Memory Allocation Simulator

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Installation and Overview

- Take the .jar or .exe file from the flash drive and install anywhere you wish on your computer
- Note: .jar and .exe file require java version 1.8 or higher to be installed, .exe requires a windows computer
- Program uses first fit, best fit, worst fit, and next fit, with both fixed and dynamic partitions, to simulate memory allocation
- Program saves the results of each snapshot of a simulation to strings
- These strings are printed to text pane objects in the GUI when the main class calls the simulations to start
- Only thing user is required to do is run the .jar or .exe file and the simulations will run in the background and then display on the screen

Job Class

- Job class holds all the information
  - Name
  - Size
  - Status
- Get/set methods like normal
- toString prints all info of the job

Partition Class

- Holds info about the partitions
  - Name
  - Size
  - Memory address
  - Status (free or not)
  - Job running in partition
  - Job name
  - Job size
  - Amount of fragmentation

FixedMemoryAllocator Class

- Holds the logic of first, best, worst, and next fit
- Loops through the jobs and partitions to allocate
- First fit loops through and simply compares the job size to partition size
- Best fit does something similar but first sorts the list of partitions by job size smallest to largest. Then similar steps to the first fit is used. (once the list is sorted by smallest – largest, the first fit essentially becomes the best fit)
- Worst fit does same as best fit but opposite
- Next fit is similar to first fit but has an added step that changes the index to loop from, once a job is allocated
- Returns strings that hold the results of each snapshot

DynamicMemoryAllocator Class

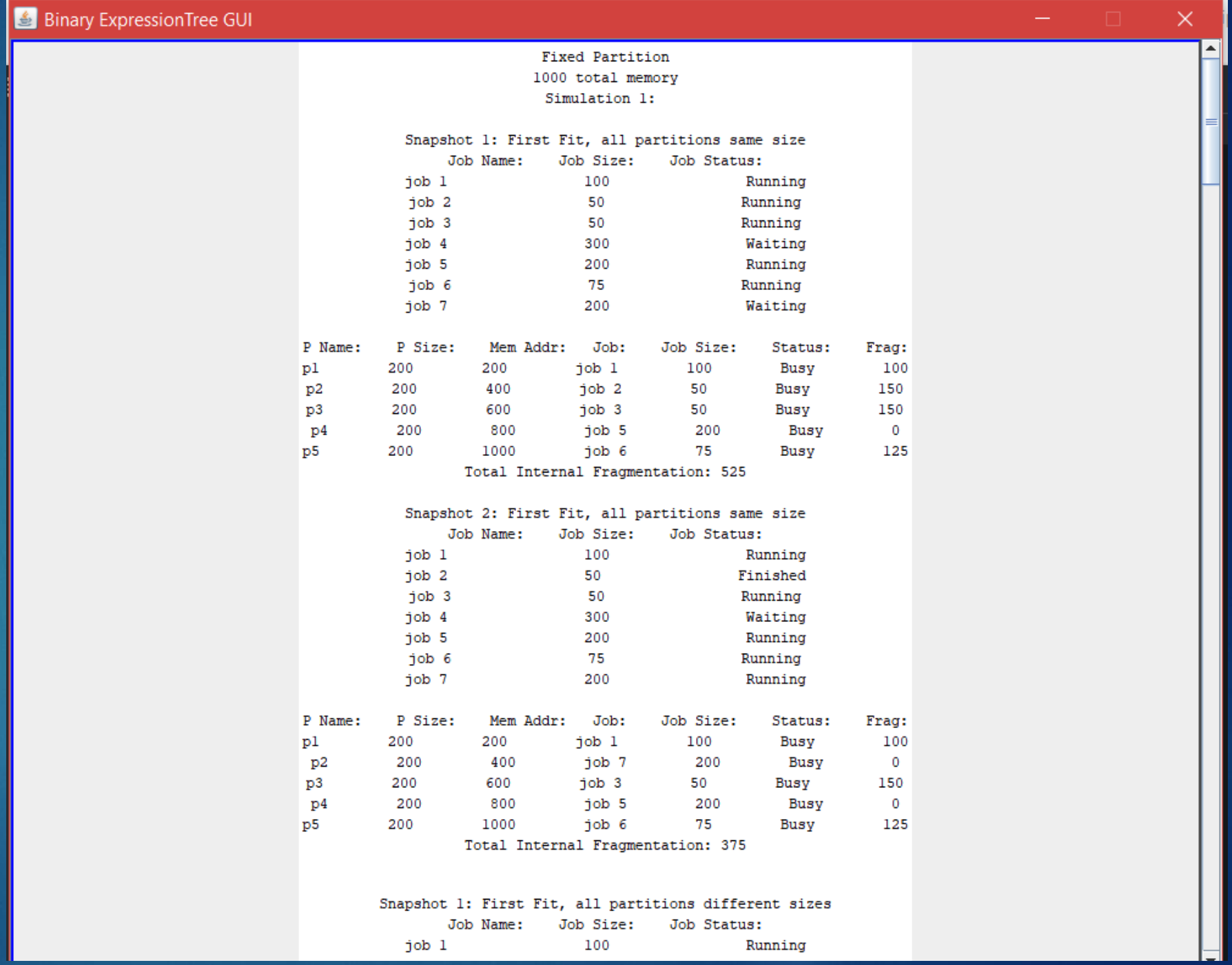
- Holds the logic of first, best, worst, and next fit
- Loops through the jobs and partitions to allocate
- Slightly different to fixed partition in order to take advantage of the dynamic partitions
- All algorithms start the same by allocating the initial jobs to partitions that fit the job size. Then once the initial jobs start to finish, the functionality to resize partitions and create new ones that become external fragmentation, is added.
- Returns strings that hold the results of each snapshot

