



## Family Operations

### 1 Why

We want to generalize operations beyond two objects.

### 2 Operations

The *pairwise extension* of a commutative operation is the function from finite families of the ground set to the ground set obtained by applying the operation pairwise to elements. TODO: this is not a function if the operation is not commutative.

The *ordered pairwise extension* of an operation is the function from finite families ground set to the ground set obtained by applying the operation pairwise to elements in order.

#### 2.1 Notation

Let  $(A, +)$  be an algebra and  $\{A_i\}_{i=1}^n$  a finite family of elements of  $A$ . We denote the pairwise extension by

$$\bigoplus_{i=1}^n A_i$$