OpenMath 1.0

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1. Copyright

This share package is distributed under the terms of the GAP copyright. Additionally, it contains code developed at INRIA (copyright INRIA), under the ESPRIT project number 24969 (OpenMath). The user may not use the library in commercial products without seeking permission from the GAP group (gap@dcs.st-and.ac.uk) and the CAFE team at INRIA SA (stephane.dalmas@sophia.inria.fr).

It may be redistributed "as is" together with this notice.

2. Technicalities

This share package uses an external binary and therefore works only under UNIX systems.

To install this share package (after extracting the share packages archive file to the GAP home directory):

a) go to the directory `pkg/openmath/OMCv1.3c/src` and call

/bin/sh ./configure

and then call `make` to compile the INRIA library (producing libOM.a).

b) go to the directory `pkg/openmath` (the directory containing this README file) and call

/bin/sh ./configure *path*

where path is a path to the main GAP root directory (so normally you would call /bin/sh ./configure ../..).

afterwards call `make` to compile the binary.

3. The INRIA library

The files in the directory `openmath/OMCv1.3c` are the OpenMath C library version 1.3c developed by the CAFE group at INRIA SA. For the latest version, contact: stephane.dalmas@sophia.inria.fr

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A short introduction to OpenMath

From the official OpenMath society website:

OpenMath is an emerging standard for representing mathematical objects with their semantics, allowing them to be exchanged between computer programs, stored in databases, or published on the worldwide web. While the original designers were mainly developers of computer algebra systems, it is now attracting interest from other areas of scientific computation and from many publishers of electronic documents with a significant mathematical content. There is a strong relationship to the MathML recommendation from the Worldwide Web Consortium, and a large overlap between the two developer communities. MathML deals principally with the presentation of mathematical objects, while OpenMath is solely concerned with their semantic meaning or content. While MathML does have some limited facilities for dealing with content, it also allows semantic information encoded in OpenMath to be embedded inside a MathML structure. Thus the two technologies may be seen as highly complementary.

Mathematical objects encoded in OpenMath can be:

- displayed in a browser
- exchanged between software systems
- cut and pasted for use in different contexts
- verified as being mathematically sound (or not!)
- used to make interactive documents really interactive.

OpenMath is highly relevant for persons working with mathematics on computers, for those working with large documents (e.g. databases, manuals) containing mathematical expressions, and for technical and mathematical publishing.

The worldwide OpenMath activities are coordinated within the OpenMath Society, based in Helsinki, Finland. It is coordinated by an executive committee, elected by its members. It organizes workshops and holds an annual meeting. The Society brings together tool builders, software suppliers, publishers and authors.

OpenMath and GAP

This share package has been developed to allow GAP users to import and export mathematical objects encoded in in OpenMath, for the purpose of exchanging them with other applications which are OpenMath enabled.

Further Information

Visit the OpenMath Society webpage at http://www.openmath.org, or the ESPRIT project webpage at http://www.nag.co.uk/projects/OpenMath.html.

1 OpenMath functionality in GAP

After loading the share package the following operations are available.

1 ▶ OMPrint(*obj*)   F

OMPrint writes the XML OpenMath encoding of GAP object *obj* to the standard output.

```
gap> g := Group((1,2,3));;
gap> OMPrint(g);
<OMOBJ>
<OMA>
<OMS cd="group1" name="Group"/>
<OMA>
<OMS cd="permut1" name="Permutation"/>
<OMI> 2</OMI>
<OMI> 3</OMI>
<OMI> 1</OMI>
</OMA>
</OMA>
</OMOBJ>
```

2 ▶ OMGetObject(*stream*)   F

stream is an input stream with an OpenMath object on it. OMGetObject takes precisely one object off *stream* and returns it as a GAP object.

This may be used to retrieve objects from a file, for example:

```
gap> stream := InputTextFile(test3.omt");;
gap> OMGetObject(stream);
912873912381273891
```

or it can be used to retrieve them from standard input - one may paste an OpenMath object direcly into standard input after issuing GAP with the following commands:

```
gap> stream := InputTextUser();;
gap> g := OMGetObject(stream);
```

3 ▶ OMPutObject(*stream*, *obj*)   F

OMPutObject writes the XML OpenMath encoding of the GAP object *obj* to output stream *stream*.

```
gap> g := [[1,2],[1,0]];;
gap> t := "";
""
gap> s := OutputTextString(t, true);;
gap> OMPutObject(s, g);
gap> CloseStream(s);
gap> Print(t);
<OMOBJ>
<OMA>
<OMS cd="linalg1" name="matrix"/>
<OMA>
<OMS cd="linalg1" name="matrixrow"/>
<OMI> 1</OMI>
<OMI> 2</OMI>
</OMA>
<OMA>
<OMS cd="linalg1" name="matrixrow"/>
<OMI> 1</OMI>
<OMI> 0</OMI>
</OMA>
</OMA>
</OMOBJ>
```

4 ▶ OMTest(*obj*)   F

Converts *obj* to OpenMath and back. Returns true iff *obj* is unchanged (as a GAP object) by this operation. The OpenMath standard does not stipulate that converting to and from OpenMath should be the identity function so this is a useful diagnostic tool.