Embedded Systems: Programming in C

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Overview

- Intro to Embedded Systems
- C: The good, the bad and the ugly
- From English to Hex: the process
- Code Examples:
  - Hello world!!
  - Primitives
  - Variable scope: local, global, static
  - Casting
  - Arithmetic operations
  - Control flow(if, if/else, else/if, switch, for), loops (for, while, do, goto)
  - Arrays, pointer math
  - Bitwise operations, brief review of binary math/representation
  - Enumerated types
  - Structs, unions
  - Headers, inclusion guards

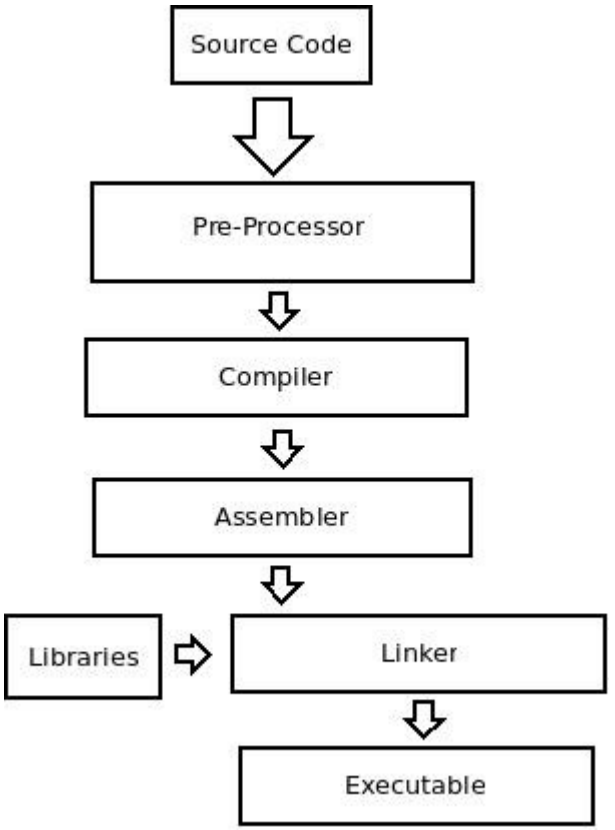
Intro to Embedded Systems

- Simpler, more specific functions than normal PC
- Low-power
- Resource-constrained
- Often lacking an operating system
- Sometimes cost-sensitive
- Might carry out safety-critical tasks (Automotive, Aerospace, Defense)
- Often “real-time” in nature

C: The good, the bad and the ugly

- Why C?
  - High-level: (Relatively) Easy to read
  - Efficient and low overhead
  - Allows for access to low-level hardware
  - Affectionately called “High-level Assembly”
- Why not C?
  - Plenty of undefined behavior (lots of features can be implementation-specific)
  - Assumption of programmer competency
  - Learning curve – Not huge, but requires some understanding of computer hardware
- Why avoid C?
  - Large projects can develop bugs even with thorough testing
    - Can be disastrous in certain safety-critical apps
      - https://www.youtube.com/watch?v=gp_D8r-2hwk @ t>54 sec :)

From English to Hex: the process



- Credit: https://www.cs.cf.ac.uk/Dave/C/node3.html