Introduction:

- **Objective**
  Develop an algorithm to automatically reconstruct complex 3D solid objects from line drawings.

- **Previous method**
  3D reconstruction is to find a 3D object that is most consistent with some rules of our visual system. These rules include:
  - Line Parallelism: Two parallel lines in a 2D sketch imply that they are also parallel in 3D.
  - Isometry: The ratio of the lengths of two lines in 2D sketch plane should near their ratio in 3D space. 

Limitation: These rules may break in some cases and require the carefully tuning of the weights for each rule.

- **Our Approach**
  Observation: a natural or man-made complex 3D object normally consists of a set of basic 3D objects.

Method: Recover the 3D shape by finding a combination of basic 3D models in a database that best fits the input line drawing.

Reconstruction Algorithm:

- **Overview**
  The 3D shape of each model is controlled by a set of parameters. The coordinates of each point is a linear combination of these parameters.

- **Models in 3D database**
  Each 3D part is determined by a set of random variables. The relationship of the vertices of two neighboring 3D parts should be consistent with the original line drawing.

- **3D Reconstruction**
  The 3D reconstruction is to find a 3D model in the database that best fits the input line drawing.

Experimental Result:

- **Quantitative experiment**
  This problem is solved by an alternative minimization algorithm (See our paper for more details).