

Introduction to Tabled Logic Programming with Picat

Sergii Dymchenko

<http://sdymchenko.com>

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Links

- Install Picat from <http://picat-lang.org/>
- <https://github.com/kit1980/lambdaconf-2016-usa>, directory called Introduction to Tabled Logic Programming with Picat

Picat

Picat is a new logic-based multi-paradigm programming language. Picat shares many features with Prolog, especially B-Prolog, but also has many distinct features: optional destructive assignments, functions in addition to predicates, hash tables, list and array comprehensions. . .

Picat cont.

- Pattern-matching
- Intuitive (used to be Imperative)
- Constraints
- Actors
- Tabling

Demo some interactive Picat

Variables, math, destructive assignment, lists, arrays, hash tables, non-determinism (`member`, `disjunction`).

Factorial

Demo `fac.pi`, compare to `fac.pl`

TPK

TPK is a simple algorithm proposed by D. E. Knuth and L. T. Pardo in “The Early Development of Programming Languages”. It is used to demonstrate some basic syntax of a language beyond the “Hello, World!”.

- Prompt for 11 real numbers ($a_0 \dots a_{10}$)
- For each a_i compute $b_i = f(a_i)$, where $f(t) = \sqrt{|t|} + 5t^3$
- For $i = 10 \dots 0$ (in that order) output a pair (i, b_i) if $b_i \leq 400$, or $(i, \text{TOO LARGE})$ otherwise

Demo `tpk.pi`

Tabling

Tabling is a form of automatic memoization.

Demo `fib.pi`

Mode-directed tabling

Demo seq.pi

Edit distance

`http://codeforces.com/contest/530/problem/G`
Demo edit.pi

Exercise: coin sum

Given a list of coin values and the target sum S , find the minimum number of coins the sum of which is S (can use many coins of the same value), or report that its not possible.

Example: for coin values $[1, 3, 5]$ and the target sum 13, the answer is 3 (take 5, 5, and 3).

- Complete code in `coin-sum.pi`
- Extra: output not only the number of coins, but also their values
- Demo `coin-sum.pi`

Extra: dynamic programming problems from GCJ

- Welcome to Code Jam, Qualification Round 2009: <https://code.google.com/codejam/contest/90101/dashboard#s=p2>
- Polynesiaglot, Code Jam to I/O 2016 for Women: <https://code.google.com/codejam/contest/8274486/dashboard#s=p2>
- Bribe the Prisoners, Round 1C 2009: <https://code.google.com/codejam/contest/189252/dashboard#s=p2>

Planning with Picat

planner module is based on tabling.

Demo reach-number.pi

Wordsearch

https://en.wikipedia.org/wiki/Word_search
Demo wordsearch.pi

Exercise: fix wordsearch

- Fix wordsearch to search for straight lines only
- Extra: any word shape, but don't reuse letters
- Demo fixed wordsearch.pi

Extra: planning problems from GCJ

- Osmos, Round 1B 2013: <https://code.google.com/codejam/contest/2434486/dashboard#s=p0>
- Senate Evacuation, Round 1C 2016: <https://code.google.com/codejam/contest/4314486/dashboard#s=p0>

More info

- Picat official site – <http://picat-lang.org/>
- Book “Constraint Solving and Planning with Picat” by Neng-Fa Zhou, Hakan Kjellerstrand, Jonathan Fruhman
- Examples by Hakan Kjellerstrand – <http://www.hakank.org/picat/>