The ddphonism package*

Celia Rubio Madrigal[†]

August 10, 2019

Abstract

This is a music-related package focused on notation from the Twelve-Tone System, also called Dodecaphonism. It provides LATEX algorithms that produce typical dodecaphonic diagrams based off a musical series, or row sequence, of variable length.

Keywords

twelve tone system, dodecaphonism, music, mathematics, matrix, row, series, diagram, clock diagram, notation, algorithm, schoenberg, contemporary music, 20th century

Contents

1	Introduction	1
2	Using the ddphonism package	2
3	The package code	6

1 Introduction

There are hundreds of music tools and software online which are able to produce different music notations. However, I have never seen a LATEX tool that can do the same. This package is not only about notation, but it also calculates mathematically how this notation should work.

It is said that a twelve-tone matrix is the only thing a twelve-tone composer should need, because it provides the whole serial spectrum with which they may work. I wanted LATEX users to be able to generate them automatically.

But I also think that a twelve-tone matrix is not enough, that there exist several other notations with which they may understand their series and their potential. These are the diagrams that can be obtained with this package.

^{*}This document corresponds to ddphonism v0.2, dated 2019/08/10.

[†]Email: celirubio.m@gmail.com

4 0 1 2 3	3 4 0 1 2	2 3 4 0 1	1 2 3 4 0	0 1 2 3 4	$ \begin{array}{c} 3 & \stackrel{4}{\cancel{}} & 5 \\ 1 & & & \\ 0 & & & \\ 11 & & & \\ 10 & & & \\ \end{array} $
9	11 9 8	7)	0 0 1 P	1 2 3 3 4 4	
	7) (6	5	$\left(\begin{array}{cccc} 0 & 1 & 2 & 3 & 4 \\ 4 & 3 & 2 & 1 & 0 \end{array}\right)$

2 Using the ddphonism package

These are the commands provided by ddphonism. The main parameter in every command is the row sequence.

\dmatrix produces a twelve-tone matrix of arbitrary length, as shown in this website. For example, \dmatrix{0,2,1,4,3,6,5} produces the matrix

0	2	1	4	3	6	5
5	0	6	2	1	4	3
6	1	0	3	2	5	4
3	5	4	0	6	2	1
4	6	5	1	0	3	2
1	3	2	5	4	0	6
2	4	3	6	5	1	0

sep scales the matrix.

vsep scales the matrix vertically.hsep scales the matrix horizontally.

lines draws lines between rows and columns.

outside lines only draws the outside lines.

inside lines only draws the inside lines.

vlines only draws the vertical lines.

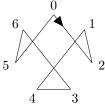
hlines only draws the horizontal lines.

\dmatrix[lines, sep=0.75] {0,2,1,4,3,6,5} produces the matrix

0	2	1	4	3	6	5
5	0	6	2	1	4	3
6	1	0	3	2	5	4
3	5	4	0	6	2	1
4	6	5	1	0	3	2
1	3	2	5	4	0	6
2	4	3	6	5	1	0

no tikz deletes the tikz environment and lets the user write it instead.

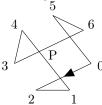
\ddiagram produces a twelve tone clock diagram of arbitrary length, as shown in this website. For example, \ddiagram{0,2,1,4,3,6,5} produces the diagram



name lets the user write a name at the center of the diagram.

up lets the user choose which number is up north. The default value is the first number in the row.

arrow shift lets the user where the arrow should fall on the line. The values range from 0 to 10. The default is 2.5.



no numbers deletes the numbers around the diagram.

no arrow deletes the arrow inside the diagram.

 $\label{lem:condition} $$ \diagram[no numbers, no arrow]{0,2,1,4,3,6,5}$ produces the diagram$



xshift lets the user shift the figure horizontally.

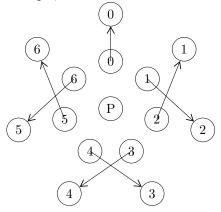
yshift lets the user shift the figure vertically.

no tikz deletes the tikz environment and lets the user write it instead. The option up does not work anymore and the up position becomes 0. It is recommended that the user passes the option ddiagram to the environment:

\begin{tikzpicture}[ddiagram]
\ddiagram[no tikz]{0,2,1,4,3,6,5}
\end{tikzpicture}

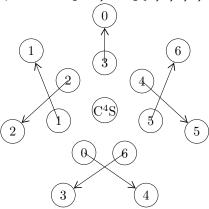
produces the same diagram as \ddiagram{0,2,1,4,3,6,5}.

