH SCIENCE

Eclat Digital is a software editor and service provider in the field of optical engineering. Specializing in digital materials visualization and virtual prototyping, Eclat Digital provides engineers and designers in the building industry with unprecedented capabilities. We drive decision making by providing realistic visualisations in different environments and lighting conditions. Our expertise extends to the accurate characterization of complex materials using techniques such as BRDF and gonio-spectrophotometry.

VIRTUAL PROTOTYPING WITH OCEAN™

Ocean™ is our proprietary software. It's state-of-the-art ray-tracing capabilities enable life-like simulations that validate colorimetric accuracy and complex scenarios, including color shifting, metamerism, sparkling effect, transparency and in-situ conditions revealing the adaptability and aesthetic versatility of coatings.

Unlike most computer graphics programs, Ocean™ has a full-spectrum lighting algorithm. Light transmission is calculated for every wavelength of the visible spectrum, preserving all colour information across multiple bounces on materials. Ocean™ makes no approximations to the laws of geometric optics.

KEY FEATURES AND FIELD OF EXPERTISE

OCEAN™ FEATURES:

1. Full-spectrum calculations for accurate color reproduction.
2. Exact geometric optics solutions for complex lighting scenarios.
3. Light polarization tracking for materials like glass, water, or metals.
4. Photometry & radiometry capabilities with virtual instruments.
5. Fully detailed CAD models, supporting high-precision lighting calculations with efficiency.

ECLAT DIGITAL FIELDS OF EXPERTISES:

1. Predictive Appearance: Evaluate design option, identify and eliminate conflicts, validate material choices, create realistic visuals, observe projects in real environments…

2. Light Quantification: Photometry, radiometry, spectral Imaging, colorimetry, illumination mapping…

3. Material Characterization: Transparency, translucence, textured materials, metallic materials, composites (multilayer), multi-angle measurements (coatings), total appearance (BSDF)…

4. Sensitivity Study & Optical Diagnosis: Design of experiments (DOE), optical diagnostics, physical phenomena understanding

BENEFITS FOR USERS:

1. Reduced Time to Market: Accelerates product development, shortens design cycles, enables confident decisions at early stages.

2. Improved Product Quality: Identifies and addresses defects early, ensures superior final product quality, enhances reputation for excellence

3. Cost Optimization: Reduces prototyping and testing costs, minimizes material and resource expenses, optimizes budgets for improved profitability

4. Enhanced Collaboration: Facilitates collaboration among stakeholders, enables seamless sharing of virtual prototypes, promotes effective communication and understanding

5. Allows Simultaneous Work on Performances and Design: provides comprehensive understanding of optical behavior, allows exploration of diverse design options, enhances creativity and innovation

Q&A:

1. What is virtual prototype software and how can it benefit my development process?

Eclat Digital's Ocean™ virtual prototype software focuses on optical simulation. Its scientific approach accounts for the laws of physics, that includes material properties, geometric configurations and lighting conditions. It creates a physically true digital model that simulates the appearance of a final product and quantifies its optical performance.

This allows you to identify and address potential issues early on, optimize design choices, and iterate quickly within a virtual environment. As a result, you can save a significant amount of time and money during the development process.

Read more about what virtual prototyping is with Ocean™

2. How does Ocean™ virtual prototype software enhance product design and development?

Ocean™ offers virtual prototyping solutions bringing several advantages for product design and development:

- Early problem identification: Virtually test your design to discover potential flaws or limitations before physical prototyping.
- Enhanced design iteration: Quickly explore different design options and make informed decisions based on virtual simulations.
- Optimized material selection: Simulate how different materials interact with light and function within your design.
- Improved communication: Share and discuss virtual prototypes with stakeholders for better collaboration and feedback.

3. What industries can benefit from using Ocean™ virtual prototype software?

Virtual prototyping is a key part of innovation and competitiveness in many industries. It allows for the creation of detailed digital products that can be rigorously tested in virtual environments, reducing the need for physical samples. The scientifically rigorous approach employed by Eclat Digital with Ocean™ provides solutions to a wide range of industries such as:

- Architecture
- Consumer electronics
- Jewelry
- Materials: Plastics, Glass, Coatings...
- Product design
- Transportation
- Watches
- and a lot more!

