

# Package ‘kstIO’

March 8, 2026

**Version** 0.5-0

**Date** 2026-03-08

**Title** Knowledge Space Theory Input/Output

**Description** Knowledge space theory by Doignon and Falmagne (1999) [doi:10.1007/978-3-642-58625-5](https://doi.org/10.1007/978-3-642-58625-5) is a set- and order-theoretical framework which proposes mathematical formalisms to operationalize knowledge structures in a particular domain. The 'kstIO' package provides basic functionalities to read and write KST data from/to files to be used together with the 'kst', 'kstMatrix', 'pks', or 'DAKS' packages.

**License** GPL (>= 3)

**Depends** R (>= 4.4.0), sets, kstMatrix (>= 2.3-0), openxlsx2, readODS, tools

**Author** Cord Hockemeyer [aut, cre]

**Maintainer** Cord Hockemeyer <cord.hockemeyer@uni-graz.at>

**NeedsCompilation** no

**Repository** CRAN

**Encoding** UTF-8

**Date/Publication** 2026-03-08 15:50:02 UTC

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kstIO-package	<i>kstIO File formats</i>
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## Description

Knowledge space theory by Doignon and Falmagne (1985, 1999) is a set- and order-theoretical framework, which proposes mathematical formalisms to operationalize knowledge structures in a particular domain. The 'kstIO' package provides basic functionalities to read and write KST data from/to files.

## Details

This page focuses on the different file formats that can be used with the kstIO functions.

## File Formats

Over time and in different research groups with knowledge space theory, different file formats have evolved.

**Matrix Format:** The probably simplest and most direct approach is to store the information in a binary ASCII matrix where a "1" in row *i* and column *j* means that item *j* is element of state/response pattern *i*.

There is no separating character between the columns, and there should be no trailing whitespace at the end of the line. The last line of the matrix must carry an EndOfLine - in most editors (except vi) this means an empty line after the matrix.

**KST Tools Format:** This format (Hockemeyer, 2001) extends the matrix format by two preceding header lines containing the number of items and the number of states/response patterns, respectively.

**SRBT Tools Format:** This format (Poetzi & Wesiak, 2001) extends the KST tools format by yet another preceding header line with format and content metadata. This new header line has the format

```
#SRBT v2.0 <struct> ASCII <comment>
```

where <struct> specifies the type of data stored in the file and <comment> is an optional arbitrary comment.

Furthermore, SRBT files may contain an arbitrary number of comment lines after the number of states/patterns.

The following data types are supported by the respective kstIO functions:

- basis
- data
- relation
- space
- structure

For kbase and surmise relation files, the encoding information "ASCII" is missing because these files are always in ASCII format.

**Spreadsheet Formats:** Starting with version 0.5-0, `kstIO` supports various spreadsheet formats (CSV, XLSX, and ODS). The automatic format detection in the `read...()` functions detects these formats based on the filename extension. As explicit format specification, the following names are recognised: CSV, XLSX, and ODS.

The spreadsheet files themselves contain one sheet only (the `read...()` functions read only the first sheet of the file) containing an optional (but default) header row with item names and the matrix (or data frame in case of surmise functions).

### Special File/Data Types

**Base Files:** Base files are not available in KST tools format.

Their matrix part differs from the other files in that it contains "0", "1", and "2". A "1" means that the state is minimal for the item and a "2" means that it is not (but contains the item). A "0" stands (as always) for the state not containing the item.

**Surmise Relation Files:** Surmise relation files are not available in KST Tools format, either.

Their matrices are somewhat transposed in comparison to all the other formats. Row *i* and column *j* is equal to "1" if knowing *i* can be surmised from knowing *j*, and equal to "0" otherwise. Thus, column *j* describes the minimal state for item *j*.

**Surmise Function Files:** Surmise function files are available only in spreadsheet formats.

The matrix is here preceded by a row which denotes the item for which the respective state (i.e. row) is a clause.

