

Chord Voicing Feedback: Signal Comparison 2

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1 Introduction

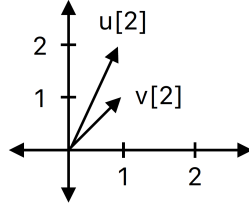
The chord voicing feedback data processing and analytics comprises of two main stages: filtering and signal comparison. This document will focus on an alternative method to the first one I developed. To remind of the objective, the user will play a chord and that chord will be compared with a target chord to determine the similarity.

2 Method

The revised method for signal comparison involves comparing the signals in the frequency domain using the angle between vectors for each present frequency. In addition to the magnitude of the angle, it is assigned a quality of -1, 0, and 1 to determine the position of the input signal. This is necessary because the vectors are restricted to the first quadrant of the unit circle since the frequencies will always be positive and there are no negative amplitudes. So, assigning -1, 0, and 1 to the angles provides a way to classify the position relative to the target chord. This way, I can provide more specific feedback to the user regarding whether they need to play a certain note louder or quieter.

3 Example

Given the user chord in frequency domain denoted as $u = [[1, 1], [1, 1], [1, 1]]$ and the target chord as $v = [[1, 1], [1, 1], [1, 2]]$, the angle between the vectors in each array will be compared. This will be found by using $\theta = \arccos \frac{\vec{A} \cdot \vec{B}}{|\vec{A}| |\vec{B}|}$. For the first two elements, the angle should be zero, this would correspond to a score of 0 meaning they perfectly align. However for the third element, observe the graph below



This time there is a difference in angle, θ will be calculated as $\theta = \arccos \frac{\langle 1,1 \rangle \cdot \langle 1,2 \rangle}{|\langle 1,1 \rangle| |\langle 1,2 \rangle|} = 0.3218$. Since the user input is less than the target, the score would be assigned a 1 indicating that the user needs to play louder.