istanbul matematiksel bilimler merkezi
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Group Actions on four-manifolds

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Lecture 1: Introduction

In this lecture, we shall give a historical review on group actions in dimensions 2 and 3, leading up to dimension 4, and explain how the topic is connected to some of the central questions in the study of manifolds in these dimensions.

Lecture 2: Locally linear actions and smoothability

We review the basic results on and the basic tools for studying the locally linear topological actions on 4-manifolds, and the known criteria for non-smoothability of locally linear actions derived from gauge theory (Yang-Mills or Seiberg-Witten).

Lecture 3: Symplectic finite group actions: part I

We discuss symplectic finite group actions on symplectic 4-manifolds, and the principal tools for studying them, i.e., pseudo-holomorphic curves in symplectic 4-orbifolds.

Lecture 4: Symplectic finite group actions: part II

We discuss some recent new approach for studying symplectic finite group actions based on the construction of symplectic resolution, i.e., for each symplectic 4-manifold M equipped with a finite symplectic G-action, we associate it with a symplectic 4-manifold M_G, which is the symplectic resolution of the symplectic orbifold M/G. Then the new approach will be centered around the following conjecture

$$\kappa^s(M_G) \leq \kappa^s(M), \text{ where } \kappa^s \text{ is the symplectic Kodaira dimension}$$

Lecture 5: Topology of symplectic Calabi-Yau G-surfaces

A symplectic Calabi-Yau surface (SCY) is a symplectic 4-manifold with trivial canonical line bundle. We verify the above conjecture for the case where M is a SCY, showing that in this case M_G is either minimal with $\kappa^s = 0$, or M_G is rational or a ruled surface over T^2. Furthermore, we will explain that when M_G is rational or ruled, M must be diffeomorphic to either a hyperelliptic surface, or T^4, or a $K3$ surface (on-going work), providing further evidence to the standard conjecture regarding the smooth classification of SCY.

Date and Time : Lecture 1,2,3: Wednesday, May 24, 2017 at 09:00
Lecture 4,5: Friday, May 26, 2017 at 09:00

Place : IMBM Seminar Room, Boğaziçi University