Docket #: S19-130

# KleinPAT: Rapid modal sound synthesis model

Stanford researchers have developed a method called KleinPAT, for creating sound models in seconds, making it cost effective to simulate sounds for many different objects in a virtual environment. KleinPAT's algorithm is low-cost, high-quality; and can synthesize realistic, synchronized sounds on-demand in real-time environments.

Initial results demonstrate that this method is 1000x to 4000x faster for objects with a few hundred vibration modes compared to previous methods, shortening the processing time from a few days to now just seconds. This invention may potentially revolutionize acoustic vibration analysis for engineering acoustics and sound synthesis in virtual environments.

Please see the _KleinPAT Project website_ for videos and additional information.

Stanford Engineering Research & Ideas _"A new algorithm enables more realistic sound effects in VR"_

Figures:
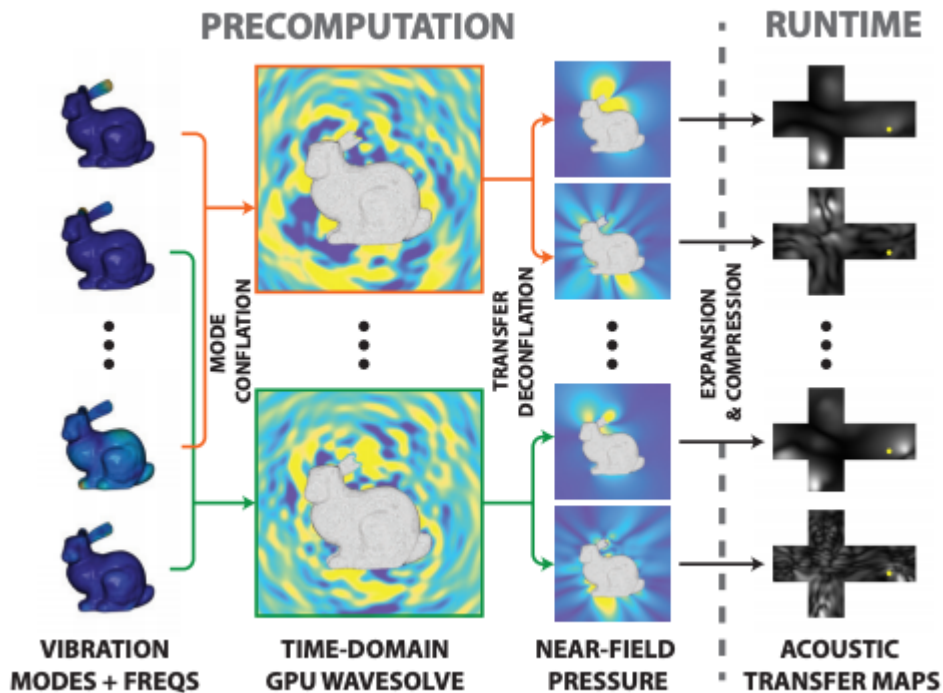
Figure description-KleinPAT Overview: Our method can evaluate acoustic transfer for 292 modes of this plastic bunny using only 6 time-domain wave simulations constructed by optimally conflating modes into 6 chords. The resulting sounds fields are deconflated to estimate the 292 transfer fields, then approximated with far-field acoustic transfer (FFAT) cube maps for real-time evaluation. This precomputed acoustic transfer (PAT) preprocess is over 4000x faster than traditional BEM-based approaches for the bunny.

Stage of Development
Prototype - The code has been tested and verified on several different 3D objects

Applications

- **Virtual reality/ Augmented Reality (VR/AR)** - Real-time sound synthesis for rigid-body objects in virtual environments
- **Radiation analysis** of vibrating structures in engineering and product design

Advantages

- **Fast and real-time - new sounds can be synthesized in real-time** Lower preprocessing costs - can precompute acoustic radiation fields 1000x-4000x

faster than prior computer simulation methods
- **Enables interactive environments with realistic sound effects**
- **Easily accessible content** - can be used to create libraries of 500 new sounds quickly

Publications

- Jui-Hsien Wang, and Doug L. James. 2019. KleinPAT: Optimal Mode Conflation For Time-Domain Precomputation Of Acoustic Transfer. *ACM Trans. Graph.* 38, 4, Article 122 (July 2019), 12 pages.

Patents

- Published Application: 20220319483

Innovators

- Doug James
- Jui-Hsien Wang

Licensing Contact

Chris Tagge

Technology Licensing Program Manager

Email