

KONYA FOOD and AGRICULTURE UNIVERSITY

Computer Engineering

OS Paging Project

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Computer Engineering / 3

LRU Page Replacement Simulation - Operating Systems Project

1. Introduction

Topic: Page Replacement using the Least Recently Used (LRU) algorithm.

Goal: Simulate page insertions in memory with 4 frames using LRU.

Given: Page reference string → 8, 1, 2, 3, 1, 4, ...

Tools Used: Python, Matplotlib, Pandas, Visual Studio Code

2. What is LRU?

LRU (Least Recently Used) replaces the page that has not been used for the longest time.

If memory is full and a new page needs to be loaded:

- Remove the least recently used page
- Insert the new page

Objective: Minimize the number of page faults.

3. Algorithm Workflow

- If the page is not in memory:
 - Page fault occurs
 - If memory is full, remove the oldest used page
- If the page is already in memory:
 - Move it to the end to mark as recently used

4. Code Overview

Implemented using Python and Matplotlib.

Main Components:

- Memory simulated with deque
- Visualized step-by-step with FuncAnimation
- Data exported with Pandas to Excel

5. Animation Visualization

Each memory frame is shown step-by-step with colors:

- █ Newly inserted page
- █ Removed page
- █ Existing pages

Title shows the incoming page and total page faults so far.

6. Excel Output

For each step:

- Incoming page
- Page fault status
- Inserted and removed pages
- Content of all memory frames

Saved as 'lru_simulation_output.xlsx'

7. Results

- Total number of page faults: e.g., 12
- LRU algorithm visualized efficiently
- Code helps understand the algorithm and keeps logs

8. Learnings

- Learned how LRU works in memory management

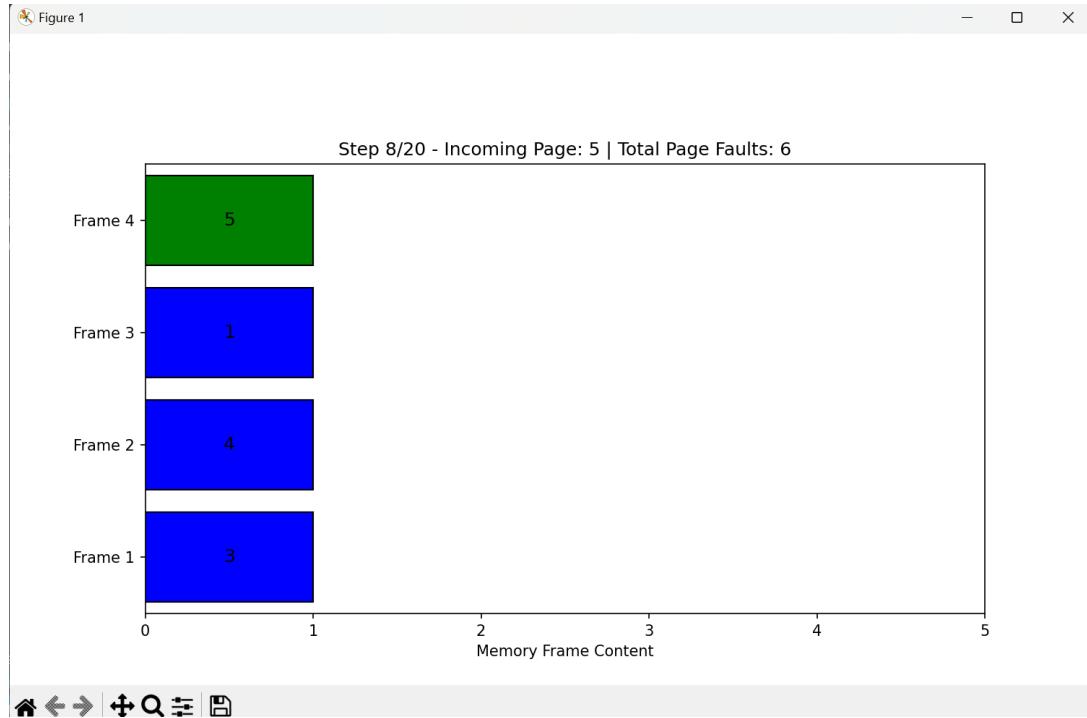
- Improved simulation and data logging skills
- Gained practical understanding of OS concepts

