[LeetCode] Gas Station

To solve this problem, some observations have to be made first.

Let's first see two relatively easy observations.

1. To maximize the probability that we can complete the circuit, at each gas station, we will add all the available gas to the tank.
2. If sum_{i = 1, 2, ..., k}gas[i] < sum_{i = 1, 2, ..., k}cost[i], then we cannot reach k if we start from i.

Make sure you convince yourself of these two observations. They will serve as the foundation for the following trickier observations.

- Starting from i, if the first unreachable position is k, then we cannot reach position k if we start from any position between i and k.

Let's do a quick proof. We use proof by contradiction. Suppose we can reach k if we start from the position j which is between i and k. Now we can reach k from j. Moreover, we can reach j from i (since k is the first unreachable position starting from i). Putting these together, we will first reach j from i, and then reach k from j. This contradicts the assumption that k is not reachable from i.

With this observation, each time we find the first point that the we cannot reach from the

公告

昵称：jcliBlogger
园龄：1年6个月
粉丝：10
关注：1
+加关注

< 2016年12月 >

日	一	二	三	四	五	六
27	28	29	30	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31
1	2	3	4	5	6	7

搜索

open in browser PRO version Are you a developer? Try out the HTML to PDF API pdfcrowd.com

current starting position. We know that we do not need to check all the points between them and simply skip to the next point of the first unreachable point.

Now comes the last observation, which is the key to give a O(n) solution.

- If the sum of gas is not less than the sum of cost, there **must** be a solution.

Well, the proof of this observation is not as easy as the above one. If there are only two gas stations, this observation is easy. When there are more than two gas stations, you may need to merge some of them to a single one and reduce the *effective* number of gas stations. You mar refer to this link for a proof.

Using these two observations, the idea to solve this problem is as follows.

Maintain a variable tank for the net gas in the tank and a variable total to accumulate the net difference between the sum of gas and the sum of cost. Then we initialize a variable start to be 0 for the final starting position. Each time we find an unreachable point, we update start to be the point after the current unreachable point. After we traverse all the points, we will have the final net difference between the sum of gas and the sum of cost. If it is not less than 0, we know there must be a solution (according to the last observation) and return start. Otherwise, return -1.

The code is as follows.

```
class Solution {
public:
    int canCompleteCircuit(vector<int>& gas, vector<int>& cost) {
        int start = 0, total = 0, tank = 0;
        for (int i = 0; i < (int)gas.size(); i++) {
            tank += gas[i] - cost[i];
            if (tank < 0) {
                start = i + 1;
                total += tank;
                tank = 0;
            }
        }
```


常用链接

我的随笔
我的评论
我的参与
最新评论
我的标签

随笔分类

Algorithms(10)
HackerRank Solutions(1)
hihoCoder Solutions(5)
LeetCode Solutions(234)
LintCode Solutions(35)
POJ Solutions(1)
UVa OJ Solutions(1)

随笔档案

2016年9月 (1)
2016年8月 (1)
2015年12月 (1)
2015年11月 (8)
2015年10月 (12)
2015年9月 (20)
2015年8月 (60)
2015年7月 (68)
2015年6月 (119)

open in browser PRO version Are you a developer? Try out the HTML to PDF API pdfcrowd.com

```
        return total + tank >= 0 ? start : -1;
    }
};
```

Well, let's do more with the last observation. In fact, if the sum of gas is not less than the sum of cost, there exists a position with the minimum net gas (sum_{i=0, 1, ..., k}gas[i] - sum_{i = 0, 1, ..., k}cost[i] is minimized) and the starting point is simply the point after it.

Using this idea, we will have a more succinct code.

```
class Solution {
public:
    int canCompleteCircuit(vector<int>& gas, vector<int>& cost) {
        int net = 0, start = 0, min_net = 0;
        for (int i = 0; i < (int)gas.size(); i++) {
            net += gas[i] - cost[i];
            if (net < min_net) {
                start = i + 1;
                min_net = net;
            }
        }
        return net >= 0 ? start : -1;
    }
};
```

One final note, all of the above solutions are from this link in the LeetCode dicussion forum. Thank you for the nice sharer. Please refer to it for more details.

分类: LeetCode Solutions

最新评论

1. Re:[LeetCode] 4Sum
Hi JianchaoMay I ask why you have "(int)nums.size() - 3" here?If I don't add it, it causes runtime e.....
--intaglio

2. Re:[LeetCode] Meeting...
You can just use: vector rooms;because you only need to store the end time of each room and update t.....
--ztchf

3. Re:[LeetCode] Alien Di...
@jcliBloggerThanks~...
--flexwang

4. Re:[LeetCode] Alien Di...
@flexwang引用Would you mind posting the problem description? Since the problem is not free of charge.H.....
--jcliBlogger

5. Re:[LeetCode] Alien Di...
Would you mind posting the problem description? Since the problem is not free of charge.
--flexwang

阅读排行榜

1. [LeetCode] Alien Dictio...
2. [LeetCode] Number of ...
3. [LeetCode] Flip Game I...
4. [LeetCode] Meeting Ro...

open in browser PRO version Are you a developer? Try out the HTML to PDF API pdfcrowd.com

好文要顶 关注我 收藏该文

jcliBlogger
关注 - 1
粉丝 - 10
+加关注

0 推荐 0 反对

« 上一篇：[LeetCode] Number of Islands
» 下一篇：[LeetCode] Clone Graph

posted @ 2015-06-24 00:51 jcliBlogger 阅读(100) 评论(0) 编辑 收藏

刷新评论 刷新页面 返回顶部

注册用户登录后才能发表评论，请 登录 或 注册，访问网站首页。

【推荐】50万行VC++源码: 大型组态工控、电力仿真CAD与GIS源码库
【福利】微软Azure给博客园的你专属双重好礼
【推荐】融云发布 App 社交化白皮书 IM 提升活跃超 8 倍
【推荐】BPM免费下载

最新IT新闻:
· 朱啸虎告诫互联网早期创业者，你们可能需要注意这些才能拿到钱

5. [LeetCode] Shortest ...

评论排行榜

1. [LeetCode] Alien Dictio...
2. [LeetCode] Meeting Ro...
3. [LeetCode] 4Sum(1)

推荐排行榜

1. [LintCode] 最小路径和(1)
2. [LeetCode] Best Meeti...
3. [LeetCode] Walls and ...
4. [LeetCode] Paint Fence...
5. [LeetCode] Graph Vali...

open in browser PRO version Are you a developer? Try out the HTML to PDF API pdfcrowd.com

· 王兴向马化腾“认罪”美团13亿的支付牌照白买了
· 传Android定制系统CM将停止更新 公司回应：只是项目改名
· Google为节日搜索装点页面：Festivus竟跳转出一根棍子
· 庆圣诞 这些地区的iTunes商店提供专辑折扣
» 更多新闻...

最新知识库文章：
· 写给未来的程序媛
· 高质量的工程代码为什么难写
· 循序渐进地代码重构
· 技术的正宗与野路子
· 陈皓：什么是工程师文化？
» 更多知识库文章...

Copyright ©2016 jcliBlogger

open in browser PRO version Are you a developer? Try out the HTML to PDF API pdfcrowd.com