

Topic 19 – Concluding Remarks

Key Ideas

- what we did
- how we did it
- why we did it
- preparing for the final

Concluding Remarks

What we did

- *all the steps that happen after creating a WLP4 program* → having the code running on a MIPS processor
- it is a difficult task
- need to know about a lot of topics: data representation (hexadecimal, 2's complement, unicode), assembly language, finite automata (deterministic and non-deterministic) and regular expressions, context free grammars, parsing, parse trees and symbol tables, linking and loading.

Concluding Remarks

How we did

- *analysis*: break big task down to smaller steps:
 - lexical analysis
 - syntactical analysis
 - context-sensitive analysis
 - code generation
 - code optimization
 - assembly
 - linking and loading
- don't try to do too much at once
- at each step detected some errors so that taking the next step is easier

Concluding Remarks

How we did

- *abstraction* at each step only focus on the details that matter:
 - lexical analysis → tokens
 - syntax analysis → parse tree
 - context-sensitive analysis → valid symbols and types
 - code generation → assembly language
 - code optimization → improve efficiency
 - assembly → machine code
 - linking → object code
 - loading → code running on a processor (a process)

Concluding Remarks

How we did

- *plan, design, implement, test*
- we helped you a bit on the planning stage by providing the abstractions and the steps in the process
- testing extensively at each step makes it easier to find bugs
- you did the rest!

Concluding Remarks

Why we did it

- programming languages are the interface between a programmer's idea and a computer running a program
- C, C++, Racket, Java etc. aren't naturally occurring phenomena
 - there were created by (some fairly bright) humans
- sometimes they have features we don't like
- sometimes they are missing features we do like
- Hopefully, you will now think more critically about programming languages.
- *You can modify an existing language or create a new one!*

Concluding Remarks

Preparing for the Final

- I will make a complete copy of my slides available on Learn (by early next week) likely in two files: CS241-Part1.pdf and CS241-Part2.pdf (with all typos corrected).
- I have a pinned post in Piazza listing any typos.
- I will have extra office hours just before the final (will post in Piazza)
- We are having review sessions before the final.
- We will be monitoring and answering questions in Piazza.
- *Good luck on the final!*
- *Good luck with computer programming!*
- *Thank-you for your attention!*