Barbados 2011

Progress report session

Monday February 5th

1 Simultaneaous drawings without mapping

progress by Vida

It is possible to draw any planar graph on a n^2 point grid.

Is it possible to beat the n^2 size for planar straight line drawing (open for years) ?

Same question allowing bends ?

Result:

With 3 bends edges, set of points $O(n)$ size.

With 2 bends edges, set of points $O(n \log n)$ size.

With 1 bend edges, set of points $O(\frac{n^2}{\log n})$ size.

If graph is sub-hamiltonian

then with 2 bends edges, set of points $O(n)$ size.

With 1 bend edges, set of points $O(n \log n)$ size.

2 Homomogical simplification

progress by Dominique, Marc, Olivier

Result: It is NP-complete even with 3D embedding.

$L \subset X \subset K$,

L, K given find X that has the complexity of L that remains in K.

We constructs gadgets:

variables are a cycle in L + 2 hemispheres in K

clauses are baloon with stribes that attach on the variables separated in 3 faces in K in L we have only boundary of the faces with a small holes at the place it attach on the variables.

3 ♯ extreme points

progress by Xavier

Result: the convex hull size of random points in a disk is increasing when n is big enough.

Result: the convex hull size of even (resp. odd) number of random points in a square is increasing when n is big enough.

see separate document

4   Norm maximization problem

problem and progress by Christian

Problem: What is the furthest vertex form the origin in an intersecttion of half spaces in dimensions d ?

Known to be NP-hard by reduction to PARTITION.

Progress: new reduction to finding a d-clique in some graph, gives complexity of $n^{O(d)}$.

Lower bound in $n^{\Omega(d)}$.

5   MADEST problem

problem and progress by Christian

Problem: Minimum Average Distance Euclidean Spaning Tree

Given a set of points, find the spanning tree that minimize the sum of distances in the tree for all pairs.

This tree can have crossings. EMST can be bad.

NP-hard ? (Known to be NP-hard in thegraph model).

Polynomial approximation scheme exists.

Link between MADEST and problem asked by Raimund (triangulation of a simple polygon instead of tree).

Progress: