京都大学スーパーグローバルコース特別講義

Introduction to Resolution of Singularities

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Abstract:

The goal of this series of lectures is to give an easy and comprehensible introduction to the subject of resolution of singularities, aimed at the beginning graduate students in algebraic geometry (while the graduate students in other fields are also welcome). After an overview, where we discuss the meaning of the problem of resolution of singularities, we introduce the operation of blowing up. This is the main tool for our resolution of singularities. By blowing up, we achieve resolution of singularities of a curve embedded in a surface. A curve is an algebraic variety of dimension 1, and a surface is an algebraic variety of dimension 2. In these low dimensions, we can visualize the solution in a very clear picture. However, all the essential ingredients to solve the problem in higher dimensions are already there. The most important of all is the notion of a hypersurface of maximal contact. (We give a modern interpretation of a proof found in a textbook by Mumford "Complex Projective Varieties".) We then discuss how we can resolve the singularities in general by induction on dimension, using a hypersurface of maximal contact. The last lecture is devoted to some of the important applications of resolution of singualrities, such as elimination of indeterminacy of a rational map.

Each lecture is about 2 hours long, and we would like to proceed at a slow and leisurely pace. The emphasis is on the main ideas rather than the technical details.

Tentative plans for the lectures:
 *All lectures will take place 10:00 - 12:15.

Monday, July 28
Overview

Wednesday, July 30
Operation of blowing up

Friday, August 1
Resolution of singularities of a curve embedded in a surface

Monday, August 4
Inductive scheme toward higher dimensions

Wednesday, August 6
Applications

Language:
Lectures will be given in English, however, questions can be asked in English or Japanese.