AS226168

Visualizing Design Analytics in VR with FormIt

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Learning Objectives

- Understand how to convert analytical data into visually immersive data.
- Understand the application of building simulation data as analytics to inform building design options.
- Build an immersive VR experience expressing key analytical building simulation information as it directly applies to formal and spatial design thinking.
- Create a process of collaboration and positive compromise with the design team, stakeholders, and project constituents using VR.

Description:

Understanding building data and its application to design thinking requires seeing beyond analytical information. Placing simulation data, the analytics, requires placing the data within a context capable of informing designers, building collaboration with the design team, and educating project stakeholders. Leveraging virtual reality to visualize energy use, daylighting, solar radiation, wind, and relevant design options allows decisions to be made with context and an understanding of cause and effect. This class will establish a strategic and replicable workflow methodology to build relevant building simulations (energy, sun, wind) in the design discovery phase, and visualize that data in VR space with respect to multiple design strategies. Once in VR, the simulation data can then be used to educate the design team, clients, or in my case, students to help build an understanding on the role analytics can play in forming design strategies.

Speaker:

David R. Beach is an architect and Associate Professor of Architecture at the Hammons School of Architecture at Drury University. Specializing in digital design technology, David is an advocate of full digital immersion as part of a traditional design process leveraging technology to inform process, collaboration, and decision making through analysis. David teaches in the architectural design studios, the Center for Community Studies working at the urban design scale, and both the introductory and advanced digital design technology courses. The application elements of David's current research can be found at the Autodesk Design Academy, and on his blog and YouTube Channel: The Architect's Digital Design Guide - which combined have over 6 million minutes of viewership, and are outlets for work and information directly related to questions received from students and practitioners. David has given 8 presentations at AU, and has completed over 25 major conference presentations in the last 10 years.

Why the Topic?:

Design thinking and technology are not always the best friends. The reality of this observation has been amplified by experience of teaching at a university. When I am trying to teach a student how to design, and how to use software, these two elements are often in competition with each other for the brain's attention…it is a bit of a left brain right brain traffic jam that happens. While the right side is trying to apply the creative principles of design thinking, the left side of the brain is tapping the brakes to enforce the recollection of which button performs specific modeling tasks. We are asking, especially at the university, for maximum creativity. Software learning is asking for retention methodology rather than out of the box problem solving. However, the complex issues that architecture is presenting, along with the amplified nature of these problems we will be addressing in the immediate future: Required massive reduction in building energy consumption, increased complexity in building systems and systems integration, unstable and less predictable construction costs and methods, hemorrhaging design and construction schedules – all lead to the requirement that we, as designers, are placing more emphasis on early design decisions that lead to major ramifications later in the process.

As a former practitioner, and now an educator, the question I often hear from students and young professionals is: "how do we convince a client to move in a direction that allows for creativity?" While that is a complex question, what I convey is the process that lead to my most creative projects had one overarching constant: quality collaboration with the client. This first requires the design team to remove any notion of "convincing" or "selling" and idea. Most of our clients know sales better than we do. They loathe being sold, but are interested in developing their understanding of design and its financial impact. My best clients were also always willing to collaborate in the design process if it was structured in a way that was engaging, well defined (ask good questions – "what do you think" is a bad questions), and allowed the client to take creative control of the project through a method of "guided inquiry." In other words, designing prompts that increase involvement, build authorship from the project stakeholders in the design outcome, and massively improve the education of what design is.

The converging path of these two points in architecture: improving our ability to leverage technology, and our ability to communicate and collaborate with clients, are extremely relevant to the future of successful practice. It is imperative that we improve our technical capacities and raise our CVP, or the Client Value Proposition. In "Thinking Like a Client" published by the American Institute of Architects (AIA), Kevin W. C. Green's research explains that while the architecture community views design as a process (verb), the perspective of a client is quite different. "Clients view 'design' as a product - a noun.... As a result, clients do not recognize the value of architects until it is time to produce (the documentation for) 'the design,' well after the formative stages of a project." Kevin Green also outlines the perception of a client toward an architect when a project does not meet their expectations: "Clients' (have a) negative perception of architects as 'monument-building' artists with little practical or technical expertise...(M)ost clients perceive architects as having been inadequately prepared during their architectural education to work corroboratively with clients, properly manage a business, and understand the construction process." These two hurdles for our profession to overcome are clearly connected. Raise the level of expertise. Share this expertise and utilize it as a way to make informed decisions with clients. Achieve these results and our profession has a whole raises our CVP. In particular, it raises the value of where we need to most significant investment

– in process. “Back in the day,” professional we always struggled with methods to convey what we were designing, as the major gap was often in visualization. We used animation, renderings, and everything else that we could to convey…but nothing comes anywhere close to the potential of leveraging VR to convey design information. In short, VR conveys two things no other media has for our profession to date: scale and immersion. Renderings and drawings and animations can convey proportions, but VR conveys scale – that is as it relates to architecture, the understanding of how the human body relates to a space. Establish an authentic sense of scale allows us to displace a viewer from reality, and immerse them into something else. This presents a set of opportunities that we, as an industry, cannot afford to transition to slowly.

To set up the learning opportunities here I am going to go through a few simple examples, and I am very trusting that this audience will have the ability to connect the dots and apply these methods to more complex projects. Also, these are examples about presenting work extremely early in the design phases – specifically within design discovery. This is the ideal time to begin simulations (if completed early simulations inform our design thinking), client visualizations and collaborations, and a process that builds value in process:

Site – Building Topography, Simulation Data, and VR Workflow

Construction of the site:

- Topography.
- Satellite Imagery.
- Conversion of data to topography.
- Add details to the toposurface.
- Establishment of location.

- *For complete step by step instruction see video linked here:*
- ***https://youtu.be/pnmGb8YPtiI***

Construction of the data:

- FormIt.
- Establish location (and weather).
- Construction of massing.
- Create simulations.

- *For complete step by step instruction see video linked here:*
- ***https://youtu.be/tbtQ-JzmplY***

Construction of the VR template:

- Push to VR using Go Live.
- Pull Live file into 3ds Max Interactive.
- Push Files from FormIt – *.obj

- Import FBX file into 3ds Max – Scale up by 1200%
- Build maps/elements in Max.
- Link to Interactive.
- Push to Interactive.
- Hit the play button in Interactive – boom.
- VR button.

- *For complete step by step instruction see video linked here:*
- ***https://youtu.be/8lZg_NvjoSA***

Wind.

CFD – Autodesk Computational Fluid Dynamics

- Creation of model (basics)
- Grab wind data image (*.jpg)
- Pull FormIt model into Revit
- Build wind volume box.
- Push Revit file to CFD.
- Set materials.
- Establish air properties (velocity and pressure).
- Run simulation.
- Create plane.
- Create traces.
- Export *fbx.

- *For complete step by step instruction see video linked here:* ***https://youtu.be/k8WNU4hDZKQ***

Simulation Data to VR

- Probably best to just watch the steps on this one:
  - ***https://youtu.be/XH4YkfD_xSU***