### Example for an SRBT file

```
#SRBT v2.0 structure ASCII
3
5
# Some comment or item information
000
100
110
101
111
```

### Author(s)

Cord Hockemeyer <cord.hockemeyer@uni-graz.at>

## References

- Doignon, J.-P. & Falmagne, J.-C. (1985). Spaces for the assessment of knowledge. *International Journal of Man-Machine Studies*, 23, 175–196.
- Doignon, J.-P. & Falmagne, J.-C. (1999). *Knowledge Spaces*. Springer Verlag, Berlin.
- Hockemeyer, C. (2001). KST Tools User Manual (2nd ed.). [https://resources.cord-hockemeyer.info/techreports/KST-Tools\\_TechRep\\_FWF01.pdf](https://resources.cord-hockemeyer.info/techreports/KST-Tools_TechRep_FWF01.pdf).
- Poetzi, S. & Wesiak, G. (2001). SRbT Tools User Manual. [https://resources.cord-hockemeyer.info/techreports/SRBT-Tools\\_TechRep\\_FWF01.pdf](https://resources.cord-hockemeyer.info/techreports/SRBT-Tools_TechRep_FWF01.pdf).

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read_kbase	<i>Read base file</i>
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## Description

Read a base from a file. The file formats are described in the [kstIO-package](#) information page.

## Usage

```
read_kbase(filename,
            format = "auto",
            as.letters = TRUE,
            header = TRUE,
            sep = ', ',
            enforce = TRUE)
```

## Arguments

filename	A character string specifying the name of the base file.
format	Specification of the files format. Can be "SRBT", "KST", "matrix", "CSV", or "auto" (default).
as.letters	logical, should the elements of the sets be letters or numbers?
header	For spreadsheet files only: does the file contain a header row?
sep	For CSV files only: character separating cells within a row.
enforce	Should we enforce that the result is really a basis, i.e. should we run <a href="#">kmbasis</a> on it?

## Details

The format values "SRBT", "KST", and "matrix" refer to the different generations of file formats described in [kstIO-package](#). The values "CSV", "ODS", and "XLSX" refer to the respective spreadsheet file formats. The value "auto" (default) requests an automatic detection of the format.

If `as.letters` is TRUE the item names are letters, otherwise numbers. If the data are read from a spreadsheet file (CSV, XLSX, or ODS) containing a header row, item names are taken from there. If they are read from a spreadsheet file without header, the reading function automatically assigns item names from "V1" to "Vn" where n is the number of items.

**Value**

A list with the following elements:

matrix	the read structure/data as binary matrix
sets	the read structure as object of class kbase

**Note**

In automatic format detection, the distinction between "matrix" and "KST" formats work somewhat heuristic. In other words, in rare cases the automatic detection might give the wrong result.

**References**

Hockemeyer, C. (2001). *KST Tools User Manual* (2nd ed.). [https://resources.cord-hockemeyer.info/techreports/KST-Tools\\_TechRep\\_FWF01.pdf](https://resources.cord-hockemeyer.info/techreports/KST-Tools_TechRep_FWF01.pdf).

Poetzi, S. & Wesiak, G. (2001). *SRbT Tools User Manual*. [https://resources.cord-hockemeyer.info/techreports/SRBT-Tools\\_TechRep\\_FWF01.pdf](https://resources.cord-hockemeyer.info/techreports/SRBT-Tools_TechRep_FWF01.pdf)

**See Also**

[kbase](#), [kmbasis](#), [kstIO-package](#)

**Examples**

```
# Produce a base file
library(kstIO)
d <- getwd()
setwd(tempdir())
write_kbase(phsg$basis, "phsg.bas", "KST") # (Old) KST format
# Read file
read_kbase("phsg.bas") # Automatic format detection
read_kbase("phsg.bas", "KST") # Explicit format specification
setwd(d)
```

---

read_kdata	<i>Read a response patterns file</i>
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**Description**

Read a set of response patterns from a file. The file formats are described in the [kstIO-package](#) information page.

