

## NAME

**urrhythm** — characterize Johnson-Laird rhythmic prototypes in a passage

## SYNOPSIS

**urrhythm** *inputfile* [ > *outputfile.urr* ]

## DESCRIPTION

The **urrhythm** command outputs a single Humdrum spine (\*\*URrhythm) containing data representing rhythmic ‘prototypes’ (Ur-rhythms) evident in a musical passage. The command implements a variation of Johnson-Laird’s theory of rhythmic prototypes (see REFERENCES below). In order to identify the rhythmic prototypes, **urrhythm** requires information about note onsets and metric position. These may be provided via two input spines: \*\*kern (or \*\*recip) and \*\*metpos.

Johnson-Laird’s rhythmic-prototype theory can be applied only to musical passages conforming to some established metric context, such as 2/4, 3/2, or 12/8 meters. The **urrhythm** command handles all regular types of meters (simple and compound, duple, triple and quadruple). Specifically, any meter having a “numerator” of 2, 3, 4, 6, 9, or 12 can be processed. **Urrhym** adapts to changes of meter, but is unable to handle irregular meters. If an irregular meter is encountered in the input an error is generated and the command terminates.

**urrhythm** characterizes each beat in a passage as belonging to one of three beat types: *Note* (N), *Syncopation* (S), or *Other* (O). Only major beats are characterized in this way. Hence, in 3/4 or 9/8 meters, three beats will be characterized for each complete measure. Similarly, in 4/2 and 12/16, four beats will be characterized for each complete measure.

A “Note” (signified in the output by the letter ‘N’) is defined as a beat that coincides with a note onset.

A “Syncopation” (signified by the letter ‘S’) is defined as arising when no note-onset happens on a beat whose position in the metric hierarchy is greater than that of the most recent note onset. By way of example, imagine a measure in 4/4 meter containing a quarter-note, followed by a half-note, followed by a quarter-note. The third beat position does not coincide with a note onset. The most recent note onset prior to the third beat occurs on beat two. Since beat three is a more important metric position than beat two, beat three is deemed to be syncopated.

Syncopated beats can happen only after the first note onset; subsequent syncopated moments will require another note onset (i.e. two syncopated moments can’t occur in a row without some note onset intervening).

An “Other” (signified by the letter ‘O’) is any beat that is not a Note (N) or a syncopation (S).

It is recommended that output files produced using the **urrhythm** command should be given names with the distinguishing ‘.urr’ extension.

## OPTIONS

The **urrhythm** command provides only a help option:

**-h** displays a help screen summarizing the command syntax

Options are specified in the command line.

## EXAMPLES

The following example illustrates the operation of **urrhythm**. The first two spines (\*\*kern and \*\*metpos) constitute the input. The third spine (\*\*URrhythm) is added by the **urrhythm** command. All three spines are given in the output.

**kern	**metpos	**URrhythm
*M4/4	*M4/4	*M4/4
*tb8	*tb8	*tb8
8g	3	N
8g#	4	.
8a	2	N
[8cc	4	.
8cc]	3	S
8a	4	.
=1	=1	=1
4.cc	1	N
.	4	.
.	3	O
[8b-	4	.
4.b-]	2	S
.	4	.
.	3	O
[8g	4	.
=2	=2	=2
8g]	1	S
[8e-	4	.
8e-]	3	S
4.r	4	.
.	2	O
.	4	.

[4c	3	N
.	4	.
=3	=3	=3
2c]	1	S
.	4	.
.	3	O
.	4	.
4r	2	O
.	4	.
*-	*-	*-

## WARNINGS

The **urrhythm** command is currently unable to handle Humdrum spine-path changes — such as join-path, exchange-path, or split-path. If spine-path changes are encountered an error is issued and the command terminates.

## PORTABILITY

DOS 2.0 and up, with the MKS Toolkit. OS/2 with the MKS Toolkit. UNIX systems supporting the *Korn* shell or *Bourne* shell command interpreters, and revised *awk* (1985).

## SEE ALSO

**\*\*kern** (2), **\*\*metpos** (2), **metpos** (4), **\*\*recip** (2), **timebase** (4), **synco** (4), **\*\*URrhythm** (2)

## NOTE

The **urrhythm** command differs from Johnson-Laird's theory in the definition of syncopation. Johnson-Laird's theory requires that a listener be able to identify a syncopation retrospectively. That is, a listener is able to determine whether the current beat is a syncopation, only by determining what happens at the beginning of the next beat. The algorithm used here avoids the theoretical assumption of backward listening. (See Simpson & Huron, 1993.)

## REFERENCES

Johnson-Laird, P. "Rhythm and meter: A theory at the computational level," *Psychomusicology*, Vol. 10 (1991) pp. 88-106.

Simpson, J. & Huron, D. "The perception of rhythmic similarity: A test of a modified version of Johnson-Laird's theory," *Canadian Acoustics*, Vol. 21, No. 3 (1993) pp. 89-90.