CS 220: Survey of Programming Languages

Lecture Slides

Some Properties of Programming Languages

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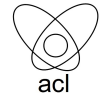
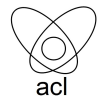
Session 3



Some Properties of Programming Languages

Preliminaries

Some Properties of Programming Languages



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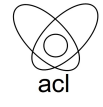
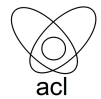
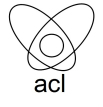


What makes a great programming language?



What makes a great programming language?

- There is no standard set of criteria for a great programming language!



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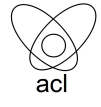

What makes a great programming language?

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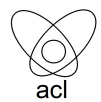
- Choice of criteria based on need for a PL that can be used to create readable, rewritable, and reliable code.



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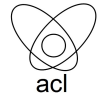
  - The set of criteria is more of a suggested list rather than a hardlined one
- Choice of criteria based on need for a PL that can be used to create readable, rewritable, and reliable code.
  - The set is taken from R.A. Finkel's and R.W. Sebesta's lists.



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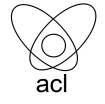
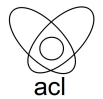


Programming language properties

	CRITERIA		
Characteristic	READABILITY	WRITABILITY	RELIABILITY
Data types	•	•	•
Syntax design	•	•	•
Support for abstraction		•	•
Expressivity		•	•
Exception handling			•
Restricted aliasing			•



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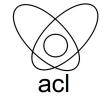
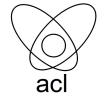
- Addendum: Efficiency (under reliability)



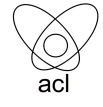



Data types



Data types

- The presence of adequate facilities for defining data types and data structures significantly aids readability



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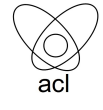


Data types

- The presence of adequate facilities for defining data types and data structures significantly aids readability
- Example: explicitly having a Boolean data type
- Issue though may be on the orthogonality of a PL

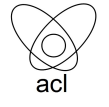


Syntax design

Syntax design

- Closely tied to the concept of clarity
  - Mechanisms should be well defined, and the outcome of code should be easily predictable



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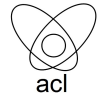

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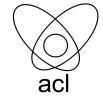
  - The more orthogonal the design of a language, the fewer exceptions the language rules require



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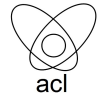

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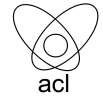

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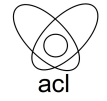

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- Factors to consider in syntax design
  - Special words
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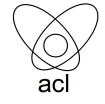
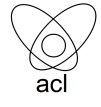
  - Meaning

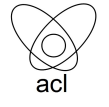


Support for Abstraction



Support for Abstraction

- There should be a way to factor out recurring patterns



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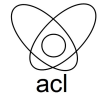

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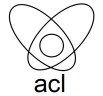

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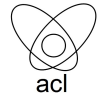

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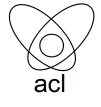
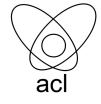


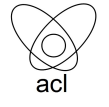
Expressivity



Expressivity

- Expressivity means that a language has relatively convenient, rather than cumbersome, ways of specifying computations.



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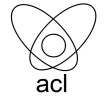
- Example: Short-circuit operators and the `case` statement



Exception handling



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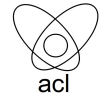

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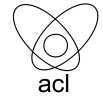

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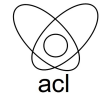
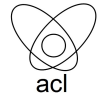
- Examples: (Most) Object-oriented languages
- Bad examples: Awk and SNOBOL silently convert data types in order to apply operators



Restricted aliasing



Restricted aliasing

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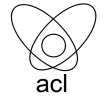

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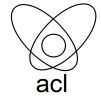

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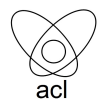
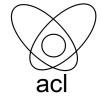
- In some languages, aliasing is used to overcome deficiencies in the language's data abstraction facilities

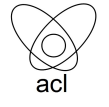


Efficiency



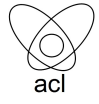
Efficiency

- Efficiency in terms of compiling and executing a program



Efficiency

- Efficiency in terms of compiling and executing a program
- Some concepts related to efficiency



Efficiency

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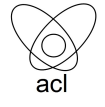
  - Type checking



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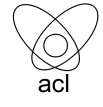

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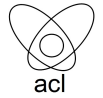

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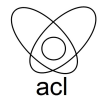

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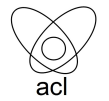
  - Levels of abstraction



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