**Usage**

```
read_kdata(filename,
            format = "auto",
            as.letters = TRUE,
            header = TRUE,
            sep = ',')
```

### Arguments

filename	A character string specifying the name of the data file.
format	Specification of the files format. Can be "SRBT", "KST", "matrix", "CSV", or "auto" (default).
as.letters	logical, should the elements of the sets be letters or numbers?
header	For spreadsheet files only: does the file contain a header row?
sep	For CSV files only: character separating cells within a row.

### Details

The format values "SRBT", "KST", and "matrix" refer to the different generations of file formats described in [kstIO-package](#). The value "auto" (default) requests an automatic detection of the format by the read\_XXX function.

If as.letters is TRUE the item names are letters, otherwise numbers. If the data are read from a spreadsheet file (CSV, XLSX, or ODS) containing a header row, item names are taken from there. If they are read from a spreadsheet file without header, the reading function automatically assigns item names from "V1" to "Vn" where n is the number of items.

### Value

A binary matrix with the response patterns.

### Note

In automatic format detection, the distinction between "matrix" and "KST" formats work somewhat heuristic. In other words, in rare cases the automatic detection might give the wrong result.

### Author(s)

Cord Hockemeyer <cord.hockemeyer@uni-graz.at>

### References

Hockemeyer, C. (2001). *KST Tools User Manual* (2nd ed.). [https://resources.cord-hockemeyer.info/techreports/KST-Tools\\_TechRep\\_FWF01.pdf](https://resources.cord-hockemeyer.info/techreports/KST-Tools_TechRep_FWF01.pdf).

Poetzi, S. & Wesiak, G. (2001). *SRbT Tools User Manual*. [https://resources.cord-hockemeyer.info/techreports/SRBT-Tools\\_TechRep\\_FWF01.pdf](https://resources.cord-hockemeyer.info/techreports/SRBT-Tools_TechRep_FWF01.pdf)

### See Also

[kstIO-package](#)

**Examples**

```

# Produce a data file
d <- getwd()
setwd(tempdir())
space <- kmunionclosure(phsg$basis)
data <- kmsimulate(space, 10, 0.1, 0.05)
write_kdata(data, "phsg.ods", "ODS") # matrix format (without any headers)
# Read file; only the first ten rows of the matrix are printed by default
read_kdata("phsg.ods") # Automatic format detection (default)
data <- read_kdata("phsg.ods", "ODS") # Explicit format specification
data
dim(data)
setwd(d)

```

---

read_kfamset	<i>Read a family of sets from file</i>
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---

**Description**

Read a family of sets from a file. The file formats are described in the [kstIO-package](#) information page.

**Usage**

```

read_kfamset(filename,
             format = "auto",
             as.letters = TRUE,
             header = TRUE,
             sep = ',',
             enforce = TRUE)

```

**Arguments**

filename	A character string specifying the name of the space file.
format	Specification of the files format. Can be "SRBT", "KST", "matrix", "CSV", or "auto" (default).
as.letters	logical, should the elements of the sets be letters or numbers?
header	Do we have a header row in spreadsheet format?
sep	Cell separator for CSV filkes
enforce	Shall we enforce famset properties, i.e. uniqueness of rows?

## Details

The format values "SRBT", "KST", and "matrix" refer to the different generations of file formats described in [kstIO-package](#). The value "auto" (default) requests an automatic detection of the format by the read\_XXX function.

read\_kfamset() reads any knowledge space file (space, structure, basis) and ignores any file type info in SRBT file headers.

If as.letters is TRUE the elements of the sets are letters, otherwise numbers.

## Value

A list with the following elements:

matrix	the read structure/data as binary matrix
sets	the read structure as kspace.

## Note

In automatic format detection, the distinction between "matrix" and "KST" formats work somewhat heuristic. In other words, in rare cases the automatic detection might give the wrong result.

There exists no write\_kfamset function on purpose.

## Author(s)

Cord Hockemeyer <cord.hockemeyer@uni-graz.at>

## References

Hockemeyer, C. (2001). *KST Tools User Manual* (2nd ed.). [https://resources.cord-hockemeyer.info/techreports/KST-Tools\\_TechRep\\_FWF01.pdf](https://resources.cord-hockemeyer.info/techreports/KST-Tools_TechRep_FWF01.pdf).