MemorySimulator Class (Main)

- Main class that calls the different simulations of fixed partition allocator and dynamic allocator
- Creates fixedPartitonAllocator and DynamicPartitionAllocator objects
- Adds jobs and partitions as needed to create different simulations that show how the algorithms work
- Calls the gui to draw the results of each simulation

GUI

- The Following Slides have examples of the GUI used.
- Please note: These pictures are for demonstration purposes, they do not show everything that the GUI prints, some things have been left out for the sake of time
- Please run the program with the .jar or .exe file in order to see everything



Binary ExpressionTree GUI

```
p3        200        600        job 3        50        Busy        150
 p4       200        800        job 5        200        Busy        0
p5        200        1000       job 6        75        Busy        125
                  Total Internal Fragmentation: 375


          Snapshot 1: First Fit, all partitions different sizes
                  Job Name:    Job Size:    Job Status:
                    job 1          100          Running
                    job 2          50           Running
                    job 3          50           Running
                    job 4          300          Waiting
                    job 5          200          Running
                    job 6          75           Running
                    job 7          200          Waiting

P Name:    P Size:    Mem Addr:    Job:    Job Size:    Status:    Frag:
p1        400        400        job 1        100        Busy        300
 p2       100        500        job 2        50         Busy        50
  p3      50         550        job 3        50         Busy        0
 p4       200        750        job 5        200        Busy        0
p5        250        1000       job 6        75         Busy        175
                  Total Internal Fragmentation: 525

          Snapshot 2: First Fit, all partitions different sizes
                  Job Name:    Job Size:    Job Status:
                    job 1          100          Running
                    job 2          50           Running
                    job 3          50           Finished
                    job 4          300          Waiting
                    job 5          200          Finished
                    job 6          75           Running
                    job 7          200          Running

P Name:    P Size:    Mem Addr:    Job:    Job Size:    Status:    Frag:
p1        400        400        job 1        100        Busy        300
 p2       100        500        job 2        50         Busy        50
   p3     50         550                               Free        0
 p4       200        750        job 7        200        Busy        0
p5        250        1000       job 6        75         Busy        175
                  Total Internal Fragmentation: 525


                        Snapshot 1: Best Fit
                  Job Name:    Job Size:    Job Status:
```

Binary ExpressionTree GUI

Snapshot 1: Best Fit

Job Name:	Job Size:	Job Status:
job 1	100	Running
job 2	50	Running
job 3	50	Running
job 4	300	Running
job 5	200	Running
job 6	75	Waiting
job 7	200	Waiting

P Name:	P Size:	Mem Addr:	Job:	Job Size:	Status:	Frag:
p3	50	550	job 2	50	Busy	0
p2	100	500	job 1	100	Busy	0
p4	200	750	job 3	50	Busy	150
p5	250	1000	job 5	200	Busy	50
p1	400	400	job 4	300	Busy	100

Total Internal Fragmentation: 300

Snapshot 2: Best Fit

Job Name:	Job Size:	Job Status:
job 1	100	Running
job 2	50	Finished
job 3	50	Finished
job 4	300	Running
job 5	200	Running
job 6	75	Running
job 7	200	Waiting

P Name:	P Size:	Mem Addr:	Job:	Job Size:	Status:	Frag:
p3	50	550			Free	0
p2	100	500	job 1	100	Busy	0
p4	200	750	job 6	75	Busy	125
p5	250	1000	job 5	200	Busy	50
p1	400	400	job 4	300	Busy	100

Total Internal Fragmentation: 275

Snapshot 1: Worst Fit

Job Name:	Job Size:	Job Status:
job 1	100	Running
job 2	50	Running
job 3	50	Running
job 4	300	Waiting
job 5	200	Waiting
job 6	75	Running

Binary ExpressionTree GUI

Total Internal Fragmentation: 275

Snapshot 1: Worst Fit

Job Name:	Job Size:	Job Status:
job 1	100	Running
job 2	50	Running
job 3	50	Running
job 4	300	Waiting
job 5	200	Waiting
job 6	75	Running
job 7	200	Waiting

P Name:	P Size:	Mem Addr:	Job:	Job Size:	Status:	Frag:
p1	400	400	job 1	100	Busy	300
p5	250	1000	job 2	50	Busy	200
p4	200	750	job 3	50	Busy	150
p2	100	500	job 6	75	Busy	25
p3	50	550			Free	0

