

## Отчет по домашнему заданию №9

### 1. Сравнение использования weakref и слотов

Для чистоты эксперимента произведем несколько запусков программы.

Результаты запуска программы с использованием обычных атрибутов смотри на Рисунке 1.

```
(.venv) (base) → 09 git:(main) × python3 ordinary.py
time of creating 2000000 objects --- 1.4142708778381348 seconds ---
time of access to 2000000 objects --- 0.6458780765533447 seconds ---
time of modifying 2000000 objects --- 0.5183689594268799 seconds ---
time of deleting 2000000 objects --- 0.36330389976501465 seconds ---
(.venv) (base) → 09 git:(main) × python3 ordinary.py
time of creating 2000000 objects --- 1.4175007343292236 seconds ---
time of access to 2000000 objects --- 0.37233829498291016 seconds ---
time of modifying 2000000 objects --- 1.8045639991760254 seconds ---
time of deleting 2000000 objects --- 0.8134441375732422 seconds ---
(.venv) (base) → 09 git:(main) × python3 ordinary.py
time of creating 2000000 objects --- 1.4070122241973877 seconds ---
time of access to 2000000 objects --- 0.45262694358825684 seconds ---
time of modifying 2000000 objects --- 0.5474660396575928 seconds ---
time of deleting 2000000 objects --- 0.3507518768310547 seconds ---
(.venv) (base) → 09 git:(main) × python3 ordinary.py
time of creating 2000000 objects --- 1.5022950172424316 seconds ---
time of access to 2000000 objects --- 0.28736019134521484 seconds ---
time of modifying 2000000 objects --- 0.4759228229522705 seconds ---
time of deleting 2000000 objects --- 0.5058109760284424 seconds ---
(.venv) (base) → 09 git:(main) × python3 ordinary.py
time of creating 2000000 objects --- 1.5754668712615967 seconds ---
time of access to 2000000 objects --- 0.3530080318450928 seconds ---
time of modifying 2000000 objects --- 0.48546886444091797 seconds ---
time of deleting 2000000 objects --- 0.5776171684265137 seconds ---
```

Рисунок 1 – Время работы программы с использованием обычных атрибутов

Результаты запуска программы с использованием слотов смотри на Рисунке 2.

```
(.venv) (base) → 09 git:(main) × python3 slots.py
time of creating 2000000 objects --- 0.9023640155792236 seconds ---
time of access to 2000000 objects --- 0.2693519592285156 seconds ---
time of modifying 2000000 objects --- 0.4391591548919678 seconds ---
time of deleting 2000000 objects --- 0.2507598400115967 seconds ---
(.venv) (base) → 09 git:(main) × python3 slots.py
time of creating 2000000 objects --- 0.9140911102294922 seconds ---
time of access to 2000000 objects --- 0.2684197425842285 seconds ---
time of modifying 2000000 objects --- 0.43010401725769043 seconds ---
time of deleting 2000000 objects --- 0.24267816543579102 seconds ---
(.venv) (base) → 09 git:(main) × python3 slots.py
time of creating 2000000 objects --- 0.9139969348907471 seconds ---
time of access to 2000000 objects --- 0.2707221508026123 seconds ---
time of modifying 2000000 objects --- 0.43618106842041016 seconds ---
time of deleting 2000000 objects --- 0.24388360977172852 seconds ---
(.venv) (base) → 09 git:(main) × python3 slots.py
time of creating 2000000 objects --- 0.8796849250793457 seconds ---
time of access to 2000000 objects --- 0.3775010108947754 seconds ---
time of modifying 2000000 objects --- 0.5324699878692627 seconds ---
time of deleting 2000000 objects --- 0.24569416046142578 seconds ---
(.venv) (base) → 09 git:(main) × python3 slots.py
time of creating 2000000 objects --- 0.9074742794036865 seconds ---
time of access to 2000000 objects --- 0.26791977882385254 seconds ---
time of modifying 2000000 objects --- 0.428847074508667 seconds ---
time of deleting 2000000 objects --- 0.24651384353637695 seconds ---
```

