演算法 Homework 20191212

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A screenshot of a social media post

Description automatically generated

(1)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Cnt | 7 | 6 | 5 | 4 | 3 | 2 | 1 | Cost | Total |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | **1** | **1** | **1** | **1** | **1** | **1** | **1** | 7 | 7 |
| 2 | 1 | **0** | 1 | **0** | 1 | **0** | 1 | 3 | 10 |
| 3 | 1 | **1** | 1 | 0 | **0** | 0 | 1 | 2 | 12 |
| 4 | 1 | 1 | 1 | **1** | 0 | 0 | 1 | 1 | 13 |
| 5 | 1 | 1 | **0** | 1 | 0 | 0 | 1 | 1 | 14 |

How to count is indicated above.

Total cost of the five counting operation is 14.

(2)

With accounting method

2 for setting a bit to 1, because initial setting is all 0 and the first time when costs come up is time to count 1 from 00… to 11…. Then,

Bit 0 -> bit 1 amortized cost +2

Bit 1 -> bit 0 amortized cost 0

Each bit 0 to 1, we add 2 to the amortize costs, which the costs of each bit 1 flipped to 0 are saved in advance. Then, flipping each bit 0 to 1, the saved cost in advance can be used. (So when you flip each bit 0 to 1, you do not need to save any cost.)

In addition to it, let we think the condition below. This is the case with the largest cost because every bits is flipped in each step. The total cost is 8. The cost in each step is 4. In this way to calculate the amortized cost, when each bit 0 to 1, 8 amortized cost is saved. It is the enough costs to cover the cost that every 1 is flipped to 0. Therefore, this way to calculate the amortized cost is correct.

init: 0000

step1: 1111

step2: 0000.

The demonstration of the calculation of the amortized cost with the example is below.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Cnt | 7 | 6 | 5 | 4 | 3 | 2 | 1 | Cost | Total | Amo | Amo-Total |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | **1** | **1** | **1** | **1** | **1** | **1** | **1** | 7 | 7 | 14 | 14 |
| 2 | 1 | **0** | 1 | **0** | 1 | **0** | 1 | 3 | 10 | 0 | 14 |
| 3 | 1 | **1** | 1 | 0 | **0** | 0 | 1 | 2 | 12 | 2 | 16 |
| 4 | 1 | 1 | 1 | **1** | 0 | 0 | 1 | 1 | 13 | 2 | 18 |
| 5 | 1 | 1 | **0** | 1 | 0 | 0 | 1 | 1 | 14 | 0 | 18 |