User Guide: Fractional Knapsack Problem Visualizer

AOA IA2 Simulation Algorithms Project by ~

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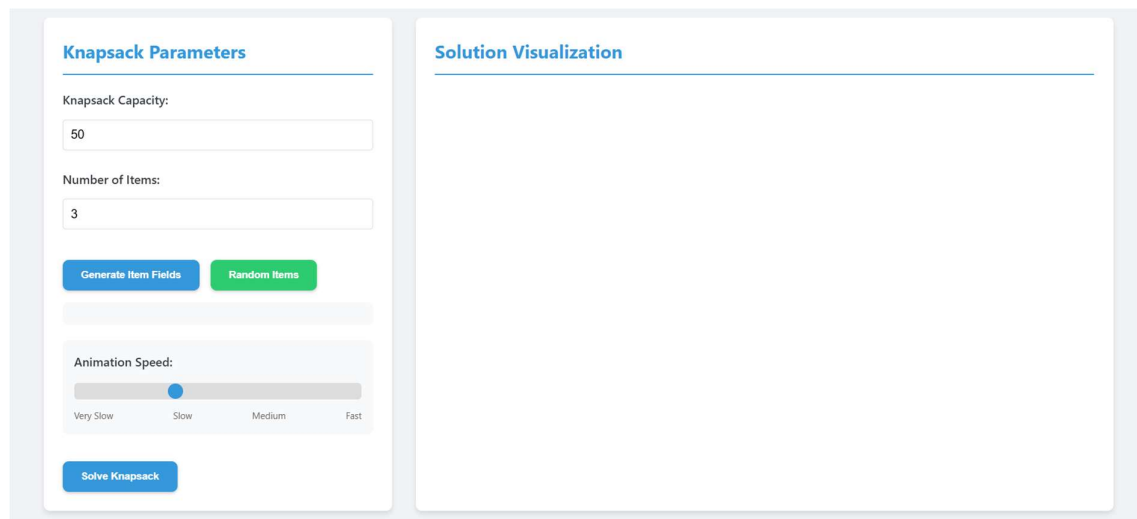
Class: E2

Overview

This tool provides an interactive visualization of the Fractional Knapsack Problem using the Greedy Algorithm. Users can input item details or generate them randomly, then visualize how the algorithm selects items to maximize value within a weight constraint.

How to Use the Visualizer:

1. Set Knapsack Parameters

- **Knapsack Capacity:**
  Enter the maximum weight the knapsack can hold (e.g., 50).

- **Number of Items:**
  Enter how many items you want to consider (e.g., 3).

Note: Both fields are required before generating item fields.

2. Generate Items

You have two options:

- **Generate Item Fields:**
  Creates empty input fields for you to manually enter each item's:

  - Weight

  - Value

- **Random Items:**
  Automatically generates random weights and values for the specified number of items.

3. Set Animation Speed

Use the slider to control the visualization speed:

- Very Slow

- Slow

- Medium

- Fast

Number of Items:

3

Generate Item Fields   Random Items

Item 1:   10   60

Item 2:   20   100

Item 3:   30   120

Animation Speed:

Very Slow   Slow   Medium   Fast

Solve Knapsack

Solution Visualization

Number of Items:

3

Generate Item Fields   Random Items

Item 1:   10   60

Item 2:   20   100

Item 3:   30   120

Animation Speed:

Very Slow   Slow   Medium   Fast

Solve Knapsack

Solution Visualization

4. Solve Knapsack

Click the "Solve Knapsack" button to:

- Run the Greedy Fractional Knapsack Algorithm

- Display a step-by-step visualization:
    - Value-to-weight ratios
    - Item selection process
   - Total value obtained