Read about the various industry applications.

Discover different use cases in the areas of product design, materials, architecture and automotive: Industry Innovations: How Ocean™ optical simulation software is leading the way

4. How does Ocean™ virtual prototype software reduce time-to-market?

By identifying and resolving issues early through virtual prototyping, Eclat Digital's software helps reduce the need for multiple physical prototypes and revisions. This streamlines the development process, leading to faster product launches and time-to-market advantages.

5. What are the benefits of using Ocean™ virtual prototype software?

Ocean™ is an advanced tool based on optical measurements. It generates physically true virtual prototypes – not just aesthetic renderings – that are a trusted asset in the product development phase. It allows for enhanced simulation accuracy, cost reduction, time efficiency and fast iteration process.

Read more about the benefits of Ocean™

6. What are the key features of Ocean™ virtual prototype software?

- Full-Spectrum Calculations: Accurate color reproduction through all lighting interactions.
- Exact Geometric Optics: Simulate complex lighting scenarios without manual adjustments.
- Light Polarization: Accurate simulation of materials like glass, liquids, and metals.
- Photometry & Radiometry: Analyze light distribution, illuminance, and sensor response.
- Fully Detailed CAD Models: Work with complex CAD models for precise light interaction.

See more details about Ocean™ key features.

7. What kind of support and training does Eclat Digital offer?

- Training programs: Educational resources to help users learn the software and its functionalities.
- User manuals and documentation: Comprehensive guides for reference and get started with features.
- Technical support: Assistance from Eclat Digital's team to answer questions and address any issues.
- Expertise in optical engineering: Service provided by Eclat Digital's team of experts according to the customer's specific needs.

Contact us for more information.

APPLICATIONS:

USE CASES

ACCURATE DIGITAL VISUALIZATION OF COMPLEX COATINGS: solving architectural design challenges with Axalta's russet scarabea.

Context:

The client, Axalta, needed a way to visualize the complex optical characteristics of their architectural coating, Russet Scarabea. This coating is known for its dynamic color-shifting properties, making it difficult to accurately predict its appearance under different lighting and viewing angles. They required a solution to help architects and designers work effectively with this material.

Objectives:

The collaboration aimed to provide a precise, digital visualization of Russet Scarabea's optical properties, including color shifts and sparkling effects, to enhance material assessment and enable better design decisions in architectural projects.

Eclat Digital Solutions:

We provided an advanced visualization solution using Ocean™, our ray-tracing software, combined with data from BRDF, gonio-spectrophotometry, and sparkling measurements. This approach allowed for the accurate simulation of light interactions with Russet Scarabea, replicating its color shifts and sparkles in various geometries and real-world conditions.

Outcomes:

As a result, the client benefited from:

- Enhanced visualization accuracy, with digital simulations closely matching real-world samples.
- Improved decision-making, as architects could visualize the coating's performance under different lighting conditions.
- Greater design flexibility, allowing the use of complex coatings with confidence in their visual impact.
- Cost and time savings, reducing the need for physical prototypes and mock-ups.

Read the article online: https://eclat-digital.com/characterisation-techniques-for-architectural-coatings-visualisation/

REDUCING VISUAL DISTORTIONS: How Polarized and Angular Simulations Improve Coated Glass Appearance

Context:

The client's main issue is accurately predicting the visual appearance of coated glass facades, specifically focusing on reflections and color shifts. They need a solution that can simulate these optical characteristics in various environmental conditions to optimize material selection for their architectural projects.

Objectives:

The collaboration aims to provide precise simulations of the angular and polarized properties of coated glass, enabling architects and designers to predict how glass coatings will interact with light, and to identify potential issues with reflections or color deviations at different viewing angles.

Eclat Digital Solutions:

We provide advanced visualization using Ocean™ software, which incorporates both angular optical data and polarization characteristics into its simulations. This approach allows us to realistically simulate how light interacts with coated glass under different angles and lighting conditions, offering insights into potential color shifts and reflective behavior.