Poetzi, S. & Wesiak, G. (2001). *SRBT Tools User Manual*. [https://resources.cord-hockemeyer.info/techreports/SRBT-Tools\\_TechRep\\_FWF01.pdf](https://resources.cord-hockemeyer.info/techreports/SRBT-Tools_TechRep_FWF01.pdf)

## See Also

[space\\_property](#), [kstIO-package](#)

## Examples

```
# Produce a space file
d <- getwd()
setwd(tempdir())
write_kfamset(phsg$basis, "phsg.fs") # Write in (default) SRBT format
# Read file
read_kfamset("phsg.fs") # Automatic format detection (default)
read_kfamset("phsg.fs", "SRBT") # Explicit format specification
setwd(d)
```

---

read_kspace	<i>Read a knowledge space file</i>
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---

### Description

Read a knowledge space from a file. The file formats are described in the [kstIO-package](#) information page.

### Usage

```
read_kspace(filename,
            format = "auto",
            as.letters = TRUE,
            header = TRUE,
            sep = ',',
            enforce = TRUE)
```

### Arguments

filename	A character string specifying the name of the space file.
format	Specification of the files format. Can be "SRBT", "KST", "matrix", "CSV", or "auto" (default).
as.letters	logical, should the elements of the sets be letters or numbers?
header	For spreadsheet files only: does the file contain a header row [default TRUE]?
sep	Cell separator for CSVC files
enforce	Do we enforce knowledge space properties, i.e. do we run <a href="#">kmunionclosure</a> ?

### Details

The format values "SRBT", "KST", and "matrix" refer to the different generations of file formats described in [kstIO-package](#). The value "auto" (default) requests an automatic detection of the format by the read\_XXX function.

If as.letters is TRUE the elements of the sets are letters, otherwise numbers.

If close is TRUE, a closure under union is computed to ensure that the returned knowledge space really is one.

### Value

A list with the following elements:

matrix	the read structure/data as binary matrix
sets	the read structure as kspace.

**Note**

In automatic format detection, the distinction between "matrix" and "KST" formats work somewhat heuristic. In other words, in rare cases the automatic detection might give the wrong result.

**Author(s)**

Cord Hockemeyer <cord.hockemeyer@uni-graz.at>

**References**

Hockemeyer, C. (2001). *KST Tools User Manual* (2nd ed.). [https://resources.cord-hockemeyer.info/techreports/KST-Tools\\_TechRep\\_FWF01.pdf](https://resources.cord-hockemeyer.info/techreports/KST-Tools_TechRep_FWF01.pdf).

Poetzi, S. & Wesiak, G. (2001). *SRbT Tools User Manual*. [https://resources.cord-hockemeyer.info/techreports/SRBT-Tools\\_TechRep\\_FWF01.pdf](https://resources.cord-hockemeyer.info/techreports/SRBT-Tools_TechRep_FWF01.pdf)

**See Also**

[space\\_property](#), [kstIO-package](#)

**Examples**

```
# Produce a space file
d <- getwd()
setwd(tempdir())
ksp <- kmunionclosure(phsg$basis)
write_kspace(ksp, "phsg.spc", format="SRBT") # Write in SRBT format
# Read file
read_kspace("phsg.spc") # Automatic format detection (default)
read_kspace("phsg.spc", "SRBT") # Explicit format specification
setwd(d)
```

---

read_kstructure	<i>Read a knowledge structure file</i>
-----------------	--

---

**Description**

Read a knowledge structure from a file. The file formats are described in the [kstIO-package](#) information page.

**Usage**

```
read_kstructure(filename,
                 format = "auto",
                 as.letters = TRUE,
                 header = TRUE,
                 sep = ', ',
                 enforce = TRUE
                 )
```

**Arguments**

filename	A character string specifying the name of the structure file.
format	Specification of the files format. Can be "SRBT", "KST", "matrix", "CSV", "ODS", "XLSX", or "auto" (default).
as.letters	logical, should the elements of the sets be letters or numbers?
header	For spreadsheet format: Does the file include a header?
sep	Cell separator for CSV files.
enforce	Do we enforce that the resulting structure is a knowledge structure or do we trust the file's correctness?