\ddihedral produces a dihedral representation of a series of arbitrary length. For example, \ddihedral \{0,2,1,4,3,6,5\} produces the diagram



- t lets the user apply the transformation *transposition* to the diagram.
- s lets the user apply the transformation *inversion* to the diagram.
- c lets the user apply the transformation *cyclic shift* to the diagram.
- ${\sf v}$ lets the user apply the transformation retrograde to the diagram. The transformations are applied in that exact order.

 $\label{lem:condition} $$ \dihedral[s=1, c=4]{0,2,1,4,3,6,5} \ produces the \ diagram $$$

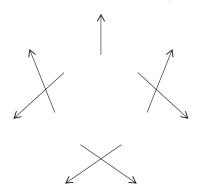


no tikz deletes the tikz environment and lets the user write it instead. It is recommended that the user passes the option ddihedral to the environment:

\begin{tikzpicture}[ddihedral]
\ddihedral[no tikz]{0,2,1,4,3,6,5}
\end{tikzpicture}

produces the same diagram as $dihedral{0,2,1,4,3,6,5}$.

\darrows produces the arrows from the \ddihedral diagram. For example, \darrows{0,2,1,4,3,6,5} produces the arrows



no tikz deletes the tikz environment and lets the user write it instead.

\drow produces a twelve-tone row sequence as a permutation in its matrix form. For example, \drow{0,2,1,4,3,6,5} produces the row

$$\left(\begin{array}{cccccccc} 0 & 1 & 2 & 3 & 4 & 5 & 6 \\ 0 & 2 & 1 & 4 & 3 & 6 & 5 \end{array}\right)$$

sep lets the user choose the column separation.

```
\drow[sep=10pt]{0,2,1,4,3,6,5} produces the row \begin{pmatrix} 0 & 1 & 2 & 3 & 4 & 5 & 6 \\ 0 & 2 & 1 & 4 & 3 & 6 & 5 \end{pmatrix}
```

