

Laser scanning puts the Rock & Roll into musical productions



Bat Out of Hell is a rock musical based on the trilogy of albums by Meat Loaf and is a loose retelling of the story of Peter Pan and Wendy set in a post-apocalyptic Manhattan. The musical has a book, music and lyrics by Jim Steinman, and the original creative team featured direction by Jay Scheib, choreography by Emma Portner and set design by Jon Sausor.

The musical premiered at the Manchester Opera House in February 2017 before making its debut at the London Coliseum in June of the same year. In October 2017, it made its North American premier at the Ed Mirvish

Transferring a musical from one theatre to another poses a myriad of logistical, set construction and promotional challenges. Laser scanning and Virtual Reality is being harnessed to keep the show on the road, as **Faith Clark** reports

Theatre in Toronto (pictured left), running until early 2018. The production subsequently returned to the UK for an extended run at London's Dominion Theatre after winning the Evening Standard Award for Best Musical.

The Fires Are Howling

Working alongside the production company, laser scanning and Virtual Reality company Preevue¹ was brought on board to help tackle some of the problems faced when moving a production from one theatre to another.

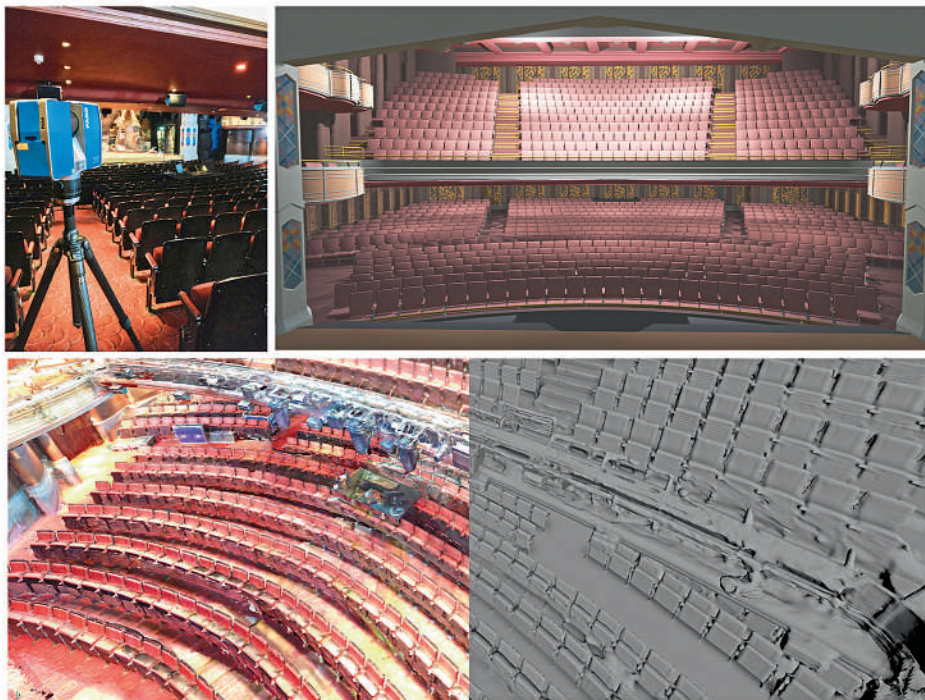
"Many theatres have no plans at all, or if they do, they are inaccurate or out of date. Therefore, laser scanning is a time and cost-effective starting point," commented Ryan Metcalfe, Founder and Managing Director of Preevue.

Using a FARO Focus X330 laser scanner

Preevue scanned both the existing set in situ in Toronto as well as a thorough scan of the Dominion Theatre in London. Capturing one of the production's most complicated sets called for around 80 distinct scans over a six-hour period.

In total, Preevue captured more than 150,000,000 individual measurements to generate a 40GB point cloud. For this project, the deadlines for deliverables to the production's design, direction and marketing teams were extremely tight.

"Visualisations and 3D models are only as accurate as the scans from which they are derived, which is why we scan to an accuracy of two millimetres," continued Metcalfe. "While this gives us absolute confidence in the outputs we generate - and the decisions that are based on those outputs - this level of



Laser scanning at the Prince of Wales Theatre in London's West End with examples of deliverables derived from point clouds

accuracy can present issues. For example, the long turnaround time that is needed to produce triangulated meshes from a point cloud."

