GTU Department of Computer Engineering

CSE 222/505 - Spring 2021
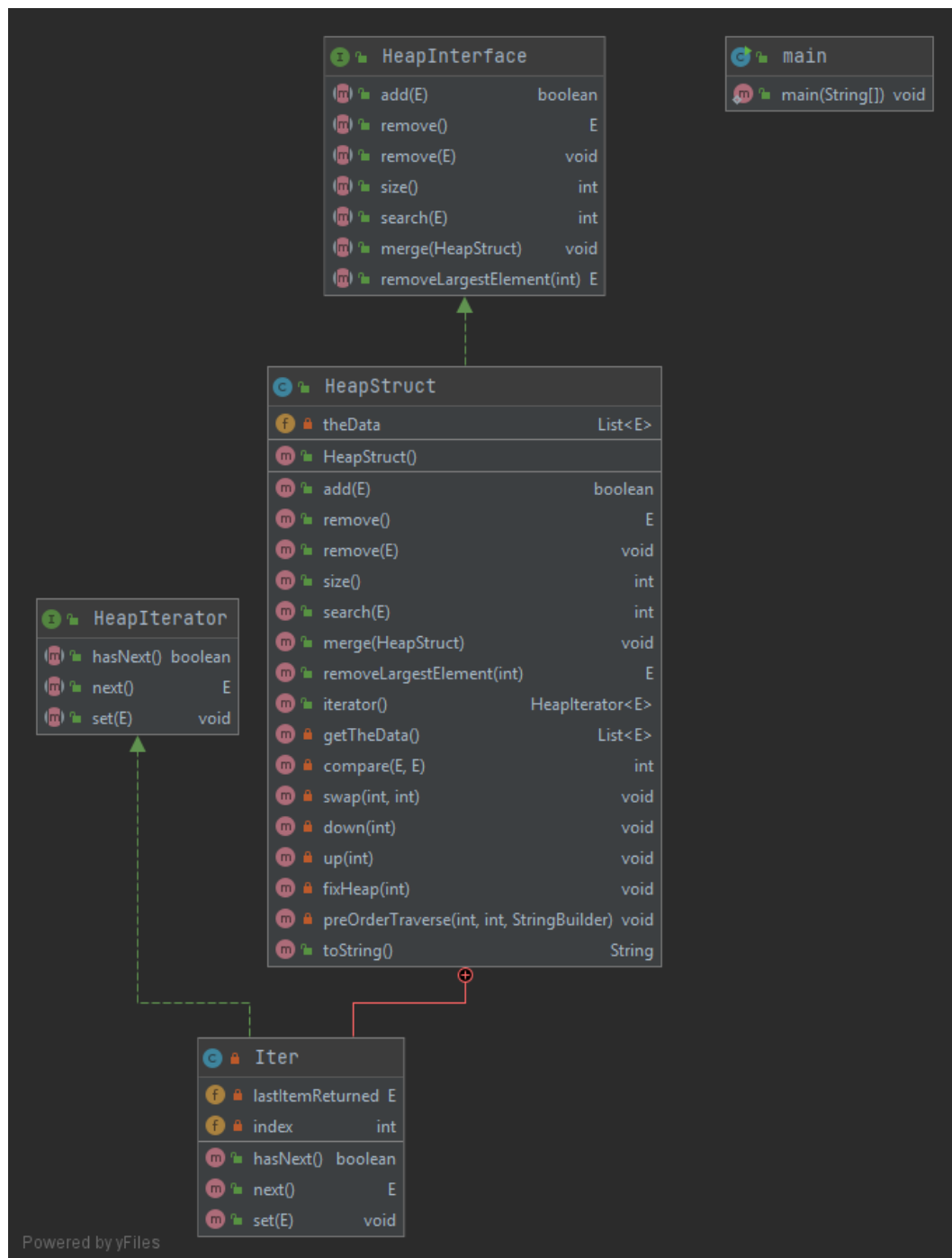
Homework 4 – Part 1

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-Problem Solution Approach

HeapStruct class holds the List structure to hold data and uses its methods. In this project, ArrayList is used as List. HeapStruct class include Iter class as inner class for iteration.

