

# Voronoi Diagram of Spherical Balls: Properties and Applications

Deok-Soo Kim

(Professor, Department of Mechanical Engineering,  
Hanyang University, Seoul, Korea)

## **Abstract**

The beautiful properties of the ordinary Voronoi diagram of points are well-known and diverse types of Voronoi diagrams inherit this beauty if they can be correctly and efficiently constructed. However, there are only a few classes of Voronoi diagrams whose construction methods are well-established. Even the efficient and robust construction of the Voronoi diagram of circular disks in the plane, also known as an additively-weighted Voronoi diagram, was reported very recently despite that the problem may seem a straightforward extension of point generators. This talk will present the Voronoi diagrams of circular disks in the plane and spherical balls in the three-dimensional space. Theoretical issues, computational issues, and applications will be covered. In this talk, we will also introduce the concept of Molecular Geometry (MG) for a geometry-priority understanding on molecular systems of both organic and inorganic nature and will present MG Operating System (MGOS) which consists of callable functions based on the Voronoi diagram of spherical atoms that implements the MG theory. MG, accompanied by MGOS, will allow researchers to focus more on their primary research issues by freeing them from the time-consuming and error-prone tasks of highly sophisticated geometry algorithms for molecular structure studies. The impact of math libraries of general purpose high-level programming languages to science and engineering is an appropriate metaphor of that of MGOS. In this talk, diverse applications of MG/MGOS will also be presented. If MG and MGOS are properly accompanied by artificial intelligence techniques such as neural networks, they might contribute to practical, relatively poorly-defined real world problems in a significant way.

Research area(s): Theory and applications of Voronoi diagrams, Molecular geometry