**Details**

The format values "SRBT", "KST", and "matrix" refer to the different generations of file formats described in [kstIO-package](#). "CSV", "ODS", and "XLSX" refer to the respective spreadsheet formats. The value "auto" (default) requests an automatic detection of the format by the read\_XXX function.

If as.letters is TRUE the elements of the sets are letters, otherwise numbers.

**Value**

A list with the following elements:

matrix	the read structure/data as binary matrix
sets	the read structure as object of class kstructure.

**Note**

In automatic format detection, the distinction between "matrix" and "KST" formats work somewhat heuristic. In other words, in rare cases the automatic detection might give the wrong result.

**Author(s)**

Cord Hockemeyer <cord.hockemeyer@uni-graz.at>

**References**

Hockemeyer, C. (2001). *KST Tools User Manual* (2nd ed.). [https://resources.cord-hockemeyer.info/techreports/KST-Tools\\_TechRep\\_FWF01.pdf](https://resources.cord-hockemeyer.info/techreports/KST-Tools_TechRep_FWF01.pdf).

Poetzi, S. & Wesiak, G. (2001). *SRbT Tools User Manual*. [https://resources.cord-hockemeyer.info/techreports/SRBT-Tools\\_TechRep\\_FWF01.pdf](https://resources.cord-hockemeyer.info/techreports/SRBT-Tools_TechRep_FWF01.pdf)

**See Also**

[kstructure](#), [kstIO-package](#)

## Examples

```
# Produce a structure file
d <- getwd()
setwd(tempdir())
kst <- kmstructure(phsg$basis)
write_kstructure(kst, "phsg.struct") # Write in (default) SRBT format
write_kstructure(kst, "phsg_struct.ods") # write in ODS format
# Read file
read_kstructure("phsg.struct") # Automatic format detection by heuristics (default)
read_kstructure("phsg_struct.ods") # Automatic format detection by filename extension
setwd(d)
```

---

read\_surmisefunction    *Read surmise function file*

---

## Description

Read a surmise function from a file. The file formats are described in the [kstIO-package](#) information page.

## Usage

```
read_surmisefunction(filename)
```

## Arguments

filename            A character string specifying the name of the surmise function file.

## Details

Surmise function files exist (so far) only in spreadsheet format. The concrete file type is derived from the filename extension.

## Value

A data frame containing the surmise function.

## Author(s)

Cord Hockemeyer <cord.hockemeyer@uni-graz.at>

## See Also

[kstIO-package](#)

## Examples

```
d <- getwd()
setwd(tempdir())
sf <- kmsurmisefunction(phsg$basis)
write_surmisefunction(sf, "phsg_sf.xlsx")
read_surmisefunction("phsg_sf.xlsx")
setwd(d)
```

---

read\_surmiserelation *Read surmise relation file*

---

## Description

Read a surmise relation from a file. The file formats are described in the [kstIO-package](#) information page.

## Usage

```
read_surmiserelation(filename,
                      format = "auto",
                      header = TRUE,
                      as.letters = TRUE,
                      sep = ',')
```

## Arguments

filename	A character string specifying the name of the base file.
format	Specification of the files format. Can be "SRBT", "matrix", "CSV", or "auto" (default).
header	Whether spreadsheet file contains header row.
as.letters	logical, should the elements of the sets be letters or numbers? Defaults to TRUE.
sep	Cell separator for CSV files.

## Details

The format values "SRBT" and "matrix" refer to the different generations of file formats described in [kstIO-package](#). The value "auto" (default) requests an automatic detection of the format by the read\_XXX function.

If as.letters is TRUE (default), the elements of the sets are letters, otherwise numbers.

The relation is always closed under reflexivity and transitivity.

## Value

The incidence matrix of the surmise relation.