-Class Diagram

-Running and Results

```
 1  "C:\Program Files\Amazon Corretto\jdk11.0.10_9\bin\java.exe
    " "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2020.3.2\lib
    \idea_rt.jar=50349:C:\Program Files\JetBrains\IntelliJ IDEA 2020.3.
    2\bin" -Dfile.encoding=UTF-8 -classpath C:\Users\murat\Desktop
    \YL\PDF\spring\cse222\HW4\Part1\out\production\hw4 main
 2  -----------------------------
 3  Create a new heap
 4  The heap was created
 5  Heap1:
 6  EMPTY HEAP
 7  -----------------------------
 8  Adding items
 9  Before adding the item to the heap
10  Heap1:
11  EMPTY HEAP
12  After adding the '10' to the heap
13  Heap1:
14  10
15
16  -----------------------------
17  Before adding the '11' to the heap
18  Heap1:
19  10
20
21  After adding the '11' to the heap
22  Heap1:
23  10
24    11
25
26  -----------------------------
27  Before adding the '78' to the heap
28  Heap1:
29  10
30    11
31
32  After adding the '78' to the heap
33  Heap1:
34  10
35    11
36    78
37
38  -----------------------------
39  Before adding the '5' to the heap
40  Heap1:
```

```
41   10
42    11
43    78
44
45   After adding the '5' to the heap
46   Heap1:
47   5
48    10
49     11
50    78
51
52   ----------------------------
53   Before adding the '25' to the heap
54   Heap1:
55   5
56    10
57     11
58    78
59
60   After adding the '25' to the heap
61   Heap1:
62   5
63    10
64     11
65      25
66    78
67
68   ----------------------------
69   Before adding the '18' to the heap
70   Heap1:
71   5
72    10
73     11
74      25
75    78
76
77   After adding the '18' to the heap
78   Heap1:
79   5
80    10
81     11
82      25
83    18
84      78
```

```
 85
 86   -----------------------------
 87   Before adding the '33' to the heap
 88   Heap1:
 89   5
 90     10
 91       11
 92        25
 93     18
 94        78
 95
 96   After adding the '33' to the heap
 97   Heap1:
 98   5
 99     10
100       11
101        25
102     18
103        78
104        33
105
106   ---------------------------
107   Before adding the '0' to the heap
108   Heap1:
109   5
110     10
111       11
112        25
113     18
114        78
115        33
116
117   After adding the '0' to the heap
118   Heap1:
119   0
120     5
121       10
122         11
123        25
124     18
125        78
126        33
127
128   ---------------------------
```

```
129   Before adding the '-3' to the heap
130   Heap1:
131   0
132     5
133       10
134         11
135         25
136     18
137       78
138       33
139
140   After adding the '-3' to the heap
141   Heap1:
142   -3
143     0
144       5
145         11
146         10
147         25
148     18
149       78
150       33
151
152   @@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
153   Adding the item existing in the heap to the heap
154   Before adding the '10' to the heap
155   Heap1:
156   -3
157     0
158       5
159         11
160         10
161         25
162     18
163       78
164       33
165
166   After adding the '10' to the heap
167   Heap1:
168   -3
169     0
170       5
171         11
172         10
```

```
173    25
174    18
175    78
176    33
177
178    ----------------------------
179    Adding the item existing in the heap to the heap
180    Before adding the '0' to the heap
181    Heap1:
182    -3
183     0
184      5
185       11
186       10
187      25
188    18
189      78
190      33
191
192    After adding the '0' to the heap
193    Heap1:
194    -3
195     0
196      5
197       11
198       10
199      25
200    18
201      78
202      33
203
204    @@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
205    Removing items
206    Before removing the smallest item to the heap
207    Heap1:
208    -3
209     0
210      5
211       11
212       10
213      25
214    18
215      78
216      33
```

```
217
218  After removing the smallest item to the heap
219  Heap1:
220  0
221    5
222      10
223        11
224      25
225  18
226      78
227      33
228
229  -----------------------------
230  Before removing the '18' to the heap
231  Heap1:
232  0
233    5
234      10
235        11
236      25
237  18
238      78
239      33
240
241  After removing the '18' to the heap
242  Heap1:
243  0
244    5
245      10
246      25
247  11
248      78
249      33
250
