

316 Data Structures

Assignment #1

(Due: Sept. 10, 2020)

Objective: To practice the implementation skills with array and linked list.

Assignment:

Implement a city database using array and linked list. Each database record contains the name of the city (a string of arbitrary length) and the coordinates of the city expressed as real numbers x and y coordinates.

- (1) Your database should allow records to be inserted, deleted by name or coordinates, and searched by name or coordinates.
- (2) Another operation that should be supported is to print all records within a given distance of a specified point.

Implement the database using a static array-based list implementation, and then a linked list implementation.

(Please write down yours answers to the following four questions using a word document.)

- 1) Collect running time statistics for each operation in both implementations.
- 2) What are your conclusions about the relative advantages and disadvantages of the two implementations?
- 3) Would storing records on the list in alphabetical order by city name speed any of the operations?
- 4) Would keeping the list in alphabetical order slow any of the operations?

Submission:

Put all files and documents related to the assignment to a directory named **A#- UANetID** (where A# is the assignment number, UANetID is your UANetID). And zip the directory. Then, submit your assignment using Brightspace.

Input/output Format

Implementation Options:

- A. Use an array-based list implementation
- B. Use a linked-list implementation

Operation Options:

- 1. Insert a record
- 2. Search for a record by name
- 3. Search for a record by coordinate
- 4. Delete a record by name
- 5. Delete a record by coordinate
- 6. Print records within a given distance of a specified location
- 7. Print all records
- 8. Exit

Enter your implementation option: A

Enter your operation option: 1

Enter name of the city: Akron

Enter x coordinate of the city: 41.081549

Enter y coordinate of the city: -81.519000

Record inserted successfully.

Implementation Options:

- A. Use an array-based list implementation
- B. Use a linked-list implementation

Operation Options:

- 1. Insert a record
- 2. Search for a record by name
- 3. Search for a record by coordinate
- 4. Delete a record by name
- 5. Delete a record by coordinate
- 6. Print records within a given distance of a specified location
- 7. Print all records
- 8. Exit

Enter your implementation option: A

Enter your operation option: 1

Enter name of the city: Cleveland

Enter x coordinate of the city: 41.499566

Enter y coordinate of the city: -81.696117

Record inserted successfully.

(Note: if the city which you are going to insert is already in the records, please print out " [No need to insert again, as this record exists in the existing data set.](#)")

Implementation Options:

- A. Use an array-based list implementation
- B. Use a linked-list implementation

Operation Options:

- 1. Insert a record
- 2. Search for a record by name
- 3. Search for a record by coordinate
- 4. Delete a record by name
- 5. Delete a record by coordinate
- 6. Print records within a given distance of a specified location
- 7. Print all records
- 8. Exit

Enter your implementation option: A

Enter your operation option:2

Enter name of the city to be searched: Akron

Output:

Akron, (41.081549,-81.519000)

(Note: if the city which you are looking for is not in the records, please print out "No such record exists in the existing data set.")

Implementation Options:

- A. Use an array-based list implementation
- B. Use a linked-list implementation

Operation Options:

- 1. Insert a record
- 2. Search for a record by name
- 3. Search for a record by coordinate
- 4. Delete a record by name
- 5. Delete a record by coordinate
- 6. Print records within a given distance of a specified location
- 7. Print all records
- 8. Exit

Enter your implementation option: A

Enter your choice: 4

Enter name of the city to be deleted: Akron

Deleted successfully.

(Note: if the city which you are going to delete is not in the records, please print out "No such record exists in the existing data set.")

Implementation Options:

- A. Use an array-based list implementation
- B. Use a linked-list implementation

Operation Options:

- 1. Insert a record
- 2. Search for a record by name
- 3. Search for a record by coordinate
- 4. Delete a record by name
- 5. Delete a record by coordinate
- 6. Print records within a given distance of a specified location
- 7. Print all records
- 8. Exit

Enter your implementation option: A

Enter your choice: 6

Enter name of the specified location: Akron

Enter distance: 45

Output:

City A (x1, y1)

City B (x2, y2)

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(Note: if there is no city within the given distance, please print out "[No such record exists in the existing data set.](#)")