**Author(s)**

Cord Hockemeyer <cord.hockemeyer@uni-graz.at>

**References**

Hockemeyer, C. (2001). *KST Tools User Manual* (2nd ed.). [https://resources.cord-hockemeyer.info/techreports/KST-Tools\\_TechRep\\_FWF01.pdf](https://resources.cord-hockemeyer.info/techreports/KST-Tools_TechRep_FWF01.pdf).

Poetzi, S. & Wesiak, G. (2001). *SRbT Tools User Manual*. [https://resources.cord-hockemeyer.info/techreports/SRBT-Tools\\_TechRep\\_FWF01.pdf](https://resources.cord-hockemeyer.info/techreports/SRBT-Tools_TechRep_FWF01.pdf)

**See Also**

[kstIO-package](#)

**Examples**

```
# Produce a relation file
d <- getwd()
setwd(tempdir())
r <- kmsurmiserelation(phsg$basis)
write_surmiserelation(r, "phsg.rel", "SRBT") # SRBT format
# Read file
read_surmiserelation("phsg.rel") # Automatic format detection
read_surmiserelation("phsg.rel", "SRBT") # Explicit format specification
setwd(d)
```

---

write\_kbase

*Write a base file*

---

**Description**

Write a base to a file. The file formats are described in the [kstIO-package](#) information page.

**Usage**

```
write_kbase(x,
            filename,
            format = NULL,
            sep = ',')
```

**Arguments**

x	The data to be written, either a binary matrix or an object of kbase class.
filename	A character string specifying the name of the base file.
format	Specification of the files format. Can be "SRBT", "KST", "CSV", "matrix" or spreadsheet formats.
sep	Cell separator for CSV files.

**Author(s)**

Cord Hockemeyer <cord.hockemeyer@uni-graz.at>

**References**

- Hockemeyer, C. (2001). *KST Tools User Manual* (2nd ed.). [https://resources.cord-hockemeyer.info/techreports/KST-Tools\\_TechRep\\_FWF01.pdf](https://resources.cord-hockemeyer.info/techreports/KST-Tools_TechRep_FWF01.pdf).
- Poetzi, S. & Wesiak, G. (2001). *SRbT Tools User Manual*. [https://resources.cord-hockemeyer.info/techreports/SRBT-Tools\\_TechRep\\_FWF01.pdf](https://resources.cord-hockemeyer.info/techreports/SRBT-Tools_TechRep_FWF01.pdf)

**See Also**

[kbase](#), [kstIO-package](#)

**Examples**

```
d <- getwd()
setwd(tempdir())
# Write base to file
write_kbase(phsg$basis, "phsg.bas") # Write in SRBT format
write_kbase(phsg$basis, "phsg.xlsx") # XLSX format
setwd(d)
```

---

write\_kdata

*Write a knowledge space theory file*

---

**Description**

Write a data set to a file. The file formats are described in the [kstIO-package](#) information page.

**Usage**

```
write_kdata(x,
            filename,
            format = NULL,
            sep = ',')
```

**Arguments**

x	The data to be written, as a binary matrix.
filename	A character string specifying the name of the data file.
format	Specification of the files format. Can be "KST" or spreadsheet format.
]	
sep	Cell separator for CSV format.

**Author(s)**

Cord Hockemeyer <cord.hockemeyer@uni-graz.at>

**References**

Hockemeyer, C. (2001). *KST Tools User Manual* (2nd ed.). [https://resources.cord-hockemeyer.info/techreports/KST-Tools\\_TechRep\\_FWF01.pdf](https://resources.cord-hockemeyer.info/techreports/KST-Tools_TechRep_FWF01.pdf).

Poetzi, S. & Wesiak, G. (2001). *SRbT Tools User Manual*. [https://resources.cord-hockemeyer.info/techreports/SRBT-Tools\\_TechRep\\_FWF01.pdf](https://resources.cord-hockemeyer.info/techreports/SRBT-Tools_TechRep_FWF01.pdf)

**See Also**

[kstIO-package](#)

**Examples**

```
d <- getwd()
setwd(tempdir())
space <- kmunionclosure(phsg$basis)
df <- kmsimulate(space, 100, 0.1, 0.05)
# Write data to file
write_kdata(df, "phsg.dat") # Write in KST format
write_kdata(df, "phsg_dat.xlsx") # xlsx format
setwd(d)
```

---

write\_kfamset

*Write a family of sets to a file*

---

**Description**

Write a family of sets to a file. The file formats are described in the [kstIO-package](#) information page.

