

Local Action Diagrams

**Super awesome package for local action
diagrams.**

0.1

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Chapter 1

Introduction

A local action diagram $\Delta = (\Gamma, (G(v)), (X_a))$ consists of:

- a directed graph Γ ,
- a closed permutation group $G(v)$ for each $v \in V(\Gamma)$, and
- a set X_a for each $a \in A(\Gamma)$ such that each X_a is disjoint and X_a is an orbit of the action of $G(o(a))$ on $X_v := \bigsqcup_{a \in o^{-1}(v)} X_a$.

The definition of digraph used is different to that of the `Digraphs` package. For our purposes, a digraph Γ consists of:

- a vertex set V ,
- an arc set A ,
- a map $o : A \rightarrow V$ assigning each arc to an *origin* vertex, and
- a bijection $r : A \rightarrow A$ (denoted by $a \mapsto \bar{a}$) such that $r^2 = \text{id}$.

The bijection r defines a reverse arc for each arc of the graph. This is more specific than the definition in the `digraphs` package which does not require a reverse mapping.

The local action diagrams package provides a category for local action diagrams. It is built in the `IsDigraph` category from the `Digraphs` package.

Chapter 2

Creating Local Action Diagrams

2.1 Creating Local Action Diagrams

2.1.1 IsLocalActionDiagram (for IsDigraph)

▷ `IsLocalActionDiagram(lad)` (filter)

Returns: true if `lad` is of the category `IsLocalActionDiagram` and false otherwise.

Every local action diagram belongs to the `IsLocalActionDiagram` category. Every local action diagram is immutable.

2.1.2 Constructing From Data

▷ `LocalActionDiagramFromData(D, v_labels, e_labels, rev)` (operation)

▷ `LocalActionDiagramFromDataNC(D, v_labels, e_labels, rev)` (operation)

Returns: A local action diagram.

Constructs a local action diagram, checking that the arguments given are a valid local action diagram. The argument D is a digraph and rev must be a compatible involution on the edges of D . The argument v_labels is a list of vertex labels such that $v_labels[i]$ is the group labelling vertex i of D .

The argument e_labels is a list of edge labels. The edges of D are stored in lexicographical order and $edge_labels[i]$ is the set labelling edge i of D (when sorted in lexicographical order).

The NC variant of the operation does not check that the arguments given are a valid local action diagram.

2.1.3 LocalActionDiagramUniversalGroup (for IsPermGroup)

▷ `LocalActionDiagramUniversalGroup(arg)` (operation)

Constructs a local action diagram corresponding to the Burger-Moses group $U(F)$.

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