Project 1:
Examples

Running through queue and stack examples, showing how output is different

Important Note

- This example is meant to be understandable, not efficient
- Think about what you would actually store in the stack or queue (or better yet, the deque, see Project 1 the STL and You slides)

Why are Stack and Queue Output Different?

- Let's do an example! Dictionary (page 2):

S

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// Just a short example dictionary. Although these words

// are in alphabetical order, that is not required.

chip

chop

junk

leet

let

shin

ship

shop

shot

stop

Queue:
chip -> stop, change only

- Before we start the loop, add the start word (chip) to the queue

- Whenever a word is added to the queue (or stack, or better yet deque), it must be marked as "used"
  - It can never be used again (it can never be added to the stack/queue/deque again)

Start the Loop

- The next item (front of the queue) becomes the "current" word, and then we add similar words to the queue
  - Loop over all words, in dictionary order
    - Skip any words already used
    - If "close enough" to current word, add it
    - As each is added, mark it as used
- If we add the end word (stop), the loop ends

Queue, starting point

Queue (front…back):
- chip

Current word:
- (none)

Queue, in progress

Queue (front…back):
- (empty)
- ---
- (The queue was empty because chip became the current word; chop then ship were added)
- chop, ship

Current word:
- chip

Queue, in progress

Queue (front…back):

- ship
- ---
- ship, shop

Current word:

- chop

Queue, in progress

Queue (front…back):

- shop

- ---

- shop, shin

Current word:

- ship

Queue, in progress

Queue (front…back):

- shin

- ---

- shin, shot, stop

Current word:

- shop

End word added, loop ends

What is the Output?

Words in morph: 4

chip

chop

shop

stop

Where did it come from?

Not what's left in queue, and not necessarily the history of "current"

Backtracking

- A word can be used at most once
  - Notice that junk is never used
- Thus every word that is used has a unique predecessor, or previous word
  - The word that was "current" when this word was added
  - The begin word has no previous word
- Question: what is stop's previous word?

Stack:
chip -> stop, change only

- Repeat with the same dictionary, and change mode only, but use stack mode instead of queue mode

- Add the start word to the top of the stack (and mark it as used)

- Start looping

Stack, starting point

Stack (shown with top of stack as top word):

- chip

Current word:

- (none)

Stack, in progress

Stack:

- (empty)

- ---

- (The stack was empty; chop then ship were added)

- ship

- chop

Current word:

- chip

Stack, in progress

Stack:

- chop

- ---

- shop

- shin

- chop

Current word:

- ship

Stack, in progress

Stack:

- shin

- chop

- ---

- stop

- shot

- shin

- chop

Current word:

- shop

End word added, loop ends

What is the Output?

Words in morph: 4
chip
ship
shop
stop

What about a Failure?

- Suppose we want to try turning "ship" into "junk"
- Which words are "checked"?
- What is the output?

Queue, failure, starting point

Queue (front…back):

- ship

Current word:

- (none)

Queue, failure, in progress

Queue (front…back):

- (empty)

- ---

- chip, shin, shop

Current word:

- ship

Queue, failure, in progress

Queue (front…back):

- shin, shop
- ---
- shin, shop, chop

Current word:

- chip

Queue, failure, in progress

Queue (front…back):

- shop, chop

- ---

- shop, chop

Current word:

- shin

Queue, failure, in progress

Queue (front…back):

- chop
- ---
- chop, shot, stop

Current word:

- shop

Queue, failure, in progress

Queue (front…back):

- shot, stop

- ---

- shot, stop

Current word:

- chop

Queue, failure, in progress

Queue (front…back):

- stop
- ---
- stop

Current word:

- shot

Queue, failure, in progress

Queue (front…back):

- (empty)

- ---

- (empty)

Current word:

- stop

Queue, failure, in progress

Queue (front…back):

- (empty)

Current word:

- (nothing)

Queue empty, loop ends

Queue, failure, output

No solution, 7 words checked.

Which words were checked?
Everything that was ever added to the queue

ship, chip, shin, shop, chop, shot, stop

Another Example, Using the Dictionary from Appendix A

rain	slip
ruin	soap
run	soil
sail	soul
she	soup
shy	sue
ski	sun
skip	tail
sky	trail
slap	train

- **Queue** mode
- Change and Length mode on
- run -> sky

App. A Example, Queue Mode

Queue (front…back):

- run

Current word:

- (none)

App. A Example, Queue Mode

Queue (front…back):

- (empty)

- ---

- ruin, sun

Current word:

- run

App. A Example, Queue Mode

Queue (front…back):

- sun

- ---

- sun, rain

Current word:

- ruin

App. A Example, Queue Mode

Queue (front…back):

- rain

- ---

- rain, sue

Current word:

- sun

App. A Example, Queue Mode

Queue (front…back):

- sue

- ---

- sue, train

Current word:

- rain

App. A Example, Queue Mode

Queue (front…back):

- train

- ---

- train, she

Current word:

- sue

App. A Example, Queue Mode

Queue (front…back):

- she
- ---
- she, trail

Current word:

- train

App. A Example, Queue Mode

Queue (front…back):

- trail
- ---
- trail, shy

Current word:

- she

App. A Example, Queue Mode

Queue (front…back):

- shy

- ---

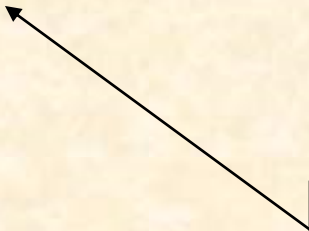- shy, tail

Current word:

- trail

App. A Example, Queue Mode

Queue (front…back):

- tail

- ---

- tail, sky

Current word:

- shy

End word added, loop ends

What is the Output?

Words in morph: 6

run

sun

sue

she

shy

sky