Tutorial -3

29 October 2018
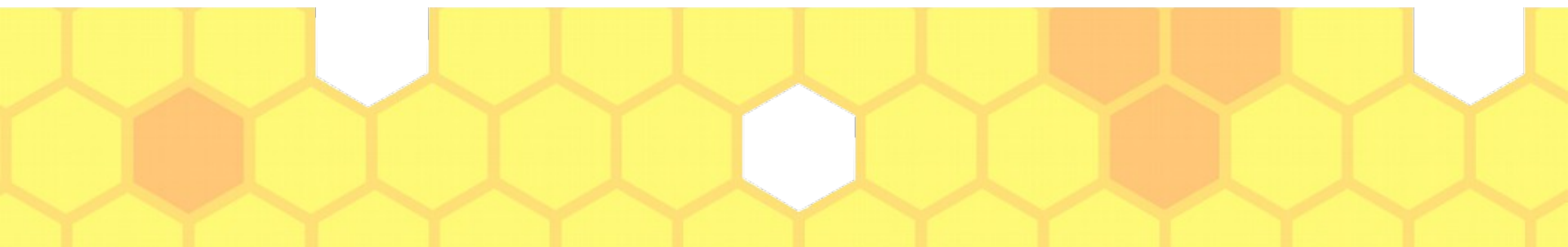
DAILY STANDUP

AGAIN

Tutorial 9
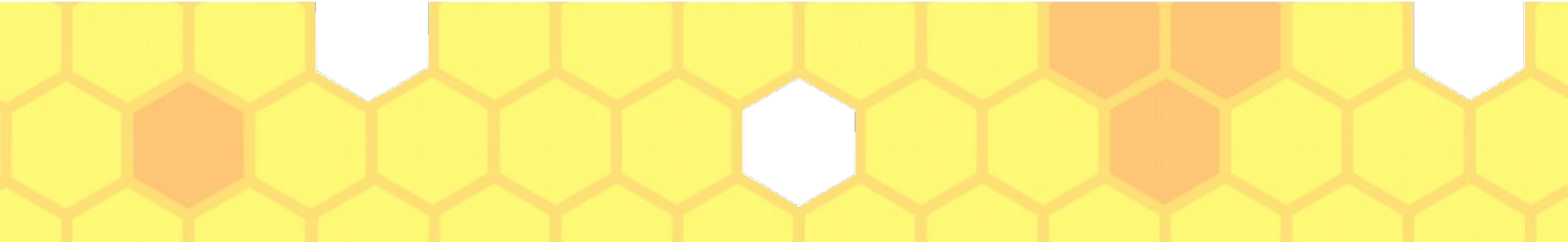
Xiao Liang |

Problem 24.1

Stop the whole sorting procedure, when a pass through the array does not lead to any swapping

```c
void bubble_pass(long last, long a[]) {
  for (long i = 0; i < last; i += 1) {
    if (a[i] > a[i+1]) {
      swap(a, i, i+1);
    }
  }
}

void bubble_sort(long n, long a[n]) {
  for (long last = n - 1; last > 0; last -= 1) {
    bubble_pass(last, a);
  }
}
```

Add a variable `swapped` to keep track

Problem 24.2

```c
void insert(long a[], long curr) {
  long i = curr - 1;
  long temp = a[curr];
  while (temp < a[i] && i >= 0) {
    a[i+1] = a[i];
    i -= 1;
  }
  a[i+1] = temp;
}
void insertion_sort(long n, long a[n]) {
  for (long curr = 1; curr < n; curr += 1) {
    insert(a, curr);
  }
}
```

(a)
what is the running time of insertion sort if the input is already sorted?

(b)
what is the running time of insertion sort if the input is inversely sorted?

