Movie-Chain-Runner Problem

Shashank Singh Jimmy Zong

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Outline

Team Members

- Sung Uk Ryu
- Eugene Scanlon
- Shashank Singh
- Jimmy Zong

The Problem

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Find the "longest" list of overlapping titles in a list of movie titles.

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Find the "longest" list of overlapping titles in a list of movie titles.

For Example: In the list

- Day of the Dead
- Live and Let Die
- Dead Poets' Society
- Die Another Day
- The Last Samurai

the "longest" chain is

"Live and Let Die Another Day of the Dead Poets' Society."

The Problem

- Equivalent to finding a Longest Simple Path in a directed graph

The Problem

- Equivalent to finding a Longest Simple Path in a directed graph
- The Longest Path Problem is NP-Complete

Previous Attempts

- Summer 2010 – 255 titles
- Fall 2010 – 271 titles (845 words)
- Summer 2011 – 311 titles (997 words)
- Fall 2011 – 323 titles (1030 words)
- Spring 2012 – 327 titles (1055 words)

Benefits

Our group will gain experience

- programming in Python (and maybe C, MATLAB, or another language)
- working as a group toward a common goal
- handling and processing a large data set
- implementing graph algorithms
- designing and implementing approximation algorithms for an NP-hard problem

Approach

- Algorithms
- Project Timeline (Gantt Chart)

Algorithms

1. Brute Force
   - Tried running on 16 GHC machines for 15 hours
   - Constructed chain of 247 titles
   - Progress slowed exponentially
2. Acyclic Subgraphs
   - A poly-time algorithm using topological sort is known for acyclic graphs
   - Try to find acyclic subgraphs
   - Too many cycles – took too long to generate subgraphs
3. Working backward
   - Tried extending chain of 247 titles using brute force without success
   - Haven't tried adding to the beginning of the chain
   - Work in progress

Gantt Chart

Tasks	Begin Date	End Date	6/1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
235 Titles	6/1	6/3																											
Proposal	6/4	6/5																											
Proposal Presentation	6/5	6/6																											
260 Titles	6/4	6/10																											
Instructions	6/8	6/10																											
Instructions Demonstration	6/9	6/11																											
285 Titles	6/11	6/17																											
Progress Report	6/15	6/17																											
Progress Presentation	6/16	6/18																											
300 Titles and Beyond	6/18	6/25																											
Final Presentation	6/23	6/25																											
Final Team Report	6/24	6/27																											

Key:	
Eugene/Sung	
Shashank/Yiming	
Everyone	

Evaluation

1. Length of the longest chain we find
2. Compare performance of a few different algorithms
3. Predict runtime for entire computation by solving tractable subproblems

Qualifications

- Sung Uk Ryu
- Eugene Scanlon

Qualifications

- Shashank Singh
  - Senior CS/Math Dual Degree
  - Completed undergrad CS/Math curricula, including courses specifically in Data Structures/Algorithms and Discrete Math (15-121, 15-211, 15-251, 15-451, 21-301, 21-484)
  - TA'd 15-211 and 15-251
  - Have extensive experience analyzing large data sets for research
- Jimmy Zong
  - Sophomore CS major
  - Completed 15-112, ...
  - Done ... projects

Summary

Sources

- Gantt Chart created using software from the Gantt Project
  - http://www.ganttproject.biz/ (accessed June 4, 2013)