Artificial intelligence in videogames

2nd Partial Project

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Objective

The objective of this project is to implement and visualize Dijkstra's algorithm for finding the shortest path in a directed graph. Specifically:

1- Main Objectives:
  - Implement Dijkstra's algorithm for shortest path search.
  - Create an interactive graphical interface for graph visualization
  - Allow manual construction of directed graphs with weights.
2- Key functionalities:
  - Creating nodes by clicks on the screen.
  - Connecting nodes by directed edges with weights
  - Visual differentiation of edge direction (blue/red)
  - Display of the shortest path found
3- User interaction:
  - Input to select start node (Start)
  - Input to select end node (End)
  - Input to define edge weights
  - RUN button to run the algorithm
  - DELETE button to clear the network
4- Visualization:
  - Nodes represented as circles with letters (A-Z).
  - Edges represented as directional arrows
  - Weights shown next to edges
  - Visual highlighting of the shortest path found
5- Practical Application: This project serves as an educational tool to:
  - Understand the operation of Dijkstra's algorithm.
  - Visualize how directed graphs behave
  - Understand the concept of shortest paths in weighted graphs
  - Experimenting with different configurations of nodes and edges

Installation and Running Guide - Dijkstra Viewer

Prerequisites

    - Ruby installed (check with `ruby -v` in the terminal, in case it is not installed go to point 1 of Troubleshooting Common Problems)

    - Visual Studio Code installed

    - Terminal access

Step 1: Install Ruby2D

    1. Open the terminal (CMD on Windows)

    2. Execute the following command:

        gem install ruby2d

Step 2: Project Structure

  - Verify that the project has the following folder and file structure

```
Dijkstra/
│
├── assets/
│   └── fonts/
│       └── ArimaMadurai-Regular.ttf
│
├── lib/
│   ├── visual/
│   │   ├── ventana.rb
│   │   ├── nodo.rb
│   │   └── arista.rb
│   │
│   ├── algoritmo/
│   │   └── dijkstra.rb
│   │
│   └── grafo/
│       └── grafo.rb
│
└── main.rb
```

Step 3: Download the font (in case you lost it)

- Download the font 'ArimaMadurai-Regular.ttf'.
- Download link: https://font.download/font/arima-madurai
- Place the downloaded file in the **assets/fonts/** folder.

Step 4: Configuring Visual Studio Code

- Open VS Code
- Go to File -> Open Folder
- Select the folder Dijkstra
- Install recommended extensions (optional):
    o Ruby (the non-deprecated)
    o Ruby Solargraph
    o Code Runner

Step 5: Run the Program

- Open a terminal in VS Code (Terminal -> New Terminal)
- Make sure you are in the root folder of the project.
- Execute the command:
    o ruby main.rb

Use of the Program

1- Create Nodes
- Click anywhere in the window to create a node.
- Nodes are automatically named (A, B, C...)

2- Connect Nodes
- Click on a source node
- Click on a destination node
- Enter the weight in the input "Weight" (default is 1)

3- Calculate Shortest Route
- In the "Start" input, type the letter of the start node
- In the "End" input, type the letter of the end node.
- Click on the "RUN" button

4- Edge Colors
- Blue: Alphabetically smaller to larger node connections (A→B).
- Red: Connections from alphabetically major to minor node (B→A)
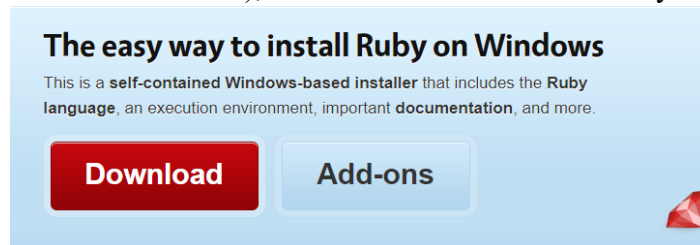- Green: Shortest path found

5- Delete All
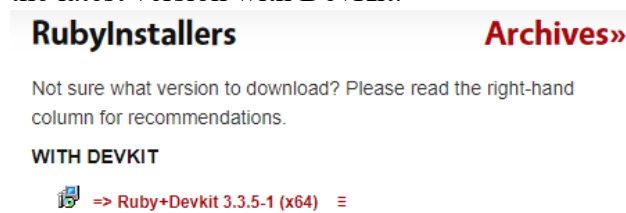- Click on the "DELETE" button to clear the screen.

Troubleshooting Common Problems

1- Ruby Installation (Windows)
- Go to the following link: https://www.ruby-lang.org/es/downloads/

  - En Linux/Unix, puedes utilizar el sistema de gestión de paquetes de tu distribución o herramientas de terceros (rbenv y RVM).
  - En computadoras con sistema operativo macOS, puedes utilizar herramientas de terceros (rbenv y RVM).
  - En computadoras con sistema operativo Windows, puedes utilizar RubyInstaller.

- Enter the link that corresponds to your operating system (Mac and Linux use commands for the installation), in case of Windows enter RubyInstaller

The easy way to install Ruby on Windows

This is a **self-contained Windows-based installer** that includes the **Ruby language**, an execution environment, important **documentation**, and more.

Download   **Add-ons**

- Select the Download button, which will show all Ruby versions, I recommend installing the latest version with DevKit.

RubyInstallers   **Archives»**

Not sure what version to download? Please read the right-hand column for recommendations.

WITH DEVKIT

=> Ruby+Devkit 3.3.5-1 (x64)

- When the download is finished, run the file, it will ask for administrator permission, we give it to you, you will be asked to accept the license agreement and the installation of the file will start.

- When the download is finished, the CMD will open, it will ask you to decide which components to install, I recommend to give ENTER, this option makes the installation by default.
- To verify that the installation was successful, open a new CMD and enter the command "ruby -v", this should show the Ruby version, if there is an error, the Ruby installation was incorrect.
- If the download was successful, you need to install "Rails", for this in the CMD enter the following command "gem install rails", after that install ruby2d, with the command "gem install ruby2d".

2- Error: cannot load such file -- ruby2d

- Solution: Run "gem install ruby2d"

3- Error: Source not found

- Verify that the .ttf file is in the correct folder
- Verify that the file name is an exact match

4- Window does not appear

- Verify that Ruby2D is installed correctly
- Verify that there is no other program using the graphics port

5- Windows permissions errors

- Run CMD as administrator
- Verify write permissions on the project folder

Recommendations

- Keep Ruby and Ruby2D up to date
- Use the latest version of Visual Studio Code
- On Windows, consider using Git Bash instead of CMD
- Keep a backup copy of the code

Notes

- The program uses Ruby2D for the graphical interface
- The window has a fixed size of 800x600 pixels.
- Nodes are automatically named from A to Z
- The program is compatible with Windows, Linux and macOS

Examples of Use