

Requirement Specification

The 3D distributed audio sound control system will enable a user to control and connect audio devices such as speakers, microphones, pre-amplifiers and amplifiers within a 3D environment for venues such as hotels. Hotels have various areas such as a pool area, reception, restaurant, or theater which may contain audio devices. The devices in these areas will need to be connected and controlled by a user. The system has five main requirements:

- Venue Construction
- Navigating the venue
- Device Enumeration and Placement
- Device Association
- Device Control

Venue Construction

The user will start up the system (Google Sketchup) with a blank environment. The venue requiring sound control will then be drawn in Google Sketchup [2] by the user using the tools provided by Sketchup as well as the Google 3D Warehouse [1]. The Google 3D Warehouse provides many different entities made by Sketchup users and shared online, this can save a lot of time when designing something in Sketchup.

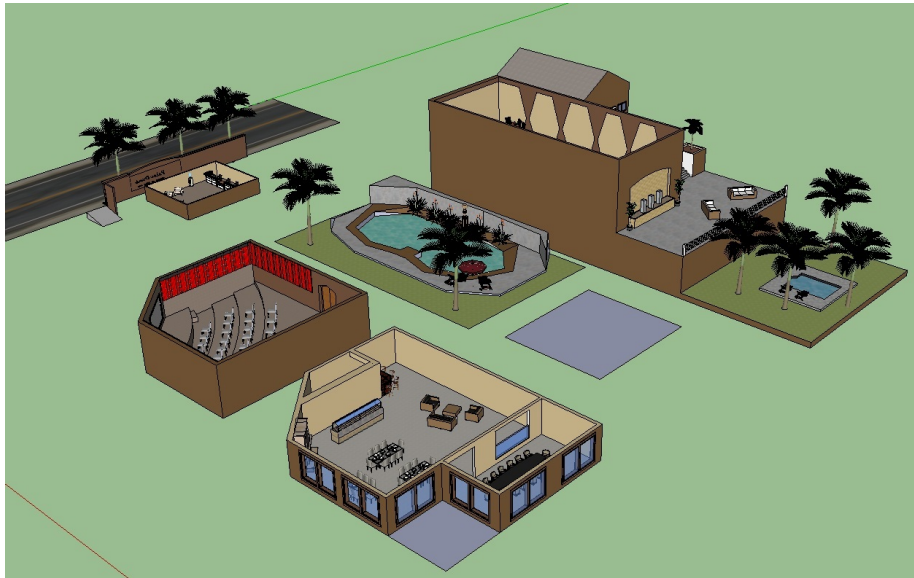


Figure 1: Example of a venue built using Google Sketchup

Navigating the venue

Users can navigate the venue by using two different methods. They will be able to move the camera around using the Sketchup controls and hotkeys. The sketchup interface provides controls for the camera movement as well as zoom, this can also be done using the 'shift' key and mouse wheel. The alternative method used to navigate the venue is by using the camera buttons. These are predefined and fall under the "plugins" menu of Sketchup. Clicking on one of these will call a ruby method which will then move the camera to view a specific area or room within the venue.