**Usage**

```
write_kfamset(x,
              filename,
              format = NULL,
              sep = ',')
```

**Arguments**

x	The data to be written, either a binary matrix as kmfamset object or an object of kfamset class.
filename	A character string specifying the name of the famset file.
format	Specification of the files format. Can be "KST", matrix, "CSV", "ODS", or "XLSX".
sep	Cell eparator for CSV files.

**Details**

The format values refer to the different generations of file formats described in [kstIO-package](#).

**Author(s)**

Cord Hockemeyer <cord.hockemeyer@uni-graz.at>

**References**

Hockemeyer, C. (2001). *KST Tools User Manual* (2nd ed.). [https://resources.cord-hockemeyer.info/techreports/KST-Tools\\_TechRep\\_FWF01.pdf](https://resources.cord-hockemeyer.info/techreports/KST-Tools_TechRep_FWF01.pdf).

Poetzi, S. & Wesiak, G. (2001). *SRbT Tools User Manual*. [https://resources.cord-hockemeyer.info/techreports/SRBT-Tools\\_TechRep\\_FWF01.pdf](https://resources.cord-hockemeyer.info/techreports/SRBT-Tools_TechRep_FWF01.pdf)

**See Also**

[kstIO-package](#)

**Examples**

```
# Obtain data to write from the 'pks' package
d <- getwd()
setwd(tempdir())
# Write famset to file
write_kfamset(phsg$basis, "phsg.fs") # Write in KST format
write_kfamset(phsg$basis, "phsg.ods") # Write the matrix in ODS format
setwd(d)
```

---

write\_kspace

*Write a knowledge space file*

---

**Description**

Write a knowledge space to a file. The file formats are described in the [kstIO-package](#) information page.

**Usage**

```
write_kspace(x, filename, format = NULL, sep = ',')
```

**Arguments**

x	The data to be written, either a binary matrix or an object of kspace class.
filename	A character string specifying the name of the base file.
format	Specification of the files format. Can be "SRBT" (default), "KST", "CSV", or "matrix".
sep	Cell eparator for CSV files.

**Details**

The format values "SRBT", "KST", and "matrix" refer to the different generations of file formats described in [kstIO-package](#).

**Author(s)**

Cord Hockemeyer <cord.hockemeyer@uni-graz.at>

**References**

Hockemeyer, C. (2001). *KST Tools User Manual* (2nd ed.). [https://resources.cord-hockemeyer.info/techreports/KST-Tools\\_TechRep\\_FWF01.pdf](https://resources.cord-hockemeyer.info/techreports/KST-Tools_TechRep_FWF01.pdf).

Poetzi, S. & Wesiak, G. (2001). *SRbT Tools User Manual*. [https://resources.cord-hockemeyer.info/techreports/SRBT-Tools\\_TechRep\\_FWF01.pdf](https://resources.cord-hockemeyer.info/techreports/SRBT-Tools_TechRep_FWF01.pdf)

**See Also**

[space\\_property](#), [kstIO-package](#)

**Examples**

```
# Obtain data to write from the 'pks' package
d <- getwd()
setwd(tempdir())
ksp <- kmunionclosure(phsg$basis)
# Write space to file
write_kspace(ksp, "phsg.spc", format="KST") # Write in KST format
write_kspace(ksp, "phsg.xlsx") # Write the matrix XLSX format
setwd(d)
```

---

write_kstructure	<i>Write a knowledge structure file</i>
------------------	---

---

**Description**

Write a knowledge structure to a file. The file formats are described in the [kstIO-package](#) information page.