251  @@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
252  Deleting an item that is not in the stack
253  Before removing the '100' to the heap
254  Heap1:
255  0
256    5
257      10
258      25
259  11
260      78
```

```
261      33
262
263   After removing the '100' to the heap
264   Heap1:
265   0
266     5
267       10
268       25
269   11
270       78
271       33
272
273   @@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
274   Merge two heaps
275   Before merging
276   Heap1:
277   0
278     5
279       10
280       25
281   11
282       78
283       33
284
285   Heap2:
286   -5
287     7
288       50
289       19
290     21
291       78
292       330
293
294   After merging
295   Heap1:
296   -5
297     0
298       5
299         10
300       7
301       21
302         25
303         50
304     11
```

```
305    19
306     78
307      330
308     33
309
310   @@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
311   Removing ith largest element in the heap
312   Before removing the 1th largest element to the heap
313   Heap1:
314   -5
315    0
316     5
317      10
318      7
319    21
320      25
321      50
322   11
323     19
324      78
325       330
326      33
327
328   Removed: 330
329   After removing the 1th largest element to the heap
330   Heap1:
331   -5
332    0
333     7
334      21
335      25
336     10
337      33
338      50
339   5
340     11
341      78
342     19
343
344   ------------------------------
345   Removing ith largest element in the heap
346   Before removing the 4th largest element to the heap
347   Heap1:
348   -5
```

```
349    0
350     7
351      21
352      25
353    10
354       33
355       50
356  5
357     11
358       78
359     19
360
361  Removed: 25
362  After removing the 4th largest element to the heap
363  Heap1:
364  -5
365    0
366     7
367      21
368      78
369    10
370       33
371       50
372  5
373     11
374     19
375
376  ------------------------------
377  Removing ith largest element in the heap
378  Before removing the -3th largest element to the heap
379  Heap1:
380  -5
381    0
382     7
383      21
384      78
385    10
386       33
387       50
388  5
389     11
390     19
391
392  Removed: null
```

```
393  After removing the -3th largest element to the heap
394  Heap1:
395  -5
396    0
397      7
398        21
399        78
400      10
401        33
402        50
403    5
404      11
405      19
406
407  @@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
408  Searching an item in the heap
409  Searching '-5'
410  Expected: 0 , Result: 0
411  --------------------------
412  Searching '-50'
413  Expected: -1 , Result: -1
414  --------------------------
415  Searching '7'
416  Expected: 3 , Result: 3
417  @@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
418  Setting items
419  Before setting the first item to 39
420  Heap1:
421  -5
422    0
423      7
424        21
425        78
426      10
427        33
428        50
429    5
430      11
431      19
432
433  Before setting the first item to 39
434  Heap1:
435  0
436    7
```

```
437      21
438        39
439        78
440      10
441        33
442        50
443    5
444      11
445      19
446
447    -----------------------
448    Before setting the third item to -10
449    Heap1:
450    0
451      7
452        21
453          39
454          78
455        10
456          33
457          50
458    5
459      11
460      19
461
462    Before setting the first item to -10
463    Heap1:
464    -10
465      7
466        21
467          39
468          78
469        10
470          33
471          50
472      0
473        11
474        19
475
476    @@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
477    Setting the item existing in the heap to the heap
478    Before setting the first item to 10
479    Heap1:
480    -10
```

```
481    7
482      21
483        39
484          78
485      10
486        33
487          50
488    0
489      11
490        19
491
492    The item is already exist in the heap!!
493    Before setting the first item to 10
494    Heap1:
495    -10
496      7
497        21
498          39
499            78
500        10
501          33
502            50
503    0
504        11
505        19
506
507
508    Process finished with exit code 0
509
```