Title

Download this presentation here:

Cognitive Science based Software Engineering

Agenda

- How the brain works
- Reading Code
- Writing / Thinking Code
- Getting into the flow
- Testing

What is Cognitive Science?

"Cognitive science is the study of the human mind and brain, focusing on how the mind represents and manipulates knowledge and how mental representations and processes are realized in the brain."

Source: Johns Hopkins University

Why Cognitive Science and Software Engineering?

Software is the result of the cognitive work of our brains: the more we know about how the brain works and the better the standpoint we start from.

Memory

- Short term memory
- Long term memory
- Working memory

Short Term Memory

- 7 items (±2)
- association and rehersal make it become Long Term Memory

Short Term Memory

- sequence of numbers

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Short Term Memory

- sequence of numbers

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- works better in patterns

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Short Term Memory

- sequence of numbers

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- works better in patterns

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Memorize it!

Bonus slide!

Method of Loci

Simonides of Ceos (556 BC – 468BC)

Uses visualization of a well-known space for easing the recall of information.

Long Term Memory

- Explicit memories
    - episodic memory
    - semantic memory

- Implicit Memories
    - procedural memory

Do you remember the number?

Do you remember the number?

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Bonus slide!

Synesthesia

- facilitates transition from STM to LTM
- songs text

Working Memory

- very close to STM
- it's STM applied to processing

Cognitive load

is the capacity of cognitive load in the context of working memory ("Cognitive load encompasses the amount of mental processing required for a developer to perform a task. When cognitive load remains high as a result of problems such as poorly documented code or systems, developers need to devote extra time and effort to complete tasks and avoid mistakes")

Cognitive load types:

- intrinsic
- extraneous
- germane

Intrinsic Cognitive Load

Definition of white holes

White holes are theoretical objects predicted by general relativity that expel matter and energy and do not allow anything to enter; they could theoretically form if the time-reversed behavior of a black hole were possible, making it a region of space where the arrow of time points outward. Some models suggest that white holes could be related to the fundamental structure of space-time or linked to other exotic phenomena, but they remain speculative and are not confirmed by current scientific observations.

Reading Code

How to read code

Why is it important: we spend more than half of our time reading code rather than writing it.

Reading Code

Why is it not taught, then?

Ok, let's see how good you're at.

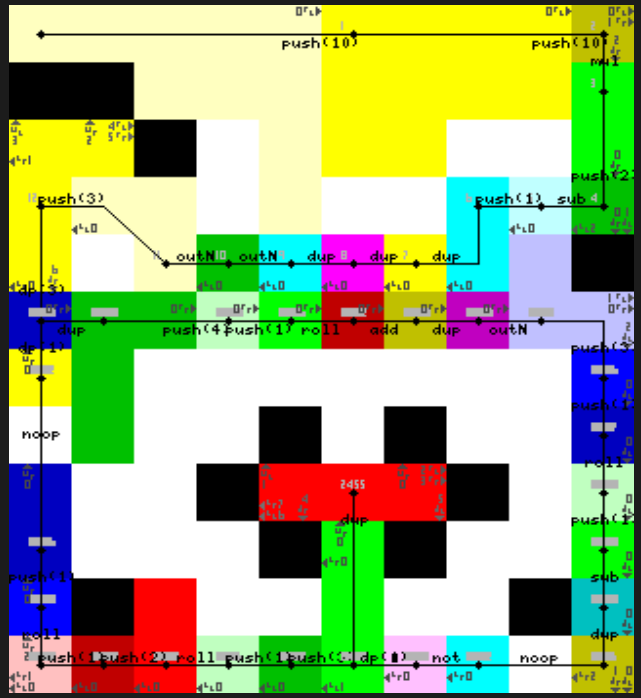
What does this program do?

What does this program do?

Hue Change	Lightness Change		
	No change	1 darker	2 darker
No change	N/A	Push	Pop
1 step	Add	Subtract	Multiply
2 steps	Divide	Modulo	Not
3 steps	Greater	Pointer	Switch
4 steps	Duplicate	Roll	Input num
5 steps	Input char	Output num	Output char

Light red (#FFC0C0)	Light yellow (#FFFFC0)	Light green (#C0FFC0)	Light cyan (#C0FFFF)	Light blue (#C0C0FF)	Light magenta (#FFC0FF)
Red (#FF0000)	Yellow (#FFFF00)	Green (#00FF00)	Cyan (#00FFFF)	Blue (#0000FF)	Magenta (#FF00FF)
Dark red (#C00000)	Dark yellow (#C0C000)	Dark green (#00C000)	Dark cyan (#00C0C0)	Dark blue (#0000C0)	Dark magenta (#C000C0)

What does this program do?



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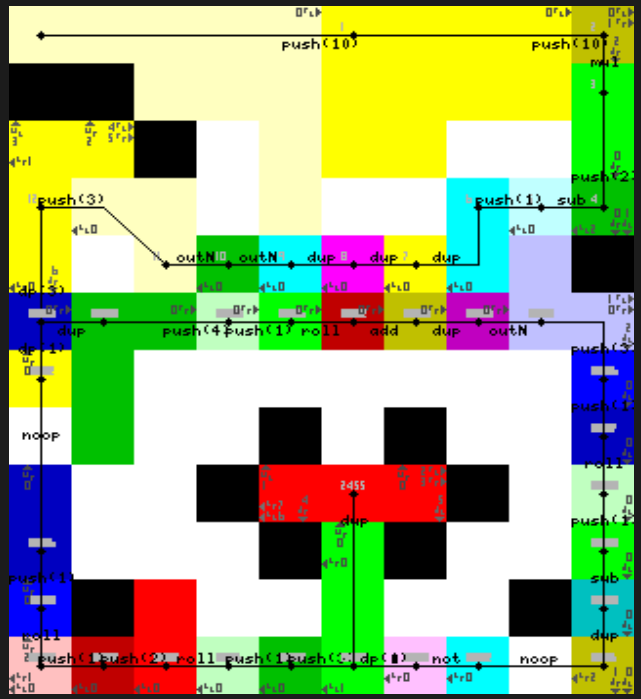

It computes a Fibonacci number

Reading Code

Roles in reading

(stepper, fixed value, most recent, most wanted, etc):

toBinaryString?

```
data class Node(val value: Int, val left: Node?, val right: Node?)

fun unknown(node: Node?) {
    if (node == null) {
        return;
    }
    unknown(node.left)
    print(node.value)
    unknown(node.right)
}
```

Now read this code knowing that it's multihtreaded

```
data class Node(val value: Int, val left: Node?, val right: Node?)

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How was it different?

Read the code

Seniority affects?
Maybe patterns?

Read the code

9 types of comments:

- Function comments
- Design comments
- Why comments
- Teacher comments
- Checklist comments
- Guide comments
- Trivial comments
- Debt comments
- Backup comments

Source: http://antirez.com/news/124

Booking Edge Case

Sequence of calls between rp-music-reebok, money-booker and PubSub in the edge case

Here is a more complicated example, because you not only need to decode what this snippet does, but also need to know that this is an algorithm for computing the greatest common divisor

```
fun unknown(a: Int, b: Int): Int {
    var v1 = a
    var v2 = b
    while (v2 != 0) {
        val tmp = v2
        v2 = v1 % v2
        v1 = tmp
    }
    return v1
}
```

By the way, do you remember the number?

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Questions?

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