南京大学
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PASA Lab

my solution of the string problems

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Problem 1

- Title: String to Integer (atoi)
- Description:
  Implement atoi to convert a string to an integer.

- https://leetcode.com/problems/string-to-integer-atoi/

Hint

- Carefully consider all possible input cases. If you want a challenge, please do not see below and ask yourself what are the possible input cases.

My mind

Possible input cases：

- “1239893”
- “jsfkajfkf121”
- “7898fsjk”
- “fsdjaf”
- “fsa-fs323jk+323”
- “+-3 23fs%&~*#kaj”
- “”

Requirements for atoi

Notes:

It is intended for this problem to be specified vaguely (ie, no given input specs). You are responsible to gather all the input requirements up front.

remark：you can communicate with the officer on detail of requirements.

Requirements for atoi

- The function first discards as many whitespace characters as necessary until the first non-whitespace character is found.
- Then, starting from this character, takes an optional initial plus or minus sign followed by as many numerical digits as possible, and interprets them as a numerical value.

Requirements for atoi

- The string can contain additional characters after those that form the integral number, which are ignored and have no effect on the behavior of this function.
- Then, starting from this character, takes an optional initial plus or minus sign followed by as many numerical digits as possible, and interprets them as a numerical value.

Requirements for atoi

- If the first sequence of non-whitespace characters in str is not a valid integral number, or if no such sequence exists because either str is empty or it contains only whitespace characters, no conversion is performed.

- If no valid conversion could be performed, a zero value is returned.

Requirements for atoi

- If the correct value is out of the range of representable values, INT_MAX (2147483647) or INT_MIN (-2147483648) is returned.

remark : boudary of interger

Algorithm steps

O(n) (Only traverse the string once)

- Find first character(non-whitespace) which is plus or minus or digital , if not , return res(initialized as 0);
- If the fowllowing character is digital , make it as a part of the integer until find the character is not digital ;
- Turn the numerical part to integer and make sure the number is an integer(the process runs through the traversal)

Algorithm steps

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O(n) (Only traverse the string once)

```
1.    for(int i = 0; i < str.length(); i++){
2.        if(str[i]!= “ ”&& first && !isSign(str[i])
3.        &&!Digital(str[i]) )
4.        {return 0;}
5.        if(!first && !Digital(str[i]))
6.        { return res;}
7.        add it  to  number (sign or digit) ;
8.        turn it to integer as res;
9.     }
```

Solution code

- http://paste.ubuntu.com/23153807/
- other idea?

Problem 2

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- Title: Longest Palindromic Substring
- Description:

Given a string S, find the longest palindromic substring in S. You may assume that the maximum length of S is 1000, and there exists one unique longest palindromic substring.

- https://leetcode.com/problems/longest-palindromic-substring/

My mind

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- It's obvious , just begin from the middle character and judge if the two side character the same .

- Key Point:

Need to consider the difference of odd and even number of the palindromic string .

Algorithm steps

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- worst : O(n^2)(traverse once to find the middle character)

```
1. for (middle = 0;middle < len -1; middle = middle + 0.5){
2.         curLen = calculate current length of
           palinromic string which center is middle;
3.     if(curLen > maxLen){
4.         record  the middle and length;
5.     }
6.  }
```

Solution code

- http://paste.ubuntu.com/23154019/

Idea to optimize

- The middle character can begin from the string center to the two side , will it be better?
- Can we get some infomation from the forward palinromic judge ?

Problem 3

- Title: Multiply Strings
- Description:

  Given two numbers represented as strings,

  return multiplication of the numbers as a string.

- https://leetcode.com/problems/multiply-strings/

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Input cases

- sign ?
- use BigInteger (JAVA)

Note

- The numbers can be arbitrarily large and are non-negative.
- Converting the input string to integer is NOT allowed.
- You should NOT use internal library such as BigInteger.

Analysis

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- Example:

```
      43
X     57
-------
     301
    215
-------
    2451
```

- include 3 ops :mutilpy, add, carry

Algorithm steps

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- O(n^2)

```
1.    for(int i = len1 -1; i >= 0; i--){
2.        for(int j = len2 -1; j >= 0; j--){{
3.            tmp = mutilply(s1[i], s2[j],carryBit);
4.            part.push_back(tmp[0]);
5.            carryBit = tmp[1];
6.        }
7.        add(result , part) ;
8.    }
```

Solution code

- http://paste.ubuntu.com/23154135/
- other idea ?

Thank you !