Before the Final Crack of Dawn

Preevue originally produced models and visualisations directly from the point cloud before going on to develop an in-house proprietary workflow for converting the raw point cloud into a polygon mesh model. Using a mixture of software, including Autodesk Recap and FARO Scene, this was still a slow process that required intensive resources, potentially putting a bank of computers out of action for several days.

However, by using mesh modelling software from Pointfuse², Preevue's modelling team was able to start on the foundations of a model almost as soon as the point cloud was registered. An overview mesh model of the Dominion Theatre was produced, complete with classified surfaces, in just a few hours, giving the Preevue team a workable base model on which to begin modelling. Complex detail was then added as the point cloud was processed further.

We're All About to See the Light

"I keep looking for that one magical piece of software that will do everything we require," continued Metcalfe, "but it has yet to appear, so for now our workflow relies on a combination of software and manual modelling. However, you could say that Pointfuse is the light at the end of the tunnel and we are excited to work with them on future releases."

Using Pointfuse as part of the workflow, Preevue delivered a range of 3D models of both the set and theatre for use by various members of the production company. The models varied in scale from incredibly detailed and accurate 3D FBX and OBJ files to semi-detailed Sketchup

files, and even heavily reduced AutoCAD 3D files. This made the outputs accessible on devices ranging from high-specification workstations to handheld mobile devices.

The models are also taken into Preevue's own Virtual Reality system where they are used to create visualisations that show how an existing set will fit in a new theatre and inform design modifications that ensure a correct fit and an optimised line of sight. Virtual site visits allow set designers to experience a new theatre – anywhere in the world – without leaving their office, and a VR 'walk around' of a set can provide crucial detail for set builders. The Preevue visualisations are also used to inform ticket pricing structures in advance of a set build, thereby eliminating the need to hold potentially restricted views off sales.

In addition to the laser scanning project, Preevue also conducted the filming of technical rehearsals using a 360-degree camera rig. The footage thus captured was used to create immersive marketing materials, some of which were used in a first-of-its-kind Augmented Reality app from Preevue that enhances a patron's experience before, during and after a theatre visit.

No One's Gonna Stop Me Now

Since completing the work on the *Bat Out of Hell* production, Preevue has gone on to work on a number of other prestigious projects including the creation of VR visualisations for the refurbished Lyric Theatre in New York ahead of the Broadway opening of *Harry Potter and the Cursed Child*; the production of an interactive VR visualisation of Southwark Playhouse's new venue in Elephant and Castle, and the creation of create a 3D model and VR visualisation of the Barbican Conservatory

"Preevue's unique tailored Virtual Reality

system was incredibly useful for developing the re-design of the Lyric Theatre and made communicating design changes virtually to our transatlantic teams a possibility," said Gary Beestone, International Technical Director for *Harry Potter and the Cursed Child* worldwide and Project Director for the Lyric Theatre Refurbishment.

Pure and Good and Right

Pointfuse is a powerful modeling engine that delivers an automatic, precise and flexible way of converting the vast point cloud datasets generated by laser scanners or photogrammetry into segmented mesh models. It employs advanced statistical techniques to create 3D models where individual surfaces can be selected and classified as new layers in the Pointfuse environment and exported to IFC and FBX for manipulation in any industry-standard CAD system.

Offering 'selectable surfaces', Pointfuse provides an approach whereby surfaces within the 3D mesh models can be identified, grouped and classified. These advancements bring a catalyst to the workflow of design and engineering projects, offering efficiencies that were previously not possible when working with point clouds or traditional mesh models.

Pointfuse also significantly reduces the file size of 3D models created from point clouds. In simple terms, the data density within each surface is reduced while maintaining the fidelity of the model. This results in a significant reduction in model size, making ongoing use of the model easier, faster and more efficient.

1. <https://preevue.com>

2. <https://pointfuse.com>

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An Augmented Reality app from Preevue enhances a patron's experience before, during and after a theatre visit. Photo courtesy Bronwen Sharp