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Title	Home Theater Room Acoustics Design Management System
Year	2023
Program	Master of Informations Systems

ABSTRACT

The company beneficiary of this project is in the sound engineering business and builds home theaters with the aim of creating the best listening experience for the audience. Part of this building process is to create a suitable acoustic design for the room being built.

This process of creating an acoustically efficient enclosed area is not a new concept and there are systems that already provide the functionalities to design an acoustic room in one way or another. For the stakeholder's case, existing tools are either difficult to maintain and too granular to use in one place. Even extensive software solutions that offer some of the same functionalities are not suitable for the business because of cost limitations and the absence of some necessary functionalities. Due to this, the company's current process involves calculations using MS Excel and manual drafting of room drawings to visualize a room's acoustical properties such as placement of speakers, acoustic panels, and view-optimized listening positions.

The goal of this project is to build a web information system to manage Home Theater Room Acoustics Design projects and allow the functionalities to quickly design the acoustical properties of a room in one place. An important feature of this project is the simulation of a room's acoustic impulse response to generate an audio representation of the room. This provides an approximate estimation of how the room will sound based on the specifications of the room. Furthermore, the system shows a visualization of the sound reflections that help locate acoustic panel placement and the visual mapping of room mode lines that are necessary to locate the low frequency resonance pressure locations to treat room modes that degrade a room's listening experience.

This project incorporates the latest cloud technologies in AWS, a reliable software stack of Django, Django REST Framework, MariaDB and Vue.js.

It was found that the tool developed in this project significantly reduced the time it takes to conceptualize and draft a home theater's room acoustic design. That is, in under 30 minutes after a room's measurements are taken, a functional acoustics design of the room is ready for review within the concerned teams in the company.

The functionality that allows to locate the reflection points helps to easily locate the acoustic panels placement locations. Also, the room modes mapping allows the designers to make sure that bass traps and other room modes treatments are correctly placed. Furthermore, the room audio simulation feature of the developed tool allows a convenient overview of the room's acoustic impulse response.

Keywords: Room Acoustics Design; Room Impulse Response; Web Information System