Algorithm Details

- **Greedy by Value/Weight Ratio**:
  - Sorts items by value/weight in descending order.
  - Fills the knapsack starting with the item with the highest ratio.
  - If the knapsack can't fit the full item, it takes the possible fraction.
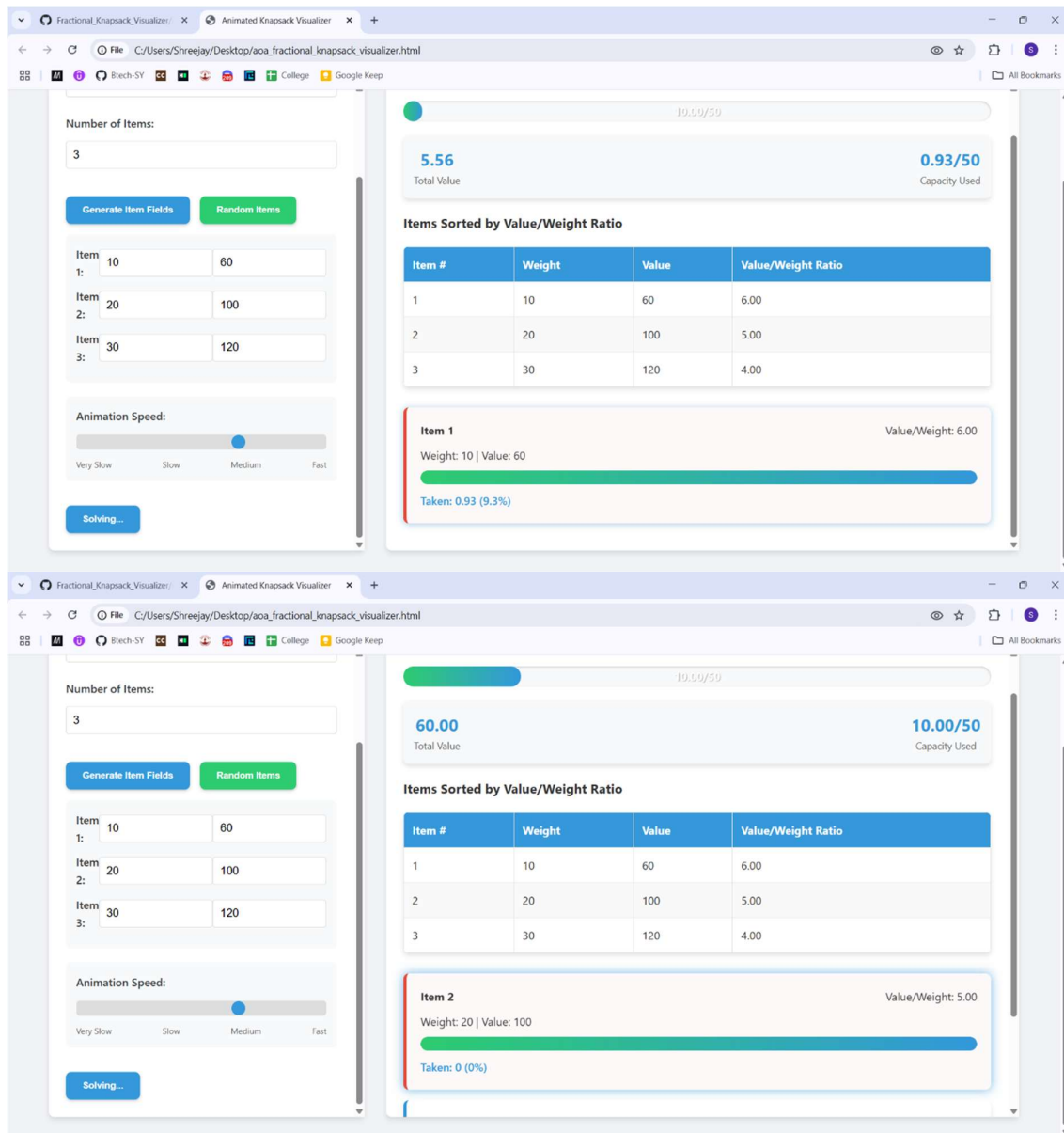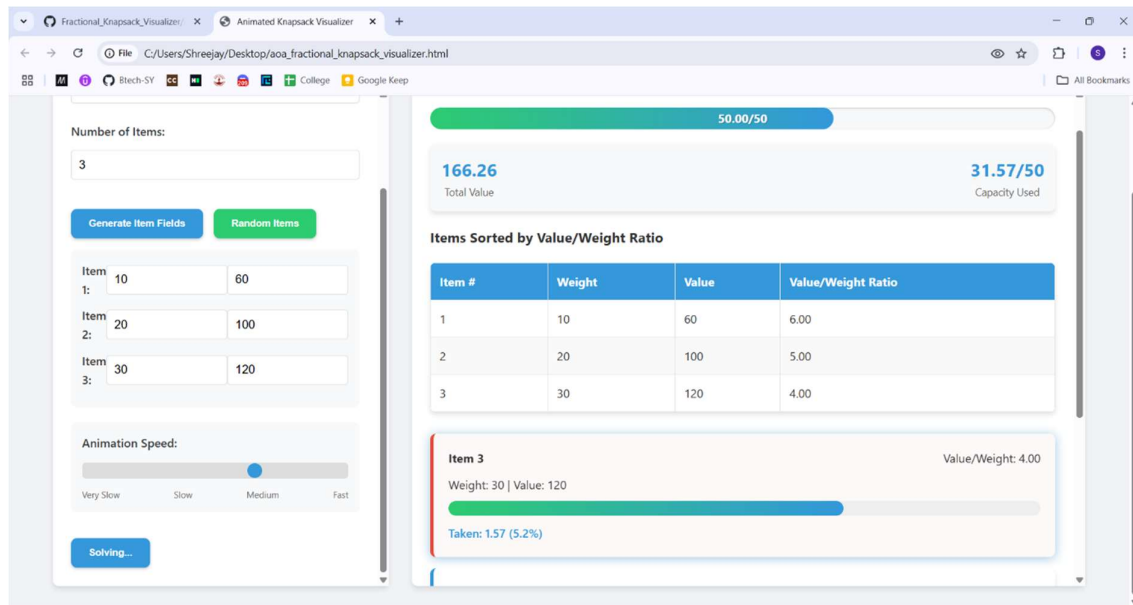
Output Sections

- **Result:**
  Displays the total value accumulated in the knapsack.