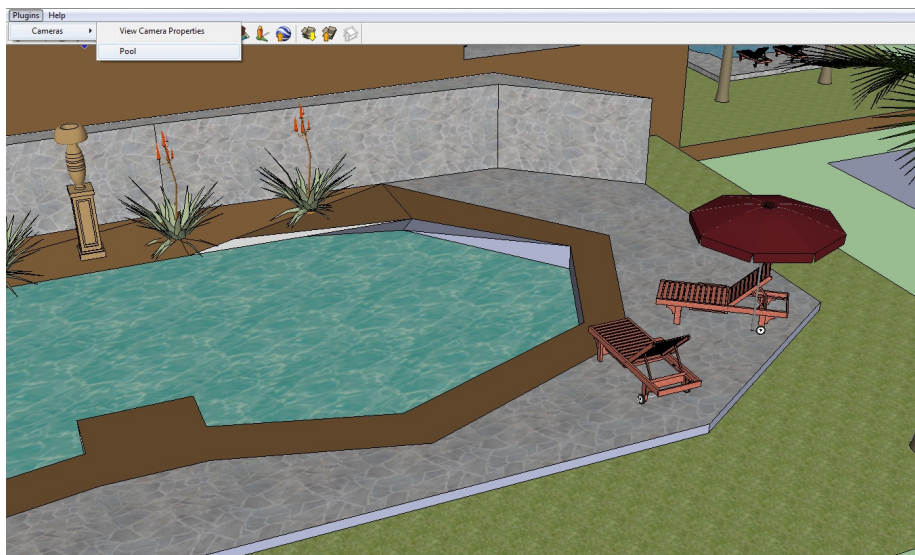


Figure 2: Example of the user navigating to the "Pool" area of the venue

Device Enumeration and Placement

When the venue has been successfully built, the user will be able to request the system to enumerate the devices on the network. The system will "scan" the network for devices. This may be done more than once to ensure that all the devices are accurately enumerated. When this is completed, the devices will be placed within the 3D environment on a set "palette". The user can then navigate to this palette and move the devices to areas within the venue to correspond to the placement of the real devices. This can be done by selecting the "move" tool, selecting the device entity, navigating to the areas where it is, and then clicking on the position where the user wishes to place the device.

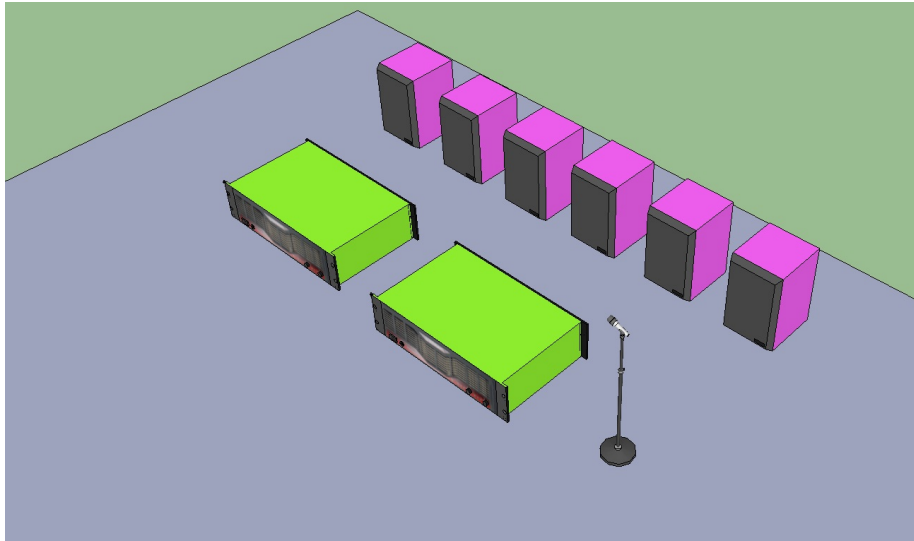


Figure 3: Device enumeration (6 Speakers, 2 Amplifiers, and 1 Microphone)

Device Connection Management

Devices will be connected to each other using the 3D interface, this will allow the user to stream audio between the distributed devices throughout the venue. This will be done by selecting the "Make Connection" item from the connection menu.



Figure 4: Selection the "Make Connection" menu item

Once this has been done, the user will then use the mouse pointer in the 3D environment to select the source and the destination respectively.

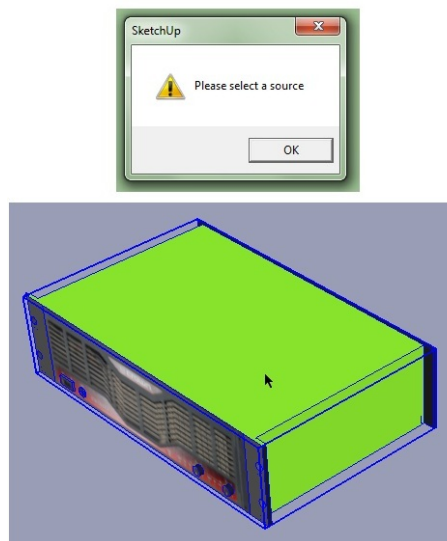


Figure 5: Selecting the source of the stream (Amplifier in this example)

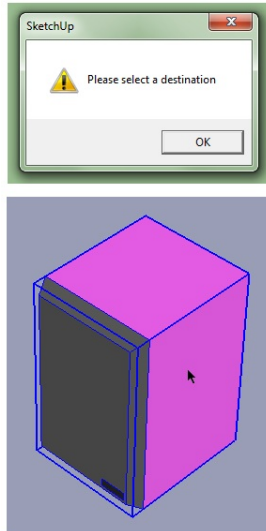


Figure 6: Selecting the destination of the stream (Powered speaker in this example)

After the source and destination have been chosen, a window showing the various channels of each device will be displayed in which the user can create the connections between devices. The number of channels shown will be device dependent and only one output will be able to go into one output.

