

## DESIGN ANALYSIS AND ALGORITHMS

### HANDSON-12

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#### Overview

The DynamicList class implements a dynamic array (list) in Python that automatically resizes as elements are added or removed. It starts with a small size and expands or shrinks based on usage, ensuring efficient memory management.

#### Features

- **Automatic resizing:** Doubles the list size when full and halves when too sparse.
- **Efficient operations:** Supports appending, accessing, updating, and removing elements in constant time (amortized).
- **Error handling:** Provides safe access with IndexError for out-of-bounds operations.

#### Methods

##### 1. `__init__()`

- Initializes an empty list with a capacity of 1.

##### 2. `append(item)`

- Adds an item to the end. Resizes the list if full.

##### 3. `fetch(index)`

- Retrieves an item by index. Raises IndexError if invalid.

##### 4. `update(index, item)`

- Updates the item at the given index. Raises IndexError if invalid.

##### 5. `remove_last()`

- Removes the last item and shrinks the list if necessary.

##### 6. `__repr__()`

- Returns a string representation of the list's current elements.

#### Complexity

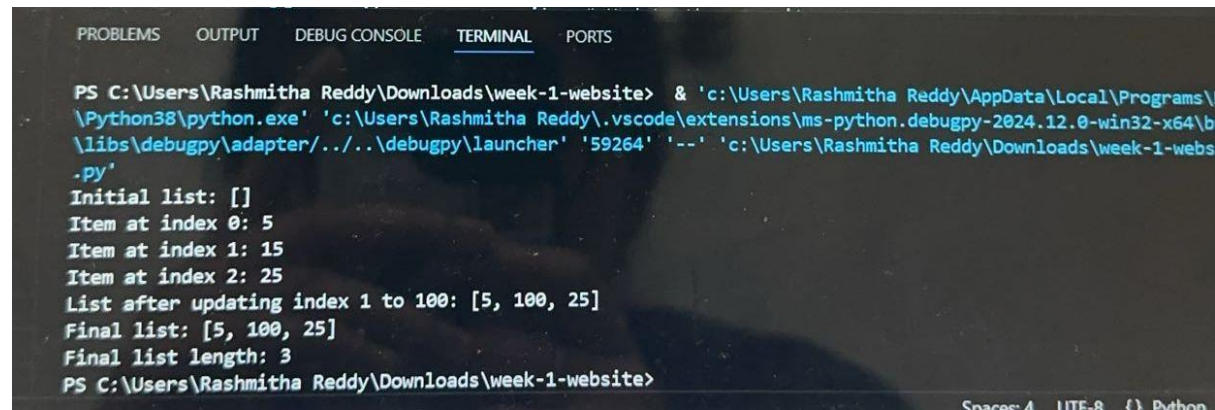
- **Append:**  $O(1)$  $O(1)$  $O(1)$  (amortized).
- **Fetch:**  $O(1)$  $O(1)$  $O(1)$ .
- **Update:**  $O(1)$  $O(1)$  $O(1)$ .

- **Remove Last:**  $O(1)O(1)O(1)$ .

## Conclusion

DynamicList efficiently manages a dynamic array with automatic resizing, ensuring that most operations are performed in constant time. It's a great solution for managing an array with unpredictable sizes

OUTPUT:



```
PS C:\Users\Rashmitha Reddy\Downloads\week-1-website> & 'c:\Users\Rashmitha Reddy\AppData\Local\Programs\Python\Python38\python.exe' 'c:\Users\Rashmitha Reddy\.vscode\extensions\ms-python.debugpy-2024.12.0-win32-x64\bin\libs\debugpy\adapter\..\..\debugpy\launcher' '59264' '--' 'c:\Users\Rashmitha Reddy\Downloads\week-1-website\main.py'
Initial list: []
Item at index 0: 5
Item at index 1: 15
Item at index 2: 25
List after updating index 1 to 100: [5, 100, 25]
Final list: [5, 100, 25]
Final list length: 3
PS C:\Users\Rashmitha Reddy\Downloads\week-1-website>
```