- **Ratio Table:**
  Shows all items with:

  - Weight

  - Value

  - Ratio

- **Items Visualization:**
  Shows selected items and how much of each was added.
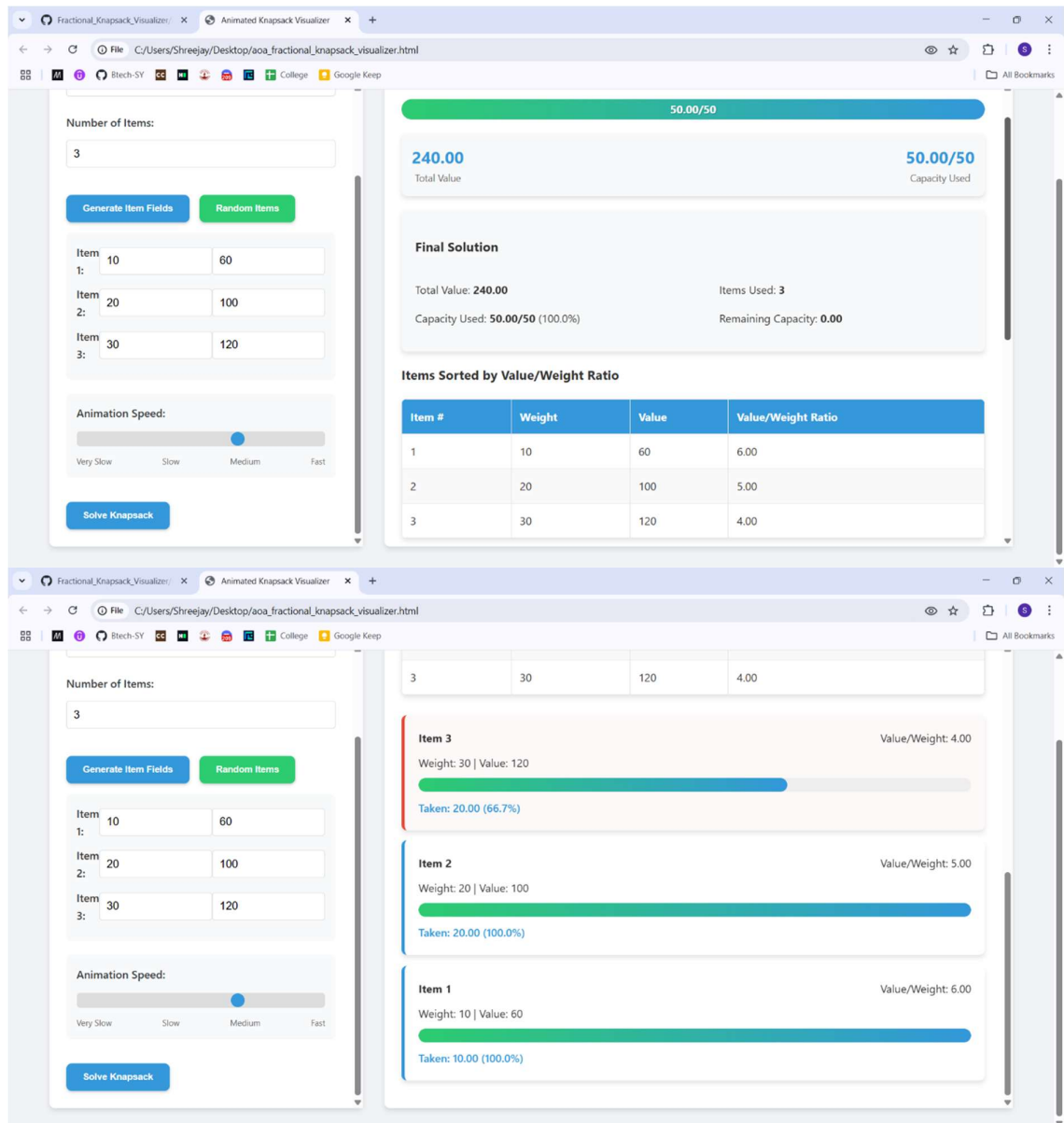
Example

1. Capacity: 50

2. Items: 3

3. Enter:

    o   Item 1: Value = 60, Weight = 10

    o   Item 2: Value = 100, Weight = 20

    o   Item 3: Value = 120, Weight = 30

4. Run the visualizer → it will pick Item 2, Item 1, and 2/3 of Item 3 to maximize the total value.

Troubleshooting

- **Nothing happens after clicking Solve**
  Solution:- Ensure all input fields are filled and valid numbers.

- **Negative or zero values entered**
  Solution:- All values must be positive and non-zero.