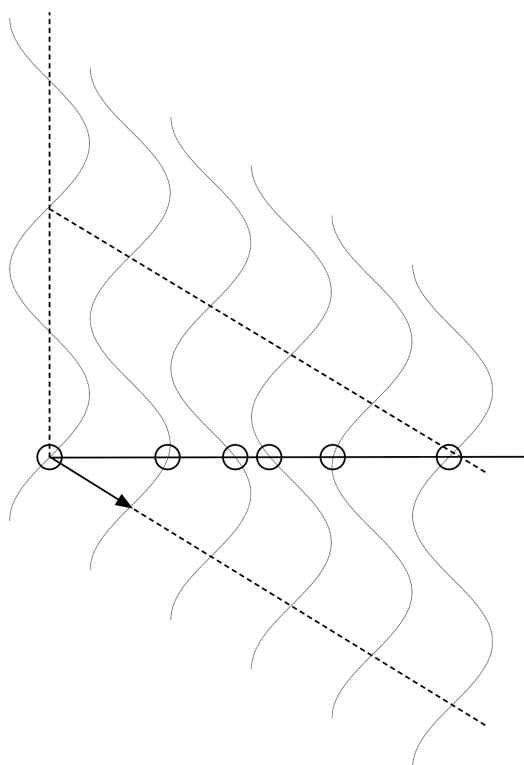# Incommensurate composition

Conventional crystalline materials are those in which the component atoms/molecules are arranged with long range translational order in three dimensions: the entire material is constructed from a well-defined structural unit that replicates in three-dimensional space. They have three translational periodicities. For some materials, on the other hand, the arrangement of the component atoms in three-dimensional space can be described only by invoking four or more translational periodicities. Such materials are described as "incommensurate". Although existing in three-dimensional physical space, the material is now no longer periodic in three dimensions but is periodic in four or higher dimensions. As such its appearance is not that of a conventional, ordered crystalline material. The three-dimensional structure of the incommensurate material represents a three-dimensional slice through a higher dimensional superspace.

The idea of an incommensurate material can be represented by creating a series of sine waves, arranged in a periodic fashion in two dimensions with the start point of each sine wave offset along a diagonal. This represents a two-dimensional structure. Drawing a line through the set of sine waves creates a one-dimensional slice through the two-dimensional structure. The points of intersection of the line and the sine wave will be incommensurate and the values of the distance between them will never be found to repeat exactly.

To use this model of describing incommensurate structures to make music, the data output of a mathematical algorithm is used to drive an aleatoric composition written in Cycling74's Max. Changes in variables input to the algorithm result in changes to the data. These in turn transform the work through the creation of new scales, generated from intervals present in the data. These intervals are also used to govern other musical variables within the work; time and pitch structures for example. The final work exists as a set of instructions generating an endless piece of music.

The distance between each intersection will never repeat