

Tuesday, 31 August 2018

LAB DEMO 01

Introduction and Expectations

- Hey I am Sidhant (Undergraduate Year 2)
 - Exempted from CS2040
- You can call me
 - “sid” (Easier to pronounce)
- Contact details
 - Email: sidhant.bansal@u.nus.edu (preferred)
 - Facebook messenger
(Find me in the CS2040C group / <https://facebook.com/sidhant.bansal007>)(profile pic →)
- Lab TA for CS2040C
 - Lab groups : Lab 04(Friday 8-9)
 - Experience: TA’ed this course last semester + Took CS3233 last sem
 - Open to feedback after every lab session :)
- Wish for CS2040C S1
 - Don’t be scared to ask doubts/clarifications throughout the course. (Even if they seem silly)
 - Enjoy the content



Ice Breaking

When your name is called: stand up and say one sentence about yourself that is *very unique* about you!

Mooshak Online Judge System

We need another system for automatic grading

- Important URL: <https://cs2040c.comp.nus.edu.sg/~mooshak/>
- Instant grading!
 - Typical Online judge verdicts: AC(cepted), W(rong)A(nswer), T(ime)L(imit)E(xceeded), R(un)T(ime)E(rror), C(ompile)T(ime)E(rror), Invalid Function, Invalid Submission (NEW), Program Size Exceeded (NEW), Requires Reevaluation (NEW)
- Unless there are special cases, if you get your code AC (Accepted), you will get that amount of points as stated in the problem description
 - However, post-deadline penalty (e.g. your code are found to be a very similar copy of someone else's code) can still alter the score
 - ${}_{76}C_2$ pairwise comparison check is a “small” number

C++ Compiler used by Mooshak

We use C++11 standard

- You can use `#include <bits/stdc++.h>`
- You can use `auto` (range based loop)
- You can use lambda expression (e.g. as comparison function for sorting)
- You can use this kind of initialization: `vector<int> A = {1,2,3};`
- (no guarantee on C++14/17 stuffs, I think it won't compile)

The Problem Sets

CS2040C PSeS (PS1-5) have subtask system

- Subtask A is always the easiest, but low -- non zero -- points
 - Everyone are expected to solve this
 - Algorithm mentioned in tutorial/lab demos (usually in tutorial)
- Subtask B (or also C) is/are CS2040/C standard, medium points
 - Majority are expected to solve this
 - Algorithm mentioned in tutorial/lab demos (usually in lab demos)
- The last Subtask is quite challenging, but low (or **zero**) point(s)
 - Minority are expected to solve this
 - No need to feel bad if you cannot solve this part, it is a teaser of what can be done at higher level, when you know more algorithms 😊
 - Recommended to attempt them, as they *can be tested* in tests.

C++ string

- **constructor or = operator**
- **at or [] operator**
- *+* (*concatenation*)
- *==, <* (*comparison*)
- *find*
- *substr*
- *c_str*
- http://en.cppreference.com/w/cpp/string/basic_string

C++ STL vector

- **constructor**
- **at or [] operator**
- **push_back**, *pop_back*
- *insert*, *erase*
- *front*, *back*
- *begin*, *end*
- **assign**, *empty*, *reserve*, *resize*
- <http://en.cppreference.com/w/cpp/container/vector>

C++ STL algorithm

- **sort**, `partial_sort`, `stable_sort`
- *reverse*
- `unique`
- `nth_element`
- `lower_bound`, `upper_bound`
- *swap*
- `random_shuffle`
- **min**, **max**
- `min_element`, `max_element`
- <http://en.cppreference.com/w/cpp/algorithm>

PS1 Status (as of today :O)

Name	A	B	C
Group A	AC	AC	AC
Group B	AC	AC	
Group C	AC		
Group D			

Practice is important for these 5 PSeS (15%) + end of semester PE (12%)

Don't hesitate to contact TAs for more help if you need it

PS1 Discussion

- Number of operations that the server that hosts Mooshak can do in about 1s is approximately $\sim 100M+$
 - (you can ‘test’ the judge)
- A:
 - $TC = 100, N = 500$
 - $O(TC * N^3) = \underline{12,500,000,000}$, likely CMI*
 - $O(TC * N^2 \log_2 N) = \underline{224,144,607.11}$, “seems possible”
- B:
 - $TC = 100, N = 3,000$
 - $O(TC * N^2 \log_2 N) = \underline{10,395,672,106.84}$, likely CMI
 - $O(TC * N^2) = \underline{900,000,000}$, “seems possible”
- C
 - $TC = 1, N = 20,000,000 :O \dots O(N)???$

PS1 Discussion

- For PS1C, **fast I/O** is required
- scanf/printf is fast enough
- cin/cout is too slow by default
 - Add the following at the top of int main

```
int main() {  
    ios::sync_with_stdio(false);  
    cin.tie(0);  
    ...  
    ...  
}
```

Hands-on 1:

- <https://open.kattis.com/problems/sidewaysorting>
- You have 15-20 mins to try coding an AC solution
- Lab TA will give gradual hints per 5m interval
- Full AC solution **will not** be given,
the last hint will be something that is “near AC”