Outcomes:

As a result, the client benefits from enhanced predictive accuracy regarding the appearance of coated glass facades, allowing for informed material choices that meet aesthetic and functional requirements. This leads to better performance in reducing unwanted reflections, improved color consistency, and optimized material selection based on environmental conditions, ultimately enhancing the overall design and user experience of the building.

Read the article online: https://eclat-digital.com/practical-coated-glass-visualization-with-ocean/

OPTIMIZING DAYLIGHT FOR VISUAL COMFORT: Reducing Direct Sunlight and Enhancing Natural Lighting in Office Spaces

Context:

The client's main issue is poor visual comfort caused by direct sunlight in office spaces, leading to overly bright areas and high contrast between light and dark zones. This makes computer screens difficult to read and causes eye fatigue. They need a solution to improve indoor lighting conditions without resorting to artificial lighting.

Objectives:

The collaboration aims to simulate and design effective day-lighting systems that reduce direct sunlight and improve visual comfort while maintaining adequate natural lighting throughout the workspace.

Eclat Digital Solutions:

We provide realistic day-lighting simulations using the Ocean software, which works with detailed CAD models. Our solution models and tests different daylighting systems, such as reflective steel blades within windows, which redirect sunlight to ceilings, and explores alternative materials like dichroic and diffuse blades. These simulations offer precise illuminance mappings and visual renderings that help assess comfort and lighting efficiency.

Outcomes:

As a result, the client benefits from improved visual comfort by reducing sunlight on desks by up to 91% while maintaining natural lighting in other areas. This reduces eye strain and the need for artificial lighting, creating a more comfortable and energy-efficient environment.

Read the article online: https://eclat-digital.com/daylighting-simulation/

ACHIEVING REALISM IN MATERIAL SCIENCE: In Situ Visualization and Virtual Prototyping

Context:

The client's main issue is the high cost and time constraints of physical prototyping for new materials. They need a reliable, fast, and cost-effective method to visualize material behavior in real-world conditions without physically scaling samples.

Objectives:

The collaboration aims to streamline the product development process by providing accurate in situ visualization of new materials, such as painted glass, using virtual prototyping techniques to reduce costs and lead times.

Eclat Digital Solutions:

We provide virtual prototyping services using our proprietary software, Ocean™, to digitally simulate and visualize material behavior. By integrating optical characterization techniques like spectrophotometry and BRDF measurements, we ensure the accurate replication of complex optical properties like reflection and color diffusion in glass coatings.

Outcomes:

As a result, the client benefits from a cost-effective, rapid prototyping solution that allows stakeholders to authentically visualize materials in real-world scenarios. This enhances communication, speeds up development, and provides a reliable representation of material aesthetics, eliminating the challenges associated with physical prototypes.

Read the article online: https://eclat-digital.com/materials-in-situ-visualization/

ACCURATELY SIMULATING TRANSLUCENT MATERIALS WITH OCEAN™

Context:

Manufacturers of translucent and transparent materials (such as plastics, glass, and liquids) often face challenges in accurately capturing and representing how their products will appear in different environments and lighting conditions. Producing physical samples of these materials in various shapes and thicknesses is costly and time-consuming, limiting their ability to showcase the true characteristics of their products.

Objectives:

The goal is to develop a cost-effective, efficient method to simulate the optical properties of translucent and transparent materials virtually, without relying on physical samples. The method must accurately represent materials' interactions with light, including refraction, absorption, and scattering, in different lighting and thicknesses, to provide a realistic visualization of these materials under various conditions.

Eclat Digital Solutions:

Eclat Digital offers a virtual prototyping solution using its Ocean™ software, which simulates the optical properties of translucent and transparent materials. By accurately measuring the refractive index, absorption, and scattering of a material, the software creates digital models that can simulate how materials behave in various thicknesses and lighting environments. These simulations allow manufacturers to visualize their products in different contexts, without producing numerous physical samples.

Outcomes:

With Ocean™, manufacturers can drastically reduce the time and costs associated with creating physical samples. The software enables them to simulate their materials' appearance in a range of conditions, providing stakeholders with accurate, lifelike visualizations. This helps them improve communication with clients, accelerate product development, and refine designs before production. The flexibility and precision of virtual prototyping also enhance their ability to create and test a wider variety of material configurations.

