The Algebra of Patterns – Rocq Proofs (Artifact)

David Binder
University of Kent, United Kingdom

Lean Ermantraut
Radboud University, Nijmegen, The Netherlands

Abstract

This artifact provides Rocq proofs for all the theorems of section 3 of the paper The Algebra of Patterns. Concretely, these are theorems 3, 4, 7, 8, 9, 10, 11, 12, 13 and 15.

2012 ACM Subject Classification Theory of computation → Lambda calculus; Theory of computation → Type theory

Keywords and phrases functional programming, pattern matching, algebraic data types, equational reasoning

Digital Object Identifier 10.4230/DARTS.11.2.10

Funding *David Binder*: supported by ARIA programme for Safeguarded AI (grant MSAI-PR01-P11).

Related Article David Binder and Lean Ermantraut, "The Algebra of Patterns", in 39th European Conference on Object-Oriented Programming (ECOOP 2025), LIPIcs, Vol. 333, pp. 2:1–2:28, 2025. `https://doi.org/10.4230/LIPIcs.ECOOP.2025.2`

Related Conference 39th European Conference on Object-Oriented Programming (ECOOP 2025), June 30–July 2, 2025, Bergen, Norway

Evaluation Policy The artifact has been evaluated as described in the ECOOP 2025 Call for Artifacts and the ACM Artifact Review and Badging Policy.

1 Scope

The paper contains the mechanization of the theorems of section 3 of the paper "The Algebra of Patterns".

2 Content

The artifact package includes:

- A docker image which provides binaries of the Rocq theorem prover.
- Proof scripts for all the definitions and theorems of section 3 of the paper.
- A file `Results.v` which restates all the theorems proved in the individual files, together with crossreferences to the specific subsections in the paper.

3 Getting the artifact

The artifact endorsed by the Artifact Evaluation Committee is available free of charge on the Dagstuhl Research Online Publication Server (DROPS).

4 Tested platforms

The artifact should work on any platform which can run docker images and provides sufficient resources to check simple Rocq developments. The authors have successfully run the image using a M1 Mac with 16GB Ram and on Ubuntu Linux 24.04 with 16GB of Ram with a i7-1260P CPU.

5 License

The artifact is available under a CC-BY 4.0 license.

6 MD5 sum of the artifact

a7996cdbff336775a44ed30c52930fbe

7 Size of the artifact

1.4 GiB

A Mechanized Theorems of the Artifact

In order to verify that the provided Rocq files can be checked it is sufficient to download the file `algebra-of-patterns.tar`, to load the image using `docker load -i algebra-of-patterns.tar` and to run it using `docker run algebra-of-patterns:latest`. This will result in the following output:

```
COQDEP VFILES
COQC theories/Utils.v
COQC theories/Patterns.v
COQC theories/Matching.v
COQC theories/Linearity.v
COQC theories/Determinism.v
COQC theories/Results.v
Closed under the global context
...
Closed under the global context
```

The file `Results.v` restates all the theorems of the mechanization and contains references to the numbering of the theorems in the paper.

In order to run a shell in the docker image the command `docker run --rm -it --entrypoint bash algebra-of-patterns:latest` can be used. The individual Rocq files can then be inspected in the `theories` subdirectory.