Total Internal Fragmentation: 675

Snapshot 2: Worst Fit

Job Name:	Job Size:	Job Status:
job 1	100	Finished
job 2	50	Running
job 3	50	Finished
job 4	300	Running
job 5	200	Running
job 6	75	Running
job 7	200	Waiting

P Name:	P Size:	Mem Addr:	Job:	Job Size:	Status:	Frag:
p1	400	400	job 4	300	Busy	100
p5	250	1000	job 2	50	Busy	200
p4	200	750	job 5	200	Busy	0
p2	100	500	job 6	75	Busy	25
p3	50	550			Free	0

Total Internal Fragmentation: 325

Snapshot 1: Next Fit

Job Name:	Job Size:	Job Status:
job 1	50	Running
job 2	10	Running

Binary ExpressionTree GUI

Snapshot 1: Next Fit

Job Name:	Job Size:	Job Status:
job 1	50	Running
job 2	10	Running

P Name:	P Size:	Mem Addr:	Job:	Job Size:	Status:	Frag:
p1	30	30			Free	0
p2	50	80	job 1	50	Busy	0
p3	10	90	job 2	10	Busy	0

Total Internal Fragmentation: 0

Dynamic Partition
1000 total memory
Simulation 2:

Snapshot 1: First Fit

Job Name:	Job Size:	Job Status:
job 1	100	Running
job 2	500	Running
job 3	200	Running
job 4	50	Running
job 5	150	Running
job 6	75	Waiting
job 7	200	Waiting

P Name:	P Size:	Mem Addr:	Job:	Job Size:	Status:	Frag:
p1	100	100	job 1	100	Busy	0
p2	500	600	job 2	500	Busy	0
p3	200	800	job 3	200	Busy	0
p4	50	850	job 4	50	Busy	0
p5	150	1000	job 5	150	Busy	0

Total External Fragmentation: 0

Snapshot 2: First Fit

Job Name:	Job Size:	Job Status:
job 1	100	Running
job 2	500	Finished
job 3	200	Running
job 4	50	Running
job 5	150	Running
job 6	75	Running
job 7	200	Running

P Name:	P Size:	Mem Addr:	Job:	Job Size:	Status:	Frag:

Binary ExpressionTree GUI

Snapshot 1: Best Fit

Job Name:	Job Size:	Job Status:
job 1	100	Running
job 2	500	Running
job 3	200	Running
job 4	50	Running
job 5	150	Running
job 6	75	Waiting
job 7	200	Waiting

P Name:	P Size:	Mem Addr:	Job:	Job Size:	Status:	Frag:
p4	50	850	job 4	50	Busy	0
p1	100	100	job 1	100	Busy	0
p5	150	1000	job 5	150	Busy	0
p3	200	800	job 3	200	Busy	0
p2	500	600	job 2	500	Busy	0

Total External Fragmentation: 0

Snapshot 2: Best Fit

Job Name:	Job Size:	Job Status:
job 1	100	Running
job 2	500	Finished
job 3	200	Running
job 4	50	Running
job 5	150	Running
job 6	75	Running
job 7	200	Running

P Name:	P Size:	Mem Addr:	Job:	Job Size:	Status:	Frag:
p4	50	850	job 4	50	Busy	0
p2	75	425	job 6	75	Busy	0
p1	100	100	job 1	100	Busy	0
p5	150	1000	job 5	150	Busy	0
p3	200	800	job 3	200	Busy	0
newP	200	225	job 7	200	Busy	0
newP	225	450			Free	225

Total External Fragmentation: 225

Snapshot 1: Worst Fit

Job Name:	Job Size:	Job Status:

Binary ExpressionTree GUI

job 3	200	Running
job 4	50	Running
job 5	150	Running
job 6	75	Running
job 7	200	Running

P Name:	P Size:	Mem Addr:	Job:	Job Size:	Status:	Frag:
newP	225	450			Free	225
p3	200	800	job 3	200	Busy	0
newP	200	225	job 7	200	Busy	0
p5	150	1000	job 5	150	Busy	0
p1	100	100	job 1	100	Busy	0
p2	75	425	job 6	75	Busy	0
p4	50	850	job 4	50	Busy	0

Total External Fragmentation: 225

Snapshot 1: Next Fit

Job Name:	Job Size:	Job Status:
job 1	30	Running
job 2	50	Running
job 3	20	Running

P Name:	P Size:	Mem Addr:	Job:	Job Size:	Status:	Frag:
p1	30	30	job 1	30	Busy	0
p2	50	80	job 2	50	Busy	0
p3	20	100	job 3	20	Busy	0

Total External Fragmentation: 0

Snapshot 2: Next Fit

Job Name:	Job Size:	Job Status:
job 1	30	Finished
job 2	50	Finished
job 3	20	Finished
job 4	40	Running
job 5	20	Running

P Name:	P Size:	Mem Addr:	Job:	Job Size:	Status:	Frag:
p1	30	30			Free	0
p2	40	10	job 4	40	Busy	0
newP	10	20			Free	10
p3	20	100	job 5	20	Busy	0

Total External Fragmentation: 0