

hypergraphs

**A GAP package to work with
hypergraphs**

Version 0.1

16 February 2016

**Bertín Hernández-Trejo
Rafael Villarroel-Flores**

Bertín Hernández-Trejo Email: bertin13@gmail.com

Rafael Villarroel-Flores Email: rvf0068@gmail.com

Homepage: <http://rvf0068.github.io>

Copyright

© 2016 by Bertín Hernández-Trejo and Rafael Villarroel-Flores

hypergraphs package is free software; you can redistribute it and/or modify it under the terms of the [GNU General Public License](#) as published by the Free Software Foundation; either version 2 of the License, or (at your option) any later version.

Contents

1	Hypergraph Objects	4
1.1	Hypergraph	4
2	Basic Constructions	5
2.1	Hypergraphs	5
2.2	Properties	6
2.3	Parameters	6
2.4	Lists	7
3	Library of Hypergraphs	8
3.1	Hypergraphs	8
	Index	9

Chapter 1

Hypergraph Objects

1.1 Hypergraph

Chapter 2

Basic Constructions

2.1 Hypergraphs

2.1.1 HHypergraph (for list of vertices and edges)

- ▷ `HHypergraph(V , Ed)` (method)
- ▷ `HHypergraph(Ed)` (method)

Returns the hypergraph object, with vertices V and hyperedges Ed . In the second form, the hyperedges determine the set of vertices, as the union of the hyperedges.

2.1.2 HCompleteHypergraph

- ▷ `HCompleteHypergraph(n , r)` (function)

Returns the hypergraph that has $\{1 \dots n\}$ as set of vertices, and all r -subsets of $\{1 \dots n\}$ as hyperedges.

2.1.3 HRandomUniformHypergraph

- ▷ `HRandomUniformHypergraph(n , r , p)` (function)

Returns a hypergraph with set of vertices given by $\{1 \dots n\}$, and where each r -subset of $\{1 \dots n\}$ appears as a hyperedge with probability p .

2.1.4 HRemovedEdge

- ▷ `HRemovedEdge(H , e)` (function)

Returns the graph obtained from the hypergraph H removing its edge e .

2.1.5 HRemovedVertex

- ▷ `HRemovedVertex(H , x)` (function)

Returns the hypergraph obtained from the hypergraph H by removing the vertex x from its list of vertices and from each of its edges. It also removes edges that become empty as a result.

2.2 Properties

2.2.1 IsUniform

▷ `IsUniform(H)` (method)

Determines if the hypergraph H is uniform, that is, if all edges of H have the same cardinality k . If H is uniform, then the function returns k , otherwise, it returns false.

2.2.2 IsSimple

▷ `IsSimple(H)` (method)

Determines whether the hypergraph H is simple. (A hypergraph is simple if no edge is contained in another edge.)

2.2.3 IsConnected

▷ `IsConnected(H)` (method)

Determines whether the hypergraph H is connected.

2.3 Parameters

2.3.1 HDistance

▷ `HDistance(H , x , y)` (function)

Given a hypergraph H and two of its vertices x , y , this function returns the distance in H from x to y .

2.3.2 HDiameter

▷ `HDiameter(H)` (method)

Returns the diameter of the hypergraph H .

2.3.3 HGirth

▷ `HGirth(H)` (method)

Returns the girth of the hypergraph H .

2.4 Lists

2.4.1 Vertices

▷ `Vertices(H)` (method)

Returns the list of vertices of the hypergraph H .

2.4.2 Edges

▷ `Edges(H)` (method)

Returns the list of edges of the hypergraph H .

2.4.3 HNeighborhood

▷ `HNeighborhood(H , x)` (function)

Given a hypergraph H and one of its vertices x , returns the set of vertices that share an edge with x .

2.4.4 HDistancesFrom

▷ `HDistancesFrom(H , x)` (function)

Given a hypergraph H and one of its vertices x , it returns a record L , where $L.u$ is equal to the distance in H from the vertex x to the vertex u .

2.4.5 IndexOfEdges

▷ `IndexOfEdges(H)` (method)

Given a hypergraph H , the function returns a record I , where $I.u$ is a list of the indices of the edges where the vertex u appears.

Chapter 3

Library of Hypergraphs

3.1 Hypergraphs

3.1.1 HFano

▷ HFano

(global variable)

The Fano hypergraph.

3.1.2 HQuad

▷ HQuad

(global variable)

The hypergraph of the smallest generalized quadrangle.

Index

Edges, [7](#)

HCompleteHypergraph, [5](#)

HDiameter, [6](#)

HDistance, [6](#)

HDistancesFrom, [7](#)

HFano, [8](#)

HGirth, [6](#)

HHypergraph

 for list of vertices and edges, [5](#)

 for only edges, [5](#)

HNeighborhood, [7](#)

HQuad, [8](#)

HRandomUniformHypergraph, [5](#)

HRemovedEdge, [5](#)

HRemovedVertex, [5](#)

IndexOfEdges, [7](#)

IsConnected, [6](#)

IsSimple, [6](#)

IsUniform, [6](#)

Vertices, [7](#)