Solution Slides FSR Coding Cup 2023

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Universität Rostock

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Pizza

- Sponsored by PLANET AI GmbH (planet-ai.de):
- 3*Margharita
- 2*Salami
- 2*Hawaii
- 1*Beef
- 1*Vegetarisch
- 1*Mozarella
- 1*Hot Dog

Intuitive Citations

Problem

- Given a list of names. Print the lexicographically smallest surname and add " et al.".

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- Remove part before space (forename).
- Find the lexicographically smallest string by sorting and taking the first element.

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- Given a list of names. Print the lexicographically smallest surname and add " et al.".

Solution

- Remove part before space (forename).
- Find the lexicographically smallest string by sorting and taking the first element.
- Print string + " et al.".

Compilers Brackets

Problem

- Check if given bracket pattern is valid.
- "{ { } { } }" is not valid.
- "{ { } { { } } }" is valid.

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- "$\{\{\}\{\}$" is not valid.
- "$\{\{\}\{\{\}\}\}$" is valid.

Solution

- Count number of currently open brackets.

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- "{{}{}" is not valid.
- "{{}{{}}}" is valid.

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- Count number of currently open brackets.
- Begin with open = 0

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- Begin with open = 0
- "$\{$" $\rightarrow$ open++

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- Begin with open = 0
- "{" → open++
- "}" → open--

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- Pattern invalid if open < 0 at any time.

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- Begin with open = 0
- "{" $\rightarrow$ open++
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- Pattern invalid if open < 0 at any time.
- Pattern invalid if open != 0 in the end.

Fascinating Books

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- For each character:
  - If character is letter: Add as lowercase to set.

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- Can concatenate strings and solve for a single string.
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- Check if length of set is 26.

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Gotchas

- Capitalization does not matter.

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Leaderboard Prediction

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- Greedy solution: Sort problems by length, then simulate.

Bicycle Lock

Problem

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- Move to final position by always turning two consecutive dials at once.

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- Grid is filled with water from the top.
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- Need to start once at every point on the top.
- Otherwise we might miss some air bubbles.

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- Given n strings $s_1 \ldots s_n$.
- Find a string S that contains all n strings in consecutive order and where no character is part of 3 strings.

Hidden Words

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- Given n strings s_1 ... s_n.
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- Else: remove first letter of s_1 and repeat process.

Jolly Fishing

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- (If we did not allow fishing after a day where we did, we would get a higher score by swapping the two days).
- Thus we only need to determine the day we start allowing fishing.
- Can simulate every 365 possible days (or use Ternary Search).

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Gotchas

- In slower languages (like Python) you need to calculate in 1 step how many bricks of each type you need.
- Also the tower can get to heights of 10^9 which means calculating each row in a single step might still be too slow.

Extravagant Voyage

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Gotchas

- Not using a dp-table results in time limit exceeded.

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- The input is rather complicated and has to be parsed into a graph structure first.

Going Home

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Gotchas

- The input is rather complicated and has to be parsed into a graph structure first.
- Need to find the right time to take a connection which is driven multiple times.

Problem

- Given a 6x6 keyboard layout of letters and some text.
- Find a way to move 2 fingers simultaneously such that the time is minimal to type the given text.

Keyboard Robot

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- Insight #1: the text is short, only 200 letters, so the maximum time is $(5 + 5) \cdot 200 = 2000$

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- Insight #1: the text is short, only 200 letters, so the maximum time is $(5 + 5) \cdot 200 = 2000$
- Insight #2: we can simulate it, but need fast way of prioritising interesting states
- Insight #3: grid is unhelpful, save as basic graph instead:
  dist[(from_pos, to_pos)] = distance
  letter_to_pos[letter] = pos

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- Initial state is (0, 0, (0, 0), 0, (0, 0), 0)
- A state is (time, index, pos1, rem1, pos2, rem2)
  1. *time* is the time since start of simulation
  2. *index* is the index of the current letter to be typed in the text
  3. *pos$_i$* is the position as a tuple of the *i*-th finger
  4. *rem$_i$* is the remaining time to move for the *i*-th finger (if negative it means it has been idle for some time and can be moved retroactively)

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- From every state put 2 new states inside the priority queue: what if either finger 1 or finger 2 moves to the next letter

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- Only states where either *rem1* or *rem2* are 0 should be put in the priority queue

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- Only states where either *rem1* or *rem2* are 0 should be put in the priority queue
- Simulate until some index is at the end of the char sequence

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Closing Remarks

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- There is a Github repository containing all problem code and our solutions
- Link: https://github.com/LiquidFun/FSR-Coding-Cup-2023
- Feel free to make a pull request with your own solutions so we can add them if you like.

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- We also opened a discord server: https://discord.gg/5xgkKyrf

- We hope you had fun today!
- Do you have any suggestions or thing we can improve on?

Prizes

- The first place receives a 150€ powerbank sponsored by Stackmeister GmbH.
- The second place receives a 15€ Amazon gift card per person
- The third place receives a 10€ Amazon gift card per person
- The fourth place receives a 5€ Amazon gift card per person
- The best Ersti team gets 10€ per person
- Also respect for everyone who chose to participate on a Saturday! :D