**Lab P-5: Synthesis of Sinusoidal Signals-A musical Illusion**

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The project objective is to reproduce a musical illusion called “the Shepard Scale”, which is a tone that sounds to rise forever, yet stay in a single octave. The Shepard scale is made of an octave of notes, where each note is the sum of individual sinusoids to trick our ears.

텍스트이(가) 표시된 사진

자동 생성된 설명

Figure 1. The key2note function used in the code for the musical illusion.

The function key2note from the earlier project was reused, with changes in the amplitude. The amplitude X was defined with the Gaussian function given from the instructions and the variables from the previous code was introduced as a constant of the function to make the tweaking process more convenient. Simply, by changing the variance v and the frequency center fc, we can alter the amplitude of the signals.

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Figure 2. Producing each note with signal synthesizing.

In the code, each note was produced by synthesizing 9 signals of + - 4 octave of the central note. To make the Shepard scale, 7 notes of the scale was added with cat() function to produce a rising scale from C4 to B4, and the reiteration was done 5 times with repmat(scale, 1, 5) function. The addition of the C# D# F# G# A# note to the scale made the scale sound more continuous.

At first, the duration of each note was set as 2 seconds, however, the tweaking process showed that shorter duration of each note in the scale made it more difficult to notice the illusion. The fc of 262 and v of 2 made the sound dense making the illusion easy to detect. Increasing the fc to 400 and decreasing the v to 1.5 made the scale sound more like the Mario music.