Programming Language for Robotics

Sungwoo Park

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Natural Languages

- Grammar
  - "What is this for ?"
    - "This… what… for (thing) is… ?"
    - "What is the purpose of this ?"
- Vocabulary
  - "Fun" is not a Russian concept.
  - Liberty(　　), Rational number(　　)
  - Nirvana(　　), Tycoon(　　),
- Language is the frame of thought.

Programming Languages

- Grammar
  - Imperative language
    - flow of program execution
  - Object-oriented language
    - description of the object behavior
  - Functional language
    - program execution = expression evaluation.
- Vocabulary
  - function library ?
- Programming language is also the frame of thought !

Domain Specific Language

- Ex. Compiler
  - functional language
- Ex. Database
  - object-oriented language
  - SQL
- Ex. Language for robotics
  - ???

Related Work

- CES(C for Embedded Systems)
  - probability computation
  - function approximation
  - no interpreter/compiler
  - useful in implementing algorithms ?
- Frob(Functional robotics)
  - Haskell
  - control language for robotic systems
  - high-level description of robot behavior
  - low-level imperative nature is hidden.

Goal

- Develop a DSL for robotics !
- Should support:
  - implementation of low-level algorithms
  - high-level description of robot behavior
- Key features
  - probability computation
  - easy description of robot control
  - learning : how ?
  - interleaved programming ?

DSL for robotics

- Why functional language ?
  - strong foundation for language semantics and static program analysis
  - learning can be achieved through function approximation and variable estimation.
  - efficiency is not always the top priority.
- Interleaved programming
  - coding -> learning -> coding -> learning …
  - now, program should carry data.
  - may engender a new paradigm of programming languages.

Plan

- 1st
  - experiments with Standard ML
    - probability manipulation library
    - focuses on interface, not algorithms.
- 2nd
  - develop and implement a new language.
- 3rd
  - borrow Xavier/Amelia and test !