高级数据结构作业

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题 1

- **Amortized costs: more cases**
  - **insert, delete**
  - **$\alpha \geq 1/2$, $\alpha < 1/2$ (use α_i, since α can vary a lot)**
  - ***size* does/doesn't change**
- **Exercise**

α >=1/2 时，F(T)=2num[T]-size[T]
α <1/2 时，F(T)=size[T]/2-num[T]

Case1：insert，α≥1/2，size doesn't change

size(i)=size(i-1)
num(i)=num(i-1)+1
c(i)=1;
Amortized cost
=c(i)+ ΔF=c(i)+F(i)-F(i-1)
=1+(2*num(i)-size(i))-(2*num(i-1)-size(i-1))
=3

Case2：insert，α≥1/2，size change

size(i)=2*size(i-1)
size(i-1)=num(i-1)=num(i)-1
c(i)=num(i-1)+1=num(i)
Amortized cost
=c(i)+ ΔF=c(i)+F(i)-F(i-1)
=num(i)+(2*num(i)-size(i))-(2*num(i-1)-size(i-1))
=3

Case3：insert，α＜1/2，size doesn't change

size(i)=size(i-1)
num(i)=num(i-1)+1
c(i)=1
Amortized cost

=c(i)+ ΔF=c(i)+F(i)-F(i-1)
=1+(size(i)/2-num(i))-(size(i-1)/2-num(i-1))
=0

Case4：insert，α＜1/2，size change

不存在这种情况；

Case5：delete，α≥1/2，size doesn't change

size(i)=size(i-1)
num(i)=num(i-1)-1
c(i)=1
Amortized cost
=c(i)+ ΔF=c(i)+F(i)-F(i-1)
=1+(2*num(i)-size(i))-(2*num(i-1)-size(i-1))
=-1

Case6：delete，α≥1/2，size change

α≥1/2>1/4，所以不存在该情况；

Case7：delete，α＜1/2，size doesn't change

size(i)=size(i-1)
num(i)=num(i-1)-1
c(i)=1
Amortized cost
=c(i)+ ΔF=c(i)+F(i)-F(i-1)
=1+(size(i)/2-num(i))-(size(i-1)/2-num(i-1))
=2

Case8：delete，α＜1/2，size change

size(i)=size(i-1)/2
size(i-1)=2*num(i-1)=2*(num(i)+1)
num(i)=num(i-1)-1
c(i)=num(i-1)
Amortized cost
=c(i)+ ΔF=c(i)+F(i)-F(i-1)
=num(i-1)+ (size(i)/2-num(i))-(size(i-1)/2-num(i-1))
=1

题 2

Exercise

- A = <1 1 1 1 0 1 1 1 0 0 1 0 0 0 0 0 0>

- Find A[6]' Children with Rank/Selections
- Find A[13]' Parent with Rank/Selections

- A[?]

① 过程：A[rank(6)*2]　A[rank(6)*2+1]
　结果：A[10]　A[11]
② 过程：A[selections([13/2])]
　结果：A[7]