# Graphs as a meaningful representation of musical concepts

Autores: Jorge Useche (1,2), Rafael Hurtado (1)
1. Grupo de Econofísica y Sociofísica, Departamento de Física, Facultad de Ciencias, Universidad Nacional de Colombia
2. Conservatorio de Música, Facultad de Artes, Universidad Nacional de Colombia

In this talk we tackle the issue of representing musical concepts in terms of mathematical relations using Graph Theory. A broad variety of systems composed by interacting elements, ranging from ecosystems to social and artificial systems, have been represented as graphs and their properties analyzed using results from Graph Theory. In each one of these cases the constituent elements of a system are embedded in an environment of relations that realize in terms of links between pairs of elements. Usually, the existence of a relation states that elements can be linked to other elements but it does not state how a given element is connected with other elements, as an example while any two human beings can be linked by marriage there are several rules that limit this possibility as those related with age or the degree of family closeness. Here we find relations to link pairs of musical elements and to construct different kinds of chords and musical scales. Besides we analyze some musical examples of classical music to identify with graph theory musical concepts related to harmony, melody and musical balance. Finally we propose a model that can quantify these relations in terms of acoustical properties of sound waves in order to generate a psychoacoustic model of melody.