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A-o-A Editor

Tool to edit and visualize Activity-on-Arc networks

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Topics

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- Application Data
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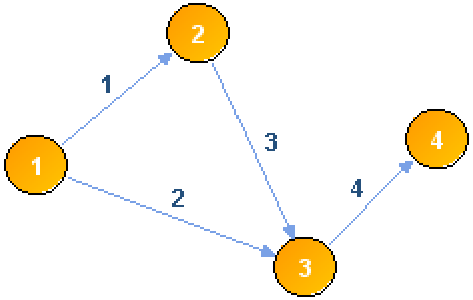
Introduction

- Integrated, along with several other projects, in a study that does research in the field of Project Management
- Necessity to allow the visualization of networks created in the projects of the refered study
- Two types of A-o-A networs to work with:
  - Single Resource
  - Multiple Resources

Acticity-on-Arc Networks

- Specifies the tasks that have to be concluded in order to complete the project



- Nodes mark the beginning and ending of each acticity
- Precedence of activities must be taken into account

Aplication Data

- Two types of networks stored in two types of files
- TXT file (single resource network):
  - Line 1 – number of arcs and nodes
  - Line 2 to n-2 – one activity per line (starting node, destination node, lambda, min and max)
  - Line n-1 – delay cost per unit
  - Line n – project due time

Aplication Data

- XML File (multiple resources networks)
  - Project name
  - Project’s due time and delay cost per unit
  - Resources (id, min, max, qcu, mcu)
  - Activities (id, starting and destination nodes)
    - Resources used by the activity (id, lambda, and occasionally changes to the default resource data)

Libraries

- Two libraries were used:

- JGraph
  - ▫ Open Source Java library
  - ▫ Graph visualization
  - ▫ Compatible with Java Swing
  - ▫ Provides many solutions and is quite extensive
  - ▫ Allows visual customization

Libraries

- JGrapht
  - Open Source Java library
  - Facilitates the manipulation of graph data
  - Easily integrated with JGraph
  - Enables the visualization of graphs

Application Design

- How to store application data?
- Three HashMaps created to store Nodes, Activities and Resources
- Another HashMap to store resources associated with each activity

Application Design

- Data related to the position and the dimension of nodes had to be stored in a separate file
- Extra coordinates had to be stored to preserve the curves in the arcs
- The applications developed previously weren’t prepared to deal with these constraints

Application Design

- AoA Files
  - Based in XML format
  - Stores nodes's coordinates and dimensions
  - Stores extra coordinates for each arc's curvature

- Export graphical layout to image formats suitable for Word and Latex use
  - PNG and EPS

Application Design

- Runs in two languages (English and Portuguese)
- The first menu allows us to:
  - Start a new single resource or multiple resource project
  - Open the two mentioned projects
  - Open a project with a graphical layout

Application Design

- The main interface allows:
  - Insertion and removal of nodes and activities
  - Saving the Network in two formats (TXT and XML)
  - Export to EPS and PNG
  - Changing the zoom
  - Changing the layout of the nodes
  - Modifying the arcs curvatures

Application Design

- Two additional interfaces
- One edits project resources
- The other edits resources associated with the activities

Application Design

- Three parsers were designed to read the data from the three file formats (TXT, XML an AoA)
- Another three parsers were design to write the data into the three file formats

Application Design

- Some important classes of the JGraph library:
  - **JGraph** – main class where all the graph information is stored (nodes, arcs and graphical atributes)
  - **GraphSelectionListener** – checks selected objects
  - **GraphUndoManager** – stores the state of the graph when there are changes in the layout

Application Design

- Some important classes of the JGrapht library:
  - **DefaultListenableGraph** – Type of graph that allows the use of listeners
  - **DefaultDirectedGraph** – Type of graph that allows external data (ex. from file) to be inserted **JGraphModelAdapter** – This class allows the two previous classes to be converted and used by JGraph (in this aplication only the DefaultListenable graph is used)

Application Design

- Method testProject()
  - Validates the project (checks for cycles and also if there is only one starting and ending nodes)
  - Calculates the projects expected duration (Critical Path Method)
- Class CoordCalc
  - Used to allocate nodes in the layout
  - This allocation only takes into account the minimizations of the intersections between nodes

Demonstration

- Creating Single Resource Network
- Opening created files (.AoA, .txt)
- Creating Multiple Resources Network
- Opening created files (.AoA, .xml)
- Editing Multiple networks

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