Рисунок 2 – Время работы программы с использованием слотов

Результаты запуска программы с использованием weakref смотри на Рисунке 3.

```
(.venv) (base) → 09 git:(main) × python3 weakrefs.py
time of creating 2000000 objects --- 6.709449052810669 seconds ---
time of access to 2000000 objects --- 0.8732359409332275 seconds ---
time of modifying 2000000 objects --- 1.59647798538208 seconds ---
time of deleting 2000000 objects --- 1.616779088973999 seconds ---
(.venv) (base) → 09 git:(main) × python3 weakrefs.py
time of creating 2000000 objects --- 3.2852728366851807 seconds ---
time of access to 2000000 objects --- 0.6943681240081787 seconds ---
time of modifying 2000000 objects --- 1.4159801006317139 seconds ---
time of deleting 2000000 objects --- 1.4873299598693848 seconds ---
(.venv) (base) → 09 git:(main) × python3 weakrefs.py
time of creating 2000000 objects --- 5.950564861297607 seconds ---
time of access to 2000000 objects --- 0.9690542221069336 seconds ---
time of modifying 2000000 objects --- 1.8319199085235596 seconds ---
time of deleting 2000000 objects --- 1.7476670742034912 seconds ---
(.venv) (base) → 09 git:(main) × python3 weakrefs.py
time of creating 2000000 objects --- 4.208540916442871 seconds ---
time of access to 2000000 objects --- 0.5751402378082275 seconds ---
time of modifying 2000000 objects --- 0.9855737686157227 seconds ---
time of deleting 2000000 objects --- 1.105882167816162 seconds ---
(.venv) (base) → 09 git:(main) × python3 weakrefs.py
time of creating 2000000 objects --- 7.156334161758423 seconds ---
time of access to 2000000 objects --- 0.9145429134368896 seconds ---
time of modifying 2000000 objects --- 1.796738862991333 seconds ---
time of deleting 2000000 objects --- 1.4857780933380127 seconds ---
```

Рисунок 3 – Время работы программы с использованием weakref

**Вывод:** по замерам видно, что с использованием слотов создание и удаление объектов происходит значительно быстрее. С использованием weakref все операции сильно замедляются.

## Профилирование вызовов и памяти в программе.

Профилирование вызовов и памяти в программе и использованием слотов смотри на рисунке 4.

49	44.7 MiB	-142.7 MiB	200004	flats = [Flat(all_windows[i], all_floors[i], all_rooms[i], all_doors[i])
50	44.7 MiB	-75.0 MiB	100001	for i in range(times_of_run)
51				]
52				
53	44.7 MiB	-0.1 MiB	1	time_2 = time.time()
54	44.8 MiB	0.1 MiB	2	print(f"time of creating {times_of_run} objects "
55	44.7 MiB	0.0 MiB	1	f"--- {time_2 - time_1} seconds ---")
56				
57	44.8 MiB	-980180.6 MiB	100001	for i in range(times_of_run):
58	44.8 MiB	-980167.9 MiB	100000	if flats[i].floor is not None:
59				pass

Рисунок 4 – Профилирование вызовов и памяти в программе и использованием слотов

Профилирование вызовов и памяти в программе и использованием обычных атрибутов смотри на рисунке 5.

48	56.8 MiB	-4192.2 MiB	200004	flats = [Flat(all_windows[i], all_floors[i], all_rooms[i], all_doors[i])
49	56.8 MiB	-2104.0 MiB	100001	for i in range(times_of_run)
50				]
51				
52	56.8 MiB	0.0 MiB	1	time_2 = time.time()
53	56.9 MiB	0.1 MiB	2	print(f"time of creating {times_of_run} objects "
54	56.8 MiB	0.0 MiB	1	f"--- {time_2 - time_1} seconds ---")
55				
56	57.0 MiB	-87405.3 MiB	100001	for i in range(times_of_run):
57	57.0 MiB	-87404.4 MiB	100000	if flats[i].floor is not None:
58				pass

Рисунок 5 – Профилирование вызовов и памяти в программе и использованием обычных атрибутов

Профилирование вызовов и памяти в программе и использованием weakref смотри на рисунке 6.

49	88.2 MiB	47.5 MiB	200004	flats = [Flat(all_windows[i], all_floors[i], all_rooms[i], all_doors[i])
50	88.2 MiB	0.0 MiB	100001	for i in range(times_of_run)
51				]
52				
53	88.2 MiB	0.0 MiB	1	time_2 = time.time()
54	88.2 MiB	0.0 MiB	2	print(f"time of creating {times_of_run} objects "
55	88.2 MiB	0.0 MiB	1	f"--- {time_2 - time_1} seconds ---")
56				
57	88.2 MiB	-409300.9 MiB	100001	for i in range(times_of_run):
58	88.2 MiB	-409295.9 MiB	100000	if flats[i].floor is not None:
59				pass

## Рисунок 6 – Профилирование вызовов и памяти в программе и использованием weakref

**Вывод:** по замерам видно, что для использования памяти справедливо следующее неравенство: (память с использованием слотов) < (память с использованием обычных атрибутов) < (память с использованием weakref).