

SIMULATION OF WIND INSTRUMENTS AND A GEOMETRIC INVARIANCE OF THE DISCRETE GRADIENT METHOD

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In this talk we consider simulation of wind instruments by using the Webster equation. The Webster equation is a model equation of sound waves in tubes such as vocal tracts and bodies of wind instruments. Simulation of sound waves requires long-time calculation compared to the time scale of wave propagation phenomena and hence we need structure-preserving methods to obtain meaningful results.

We apply the discrete gradient method to this equation. Because a gradient is defined by using an inner product, we must introduce a suitable Riemannian structure to the phase space. We used two different inner products to design numerical schemes by the discrete gradient method; however, it turned out that the schemes do not depend on the choice of the inner product.

By extending this result, we show a theorem that states a geometric invariance of the discrete gradient method under the change of the Riemannian structure.

Joint work with Ai Ishikawa (Kobe University).