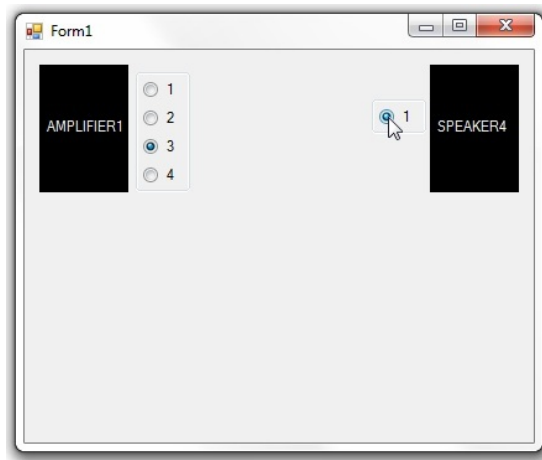


Figure 7: Interface showing how the user will be able to link devices

Device Control

The user will now be able to control the various devices from the 3D environment. The software will provide interfaces for the user to adjust levels of different devices. Appropriate controls will be shown depending on which device it is that the user wishes to adjust.

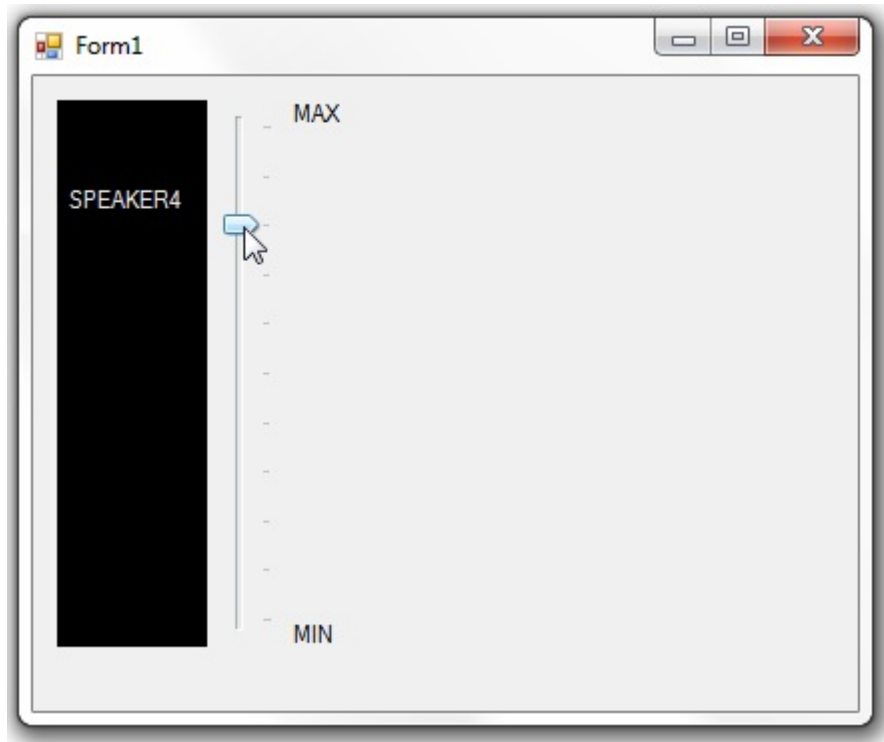


Figure 8: Example of a user adjusting the gain on a speaker

Technologies Used

This project requires the use of four different technologies: networking, the software will use networking facilities to enumerate the devices; graphics, the devices will be displayed within the 3D interface; audio networking, associations between the devices on the 3D interface and the devices in in the venue will be made; and real time multimedia, this involves the controlling of the various devices.

Bibliography

- [1] Trimble 3D Warehouse - Powered by Google. Online. Available from: <http://sketchup.google.com/3dwarehouse/>.
- [2] GOOGLE. Google Sketchup. Online. Available from: <http://sketchup.google.com/>.