**Usage**

```
write_kstructure(x, filename, format = NULL, sep=',')
```

**Arguments**

x	The data to be written, either a binary matrix or an object of kstructure class.
filename	A character string specifying the name of the base file.
format	Specification of the files format. Can be "SRBT" (default), "KST", "matrix", or spreadsheet formats. Default is NULL
sep	Cell separator for CSV files - otherwise ignored.

## Details

The format values refer to the different generations of file formats described in [kstIO-package](#).

## Author(s)

Cord Hockemeyer <cord.hockemeyer@uni-graz.at>

## References

Hockemeyer, C. (2001). *KST Tools User Manual* (2nd ed.). [https://resources.cord-hockemeyer.info/techreports/KST-Tools\\_TechRep\\_FWF01.pdf](https://resources.cord-hockemeyer.info/techreports/KST-Tools_TechRep_FWF01.pdf).

Poetzi, S. & Wesiak, G. (2001). *SRbT Tools User Manual*. [https://resources.cord-hockemeyer.info/techreports/SRBT-Tools\\_TechRep\\_FWF01.pdf](https://resources.cord-hockemeyer.info/techreports/SRBT-Tools_TechRep_FWF01.pdf)

## See Also

[kstructure](#), [kstIO-package](#)

## Examples

```
# Obtain data to write from the 'pks' package
d <- getwd()
setwd(tempdir())
kst <- kmunionclosure(phsg$basis)
# Write structure to file
write_kstructure(kst, "phsg.struct") # Write in (default) SRBT format
# Write the matrix in CSV format
write_kstructure(kst, "phsg.csv")
setwd(d)
```

---

write\_surmisefunction *Write a surmise function file*

---

## Description

Write a surmise function to a file. The file formats are described in the [kstIO-package](#) information page.

## Usage

```
write_surmisefunction(x, filename, sep=',')
```

## Arguments

x	The data to be written, either a quadratic binary matrix or an object of relation class.
filename	A character string specifying the name of the base file.
sep	Cell separator for CSAV files.

### Details

Surmise function can (so far) be stored only in spreadsheet formats. The concrete file type (CSV, ODS, or XLSX) is determined from the filename extension.

### Author(s)

Cord Hockemeyer <cord.hockemeyer@uni-graz.at>

### See Also

[kstIO-package](#)

---

write\_surmiserelation *Write a (surmise) relation file*

---

### Description

Write a surmise relation to a file. The file formats are described in the [kstIO-package](#) information page.

### Usage

```
write_surmiserelation(x, filename, format = NULL, sep=',')
```

### Arguments

x	The data to be written, either a quadratic binary matrix or an object of <code>relation</code> class.
filename	A character string specifying the name of the relation file.
format	Specification of the files format. Can be "SRBT", "matrix", "CSV", "ODS", or "XLSX". If format is NULL, the format is taken from the filename extension (if ".csv", ".ods", or ".xlsx"), otherwise it is "SRBT".
sep	Cell separator for CSV files.

### Details

The format values "SRBT" and "matrix" refer to the different generations of file formats described in [kstIO-package](#). The other formats refer to the respective spreadsheet formats.

### Author(s)

Cord Hockemeyer <cord.hockemeyer@uni-graz.at>

## References

- Hockemeyer, C. (2001). *KST Tools User Manual* (2nd ed.). [https://resources.cord-hockemeyer.info/techreports/KST-Tools\\_TechRep\\_FWF01.pdf](https://resources.cord-hockemeyer.info/techreports/KST-Tools_TechRep_FWF01.pdf).
- Poetzi, S. & Wesiak, G. (2001). *SRbT Tools User Manual*. [https://resources.cord-hockemeyer.info/techreports/SRBT-Tools\\_TechRep\\_FWF01.pdf](https://resources.cord-hockemeyer.info/techreports/SRBT-Tools_TechRep_FWF01.pdf)

## See Also

[kstIO-package](#)

## Examples

```
d <- getwd()
setwd(tempdir())
r <- kmsurmiserelation(phsg$basis)
# Write surmise relation to file
write_surmiserelation(r, "phsg.bas") # Write in (default) SRBT format
write_surmiserelation(r, "phsg.ods") # ODS format
setwd(d)
```

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