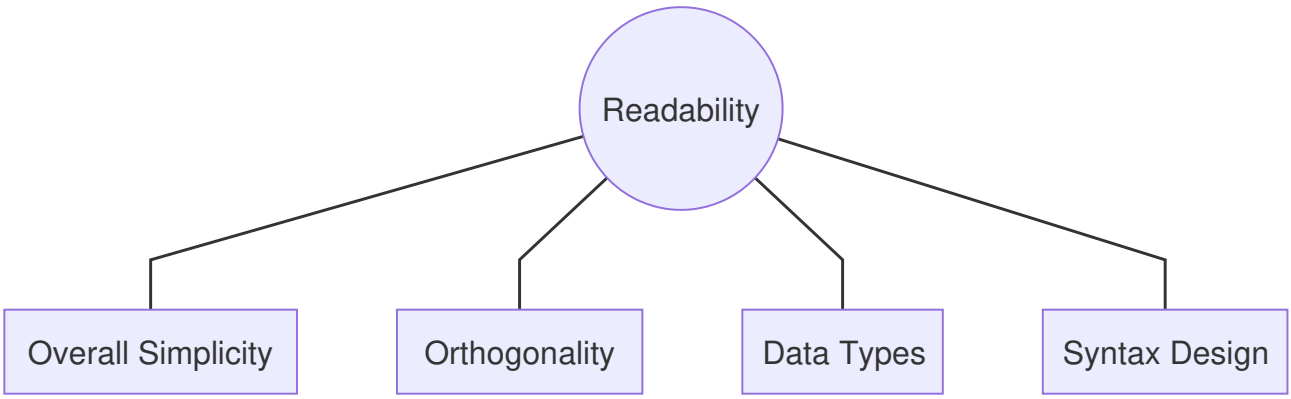
L2-PPL

Domains of software

- Scientific
  - Fortran - Formula Translation
- Business Oriented
  - COBOL - Common Business Oriented Language
- Artificial Intelligence
  - LISP - List Processing
- System Software
  - C
- Web based
  - PHP JS etc.

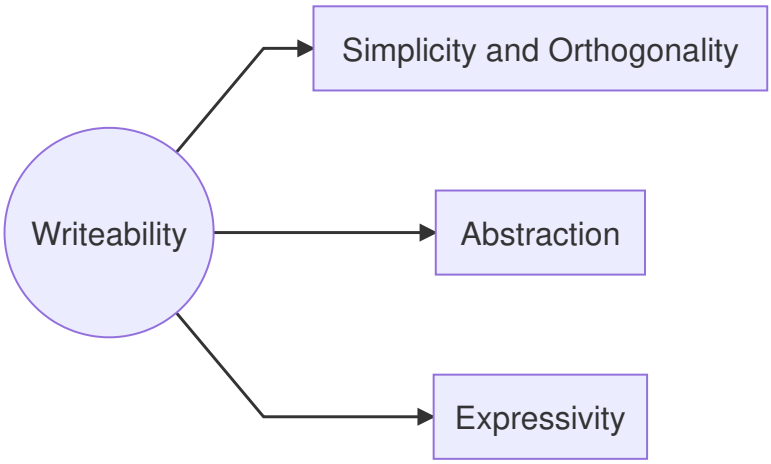
Qualities of a programming language

1. Readability



- Overall simplicity
  - Self explanatory
- Orthogonality
  - You should have small number of constructs and small number of ways to combine them to write complex programs
- Data Types
  - Some languages have richer data types than others
    eg: C & java
- Syntax Design
  - Simple keywords

2. Writeability

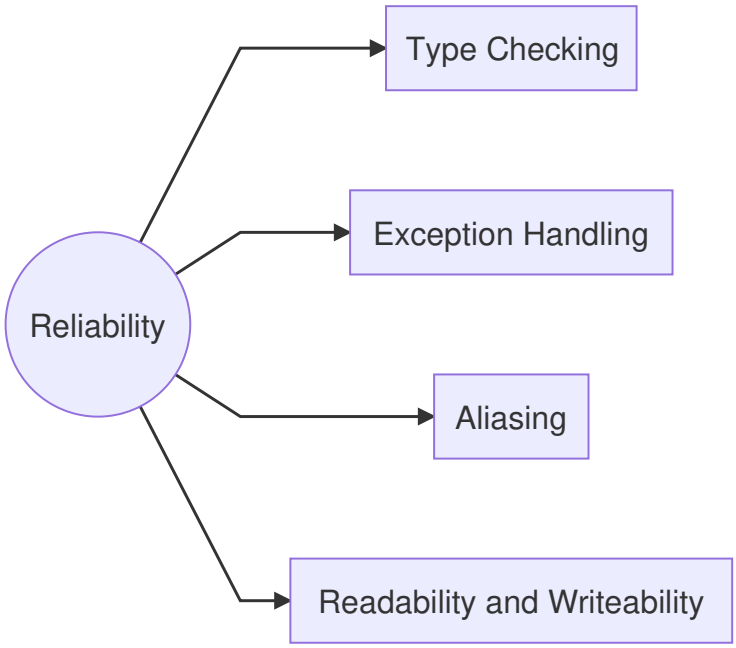


Abstraction:

- Focus on some DS, and you can abstract out the concept
- if the code doesn't have such a support
  (e.g. Language supports a abstraction like a stack)
  Simplicity and Orthogonality:
- Don't misuse too many features

  Expressivity is the breadth of ideas that can be represented and communicated in the lang

3. Reliability



- Type checking
- Exception Handling
- Aliasing
  - using different names for the same memory location
  - Leads to complications
- Readability and Writability

4. Cost

- Training

- Creating SW
- Compilation Cost
  - (compilers can be paid)
- Execution Cost
- Language Implementation Systems
  - (some VMs etc. JVM Is free but others can be paid)
- Poor reliability
- Maintenance

What influences the languge design?

1. Computer architecture
   - Major influence on design of PLs
   - Most prevalent arch is Von Neumann (1940s)
   - Memory separated from processor, stores both code and data
   - Fetch, Decode, Execute, (Store?) Cycle
   - Eg. Parallel execution incorporate this
2. Programming Design Methodologies

   I. Procedural paradigm: Code is acting on data
      - Imperative languages

   II. Functional paradigm of languages:
      - A computation is applying functions which take parameters, no variables

   III. Logical Language
      - Rules are defined, order doesn't exist
      - (NuSMV)?

   IV. Object Oriented paradigm :
      - Data allows code to access it, or allows the access to the code (public/private methods/members)

   V. Scripting languages:
      - JS/PHP/ Python to some extent

   VI. Markup
      - Add additional information to describe how the content will be displayed
      - XML / HTML / Markdown

   - Concurrenct programming

Language Design Tradeoff

1. Writeability and Reliability
   - pointers and large number of operators
2. Reliability vs cost of exectution
   - C doesn't have an array bounds check

3. Compilation cost vs Execution Cost
    - Do at Compile-time vs runtime

Compile Implementation methods

1. Compiler
2. Interpreter
3. Hybrid
4. Preprocessor