Synthesizing Quotient Lenses: Artifact Evaluation

ANONYMOUS AUTHOR(S)

1 SETUP ENVIRONMENT

1.1 Virtual Machine Environment (recommended)

To make validation easier, we provide the Artifact Evaluation Committee with a virtual machine that has all components installed. Setup for the virtual machine environment detailed below:

(1) Install a Virtual Machine Manager (we tested with VirtualBox)
(2) Download our virtual machine image (QuotientLensSynthesis.ova in TODO)
(3) Load our virtual machine from your virtual machine manager

The user for the virtual machine is solomon, with password quotientsynthesis.

1.2 Custom Environment

If you want to install on a custom environment, certain programs and libraries must be installed. We provide the commands for installation in Lubuntu 17.10 in parenthesis next to the program or library name.

(1) Install opam (sudo apt install opam; opam init; eval ‘opam config env‘; opam update)
(2) Switch opam to OCaml 4.06.0 (opam switch 4.06.0; eval ‘opam config env‘)
(3) Install necessary system packages (opam depext conf-m4.1)
(4) Install OCaml’s Core version 0.10.0 (opam install core.v0.10.0)
(5) Install OCaml’s ppx_deriving (opam install ppx_deriving)
(6) Install python-pip (sudo apt install python-pip)
(7) Install Python’s EasyProcess (pip install EasyProcess)
(8) Install Python’s matplotlib (pip install matplotlib)
(9) Install Python’s tk (sudo apt install python-tk)
(10) Install LaTeX (sudo apt install texlive-full)
(11) Install the codebase (git clone https://github.com/SolomonAduolMaina/boomerang.git)

2 TOOL VALIDATION

To validate, navigate to the directory the codebase is installed in (/home/boomerang in the virtual machine), switch to the eval-pt2 branch (git checkout eval-pt2), and then run the following commands:

(1) make generate-data
(2) make generate-graphs

After these commands are run, the figures will be present at the following locations:

- Figure 10 will be present at $/generated-graphs/times.eps
- Figure 11(a) will be present at $/generated-graphs/times_new.eps
- Figure 11(b) will be present at $/generated-graphs/times_opt.eps

The command “make generate-data” will take about 15 minutes to complete, while the command “make generate-graphs” will take about 5 seconds to complete.

2018. 2475-1421/2018/1-ART1 $15.00
https://doi.org/

2.1 Directory Information

The command make generate-data creates five csv files in the generated_data folder:

(1) The file $/generated_data/new_comparison_data.csv contains the running times for synthesizing lenses from the examples/synthexamples/new_specs folder. This folder contains the benchmarks used for the Optician tool where the lenses synthesized involved non-trivial canonization i.e. the canonization function was not the identity function. This file is used to create Figure 11 (b) when the command "make generate-graphs" is invoked.
(2) The file $/generated_data/optician_comparison_data.csv contains the running times of synthesizing lenses from the examples/synthexamples/new_optician_specs folder using the Optician tool. These are the benchmarks used in the Optician tool, with the lenses being bijective. This file is used to create Figure 11 (a) when the command "make generate-graphs" is invoked.
(3) The file $/generated_data/new_optician_comparison_data.csv contains the running times of synthesizing lenses from the examples/synthexamples/new_optician_specs folder using our new tool implement in Boomerang. These are the benchmarks used in the Optician tool with the lenses synthesized being quotient lenses. This file is used to create Figure 11 (a) when the command "make generate-graphs" is invoked.
(4) The file $/generated_data/size _data.csv contains the size of the lenses synthesized from the examples/synthexamples/new_specs folder.This file is used to create Figure 10 when the command "make generate-graphs" is invoked.

In addition to this, the $/generated_data folder contains the pre-generated file oo_data.csv file which which contains various statistics on the lenses synthesized from the Optician benchmarks. This file is also used to create Figure 10 when the command "make generate-graphs is invoked. The file was pre-generated since generating it takes a very long time.

The file QuickStart.src provides a quick introduction to Boomerang programming.

Our new tool integrates the Optician lens synthesis tool [2] into the lens programming language [1] and provides an implementation of quotient regular expressions (QREs) and QRE lenses. Consequently, the file structure of our tool inherits the file structure of each of these two systems.

We encourage the evaluation committee to consult
https://github.com/Miltnoid/BijectiveLensSynthArtifactEvaluation and
http://www.seas.upenn.edu/ harmony/ for more information on Optician and Boomerang.

REFERENCES

[1] Aaron Bohannon, J. Nathan Foster, Benjamin C. Pierce, Alexandre Pilkiewicz, and Alan Schmitt. Boomerang: Resourceful lenses for string data. In *Proceedings of the 35th Annual ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages*, POPL '08. ACM, 2008.

[2] Anders Miltner, Kathleen Fisher, Benjamin C. Pierce, David Walker, and Steve Zdancewic. Synthesizing bijective lenses. In *Proceedings of the 45th Annual ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages*, POPL 2018, 2017. To appear.