Problem 24.3

what is the loop invariant for insert?
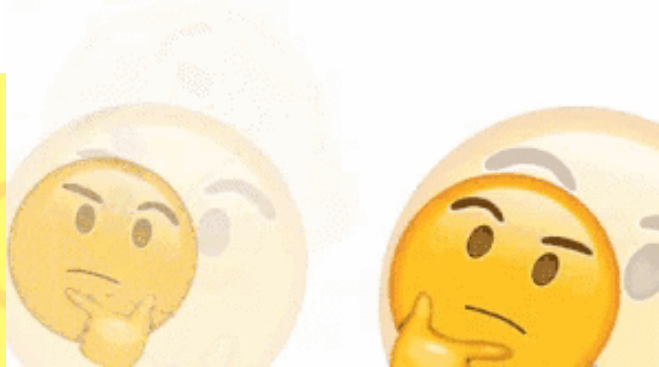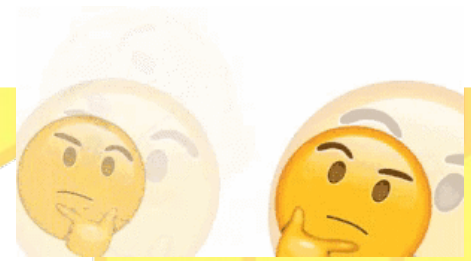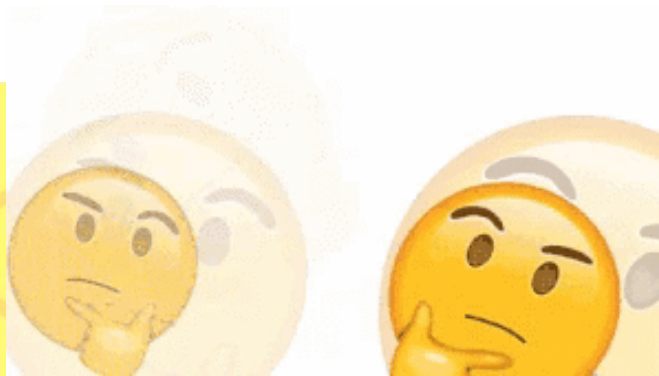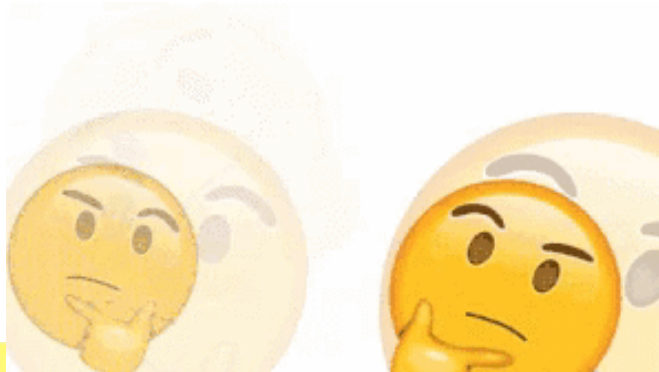
```
void insert(long a[], long curr) {
  long i = curr - 1;
  long temp = a[curr];
  while (temp < a[i] && i >= 0) {
    a[i+1] = a[i];
    i -= 1;
  }
  a[i+1] = temp;
}
```

a, curr, temp

Fun stuff

What is Fun Stuff?

This is fun stuff

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Summary of fun stuff

- cowsay
- recursive pointer array random number generator
- valgrind
- memes (Facebook pages)
- lolcat

This is fun stuff

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Programming Exercises

1. Rewrite binary search using a loop

```
long search(long list[], long i, long j, long q) {
  if (i > j) {
    return -1;
  }
  long mid = (i+j)/2;
  if (list[mid] == q) {
    return mid;
  }
  if (list[mid] > q) {
    return search(list, i, mid-1, q);
  }
  return search(list, mid+1, j, q);
}
```
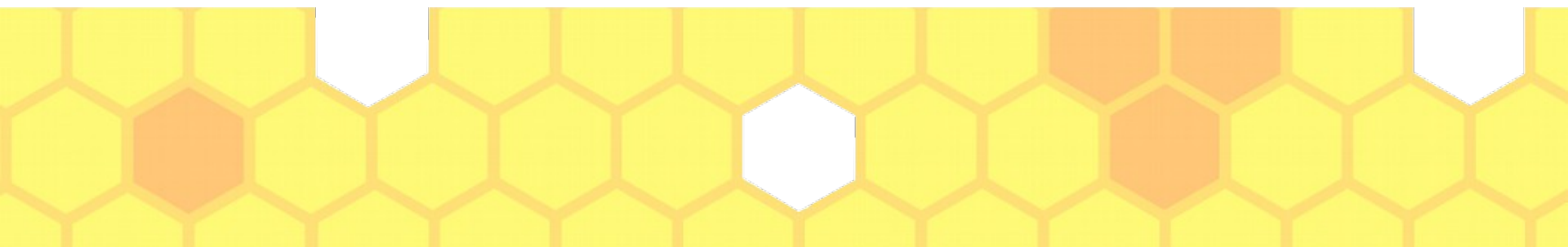
2.
Rewrite binary search so that it returns the insert position of q

- k if a[k] <= q <= a[k+1]
- -1 if k < a[0]
- n-1 if k > a[n-1]

3.
Rewrite insertion sort with the following algorithm

Algorithm

while unsorted pile is not empty

   take the first element X from the unsorted pile

   use binary search to find the correct pos to insert X

   insert X into the right pos

Q&A

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