

Relationship between Separation and Slice Interval in Similarity Comparison of Ear Canal

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Introduction: In our laboratory, we have invented a type of biometric authentication called ear acoustic authentication. Ear acoustic authentication takes advantage of the personal nature of the reflected sound when the test sound is played in the ear. We thought it necessary to elucidate the mechanism that causes individuality as a clue to improve authentication accuracy. So far, we have focused on the shape of the ear canal as the most influential factor and investigated the relationship with the acoustic characteristics. Therefore, it is necessary to evaluate the similarity of the ear canal, and the slice method has been proposed as a method. However, previous studies have not verified the proper setting of the slice interval, which is one of the parameters of the slicing method.¹⁾ In this study, I calculated with multiple setting values and obtained the result that 0.1 mm is the best.

Experiments: The right ear of three persons was measured three times using an ear canal scanner. Next, only the ear canal part is extracted from the acquired 3D data. Using these data, the cosine similarity and Euclidean distance are calculated by the slicing method, and the degree of separation(S) is calculated from these values, which is used as the performance evaluation index. I investigate the value of the separation by changing the slice interval to 0.01, 0.05, 0.1, 0.5, 1, 3[mm].

Results and discussion:

Figure 1 shows the calculation results of the separation (S). The highest degree of separation was obtained when the slice interval was 0.1 mm, regardless of whether the calculation was based on the Euclidean distance or the cosine similarity. It is considered that the reason why such a result is obtained is that the resolution of the measurement data is close to 0.1 mm, and the error becomes large when the slice interval is made smaller.

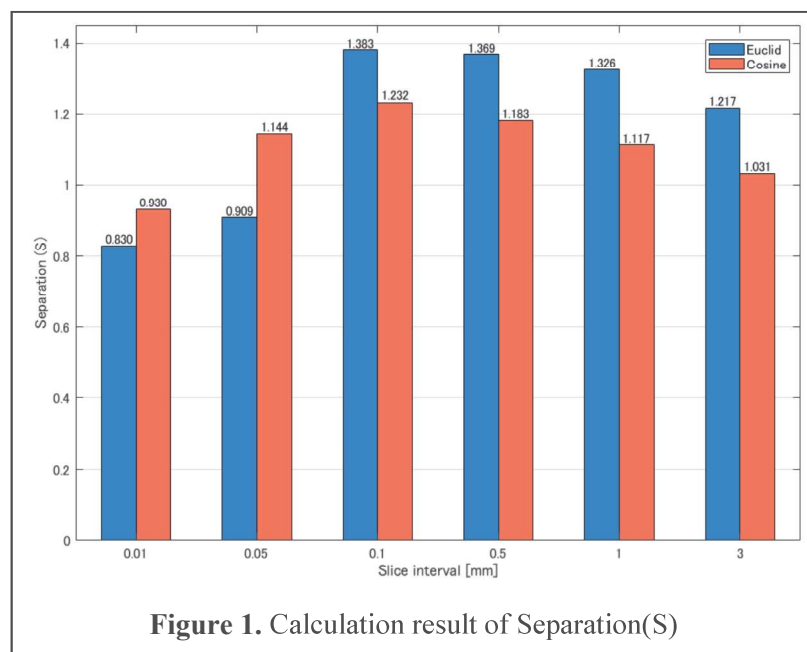


Figure 1. Calculation result of Separation(S)

References:

1. Riki Kimura, *et al.*, *Audio Engineering Society Convention 148*, **2020**, 10348