

# **A topology and geometric modeling of musical sounds**

## **Abstract**

I describe certain geometrical objects that we have always been hearing them. Each of these has a toral dimension depending on our hearing ability. These geometrical objects are intertwined within our modeling of synchronized systems of oscillators. We also use a radial type of controlled differential system to model these systems of oscillators. As an example, timbre of musical signals can be simulated using these controlled differential systems. Spectral and temporal envelopes of the signals are our means to synthesize the timbre in our study. I describe how invariant manifolds and the dynamics of the radial differential systems can be used to control and simulate these timbral features of musical notes. Finally, I describe how the topological changes (bifurcations) associated with the radial differential systems may classify sounds from different musical instruments.