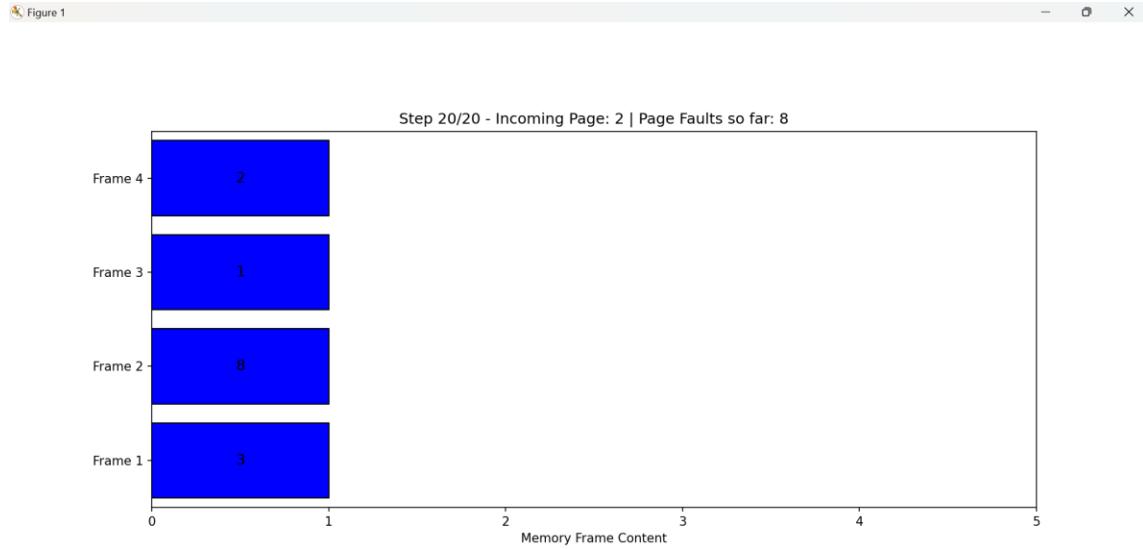
There are some things to be imported such as:

```
import matplotlib.pyplot as plt  
from matplotlib.animation import FuncAnimation  
from matplotlib.patches import Rectangle  
from collections import deque  
import pandas as pd
```

All of them works perfectly.

I imported **pip install matplotlib pandas openpyxl** to create an excel table file. Also **pip install matplotlib** is imported by me to show the diagram for this project.





This is the result i get with the help of matplotlib.

Also in this project i used pandas.

OSProject

File Edit Selection View Go Run ... ← → 🔍 OSProject

EXPLORER OPEN EDITORS Iru_simulation_output.xlsx

A T B T C T D T E T F T G T H T I T

	Step	Incoming Page	Page Fault	Inserted Page	Removed Page	Memory Frame	Memory Frame	Memory Frame	Memory Frame
1	1	8	Yes		8	8			
2	2	1	Yes		1	8	1		
3	3	2	Yes	2		8	1	2	
4	4	3	Yes	3		8	1	2	3
5	5	1	No			8	2	3	1
6	6	4	Yes	4	8	2	3	1	4
7	7	1	No			2	3	4	1
8	8	5	Yes	5	2	3	4	1	5
9	9	3	No			4	1	5	3
10	10	4	No			1	5	3	4
11	11	1	No			5	3	4	1
12	12	4	No			5	3	1	4
13	13	3	No			5	1	4	3
14	14	2	Yes	2	5	1	4	3	2
15	15	3	No			1	4	2	3
16	16	1	No			4	2	3	1
17	17	2	No			4	3	1	2
18	18	8	Yes	8	4	3	1	2	8
19	19	1	Nn			3	2	8	1
20									

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And created an excel table with the help of pandas.