Read the article online: https://eclat-digital.com/translucent-materials/

SIMULATING MICROSCOPIC SURFACE CONDITIONS WITH OCEAN™

Context:

Manufacturers in industries like automotive, architecture, and product design need to understand how microscopic surface conditions of materials, particularly glass, affect light scattering, reflection, and overall appearance. Traditional methods of creating physical samples for testing are time-consuming and expensive, particularly when evaluating different roughness scales created through techniques like acid etching, laser structuring, or roll printing.

Objectives:

The goal is to simulate microscopic surface conditions of materials such as glass using Ocean™ to provide accurate, real-world predictive images. These simulations allow manufacturers to study the optical behavior of surfaces without relying on physical samples. This includes improving product design by optimizing light reflection and scattering, particularly for displays and glass surfaces in automotive and architectural applications.

Eclat Digital Solutions:

Ocean™ is used to model and simulate microscopic surface conditions through various parameterized microfacet distribution functions, such as Beckmann and Phong models. The software can also process measurements from atomic force microscopy (AFM) to simulate real-world surface states, offering detailed simulations that match physical properties. Ocean™ also allows in-situ studies and simulations of coatings like anti-reflective (AR) layers for automotive displays and glass applications.

Outcomes:

By using Ocean™, clients can achieve high accuracy in simulating light behavior on microscopic surfaces, improving material design and performance without the need for extensive physical prototyping. This leads to faster product development cycles and reduces costs. The software's ability to replicate lab measurements virtually (with a 0.1% agreement) also allows early-stage testing and decision-making, providing a competitive edge in the automotive and building industries.

Read the article online: https://eclat-digital.com/microscopic-surface-conditions-simulations/

OPTIMIZING GLAZING DESIGN: VIRTUAL PROTOTYPING FOR ACCURATE GLASS SIMULATION

Context

The article addresses the challenge of visual distortions in architectural glazing, which can arise from processes like thermal treatment, lamination, and insulation. Eclat Digital and Buro Happold have collaborated to explore these challenges and present digital prototyping as a transformative solution, capturing the attention of industry stakeholders and leading to a nomination for the CIBSE Society of Facade Engineering 'Product of the Year' award 2023.

Objectives

1. To identify and analyze the main types of optical distortions in architectural glazing, including pillowing, rollerwave, and lensing effects.
2. To introduce digital prototyping as a method to simulate and mitigate visual distortions in glass design.
3. To utilize Ocean™, a sophisticated simulation software, to provide insights into potential visual distortions before physical fabrication.

Eclat Digital Solutions

- Digital Prototyping: Combines design and structural calculation tools with visual prototyping to assess and predict optical distortions.
- Ocean™ Software: Employs physically-based rendering and real optical characterization data to simulate light interactions with glass surfaces, generating accurate predictions of distortions.

Outcomes

1. Enhanced Visualization: Ocean™ enables detailed simulations of distortions like pillowing, rollerwave, and lensing, providing architects with a clear understanding of how these effects impact aesthetics and functionality.
2. Risk Reduction: By allowing for early detection and mitigation of visual distortions, digital prototyping reduces the risks associated with cost, time, and design iterations.
3. Improved Decision-Making: The predictive capabilities of digital prototyping empower design teams to make informed choices, enhancing the final aesthetic and performance of architectural glazing.

Read the article online: https://eclat-digital.com/virtual-prototyping-of-architectural-glazing/

TO GO FURTHER:

Understanding the Meaning of Virtual Prototyping: Benefits and Applications:

https://eclat-digital.com/virtual-prototype-meaning/

Industry Innovations: How Ocean™ optical simulation software is leading the way:

https://eclat-digital.com/industry-innovations-how-ocean-optical-simulation-software-is-leading-the-way/

CONTACT INFORMATION:

BOOTH – BAU: 210/B

GET IN TOUCH

Website: www.eclat-digital.com

LinkedIn: Eclat Digital

Contact:

Léa RAIMBAULT

Communication & Marketing Manager

lraimbault@eclat-digital.com