Finding the Distribution of the Length of the Longest Path of Acyclic Orientations on Complete Multi-Partite Graphs

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NEW ABSTRACT PART 1 (Elisabeth's portion)

We first investigate the generating functions to find distribution of the length of the longest path on complete acyclic tripartite graphs. We create a recursive system of generating functions with marker u that reproduces the number of acyclic orientations on tripartite graphs when $u = 1$. With the tripartite generating function as a basis, we construct the probability generating function for the distribution of the longest path length. Calculating for part sizes 2-10, we find that the distribution of longest path length seems to be approaching Gaussian distribution. We are currently trying to verify the asymptotics for the tripartite case and the general case.

NEW ABSTRACT PART 2 (Aiden's portion)

We refer to Pemantle's findings on asymptotics of generating functions to generalize and refine our own theorems. Surprisingly, it was found that our original method (inspired by Knuth) for calculating the number of acyclic orientations is asymptotically equal to Pemantle's theorem for finding the "smooth point leading term" of a ratio of generating functions.// Talk about asymptotics, reference the generating functions but don't rely on them. Just use reg. generating function to build probability generating function.
Notes: Talk about hessian matrix here + Pemantle?