3 The package code

```
% ddphonism
1
3
     % (c) Celia Rubio Madrigal
5
     \%\% This program can be redistributed and/or modified under the terms
     %% of the LaTeX Project Public License Distributed from CTAN archives
7
     %% in directory macros/latex/base/lppl.txt.
      \NeedsTeXFormat\{LaTeX2e\}
      \ProvidesPackage{ddphonism}
11
     [2019/08/10 v0.2 Dodecaphonic diagrams: twelve—tone matrices, clock diagrams, etc.]
13
      \RequirePackage{etoolbox}
      \RequirePackage{xparse}
      \dot{\ \ } Require Package \{tikz\}
15
      \RequirePackage{xstring}
17
     \RequirePackage{pgfkeys}
19
     21
     % Matrices
23
     \ usetikzlibrary {matrix}
25
     \ExplSyntaxOn
      \DeclareExpandableDocumentCommand{\Evaluation}{m}{\int\_eval:n}
27
      \ExplSyntaxOff
29
      \newcounter{Dsize}
      \newcommand{\DsizeMake}[1]{%
         \setcounter{Dsize}{0}%
31
         \foreach \n in \{\#1\}{\%
33
             \stepcounter{Dsize}\%
35
     }
37
     % Only with numbers.
      \newcounter{Dfirst}
      \newcommand{\DheadMake}[1]{\%}
39
         \setcounter{ Dfirst \{-1\}\%
         \foreach \n in \{\#1\}{%
41
             \left\langle \text{ifnum}\right\rangle = -1\%
43
              \setcounter{Dfirst}{n}
             \ fi %
45
         }%
     }
47
     % Only when DsizeMake is already done.
49
      \newcounter{Dmod}
```

```
\mbox{newcommand}\Modulo[1]{%
    51
                                                       \scalebox{Setcounter} \{\mathsf{Dmod}\} \{\#1\}\%
                                                        \loop%
    53
                                                        \label{lem:lemod} $$\left(D \mod \left( \operatorname{Dmod} - \operatorname{Dmod} \right) \right) $$
     55
                                                                           \repeat%
                                                       \ifnum\theDmod<0%
    57
                                                                           \setcounter{Dmod}{\Evaluation{\theDmod+\theDsize}}\%
                                                                           \repeat%
                                                       59
                                   }
    61
                                    \newif\ ifdmatrixLines
                                     \newif\ifdmatrixOutside
    63
                                     \newif\ ifdmatrixInside
     65
                                     \newif\ifdmatrixV
                                     \newif\ifdmatrixH
                                     \newif\ifdmatrixTikz
                                     \pgfkeys{
    69
                                                       /dmatrix/. is family
                                                       , /dmatrix
                                                       , default /. style =
    71
                                                                           \{ lines = false \}
    73
                                                                           , outside lines = false
                                                                           , inside lines = false
    75
                                                                           , sep = 1
                                                                           , \mathsf{vsep} = 1
     77
                                                                           , hsep = 1
                                                                                    \mathsf{no}\ \mathsf{tikz}\ = \mathsf{false}
     79
                                                       , no tikz /. is if = dmatrixTikz
    81
                                                       , lines /. is if =dmatrixLines
                                                       , outside lines /. is if =dmatrixOutside
                                                        , inside lines /. is if =dmatrixInside
    83
                                                        , vlines /. is if =dmatrixV
    85
                                                        , hlines /. is if =dmatrixH
                                                       , sep/.estore in = \dmatrixSep
    87
                                                       , vsep/.estore in=\dmatrixVsep
                                                        , hsep/.estore in = \dmatrixHsep
    89
    91
                                    \newcommand{DLOH}{\%}
                                                        \dot{draw} (0.05*\dot{matrixSep*\dmatrixHsep,0}) --\%
                                                       (\the Dsize*\dmatrix Sep*\dmatrix Hsep+0.05*\dmatrix Sep*\dmatrix Hsep,0);\%
    93
                                                         \sqrt{\text{draw}(0.05*\text{dmatrixSep*}\text{dmatrixHsep,}-\text{theDsize*}0.5*\text{dmatrixSep*}\text{dmatrixVsep})} -- \%
    95
                                                       }
    97
                                   \newcommand{\DLOV}{\%}
                                                        \dot{draw} (0.05*\dmatrixSep*\dmatrixHsep,0) -- \%
    99
                                                       (0.05*\dmatrixSep*\dmatrixHsep, -\theDsize*0.5*\dmatrixSep*\dmatrixVsep);\%
101
                                                        \draw (\theta) = \frac{1}{2} d + \frac{1}
                                                       (\theDsize*\dmatrixSep*\dmatrixHsep+0.05*\dmatrixHsep,-\theDsize*0.5*\dmatrixSep*\dmatrixVsep);
                                   }
103
                                   105
                                                       \langle 0.05*\rangle = \langle 0.05*\rangle
```

```
107
109
               111
                        (\xD*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixHsep, -\theDsize*0.5*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatrixSep*\dmatr
113
115
               \newcommand{\dmatrix}[2][]{\%}
                        \verb|\DsizeMake| \{\#2\}\%
117
                        \DheadMake{#2}%
                        %
                        \verb| pgfkeys{/dmatrix, default, $\#1$} %
119
                        \ \ ifdmatrixTikz\ else\%
121
                        \begin{ tikzpicture }%
123
                        \ fi %
                        \foreach [count=\nj] \j in \{\#2\} {%
125
                                \foreach [count=\ni] \i in \{\#2\} {%
                                         \draw node at
127
                                         -\nj*\dmatrixSep*\dmatrixVsep/2+0.25*\dmatrixSep*\dmatrixVsep)\ \{\%
129
                                                  \Modulo{Evaluation{i-\j+\theDfirst}}%
131
                                }%
                        }%
133
                        foreach \xD in \{1,...,\ Evaluation\{\theDsize-1\}\} \{\%
                                 \ ifdmatrixLines
                                 \DLOH\DLOV\DLIH\DLIV
135
                                 \ fi
137
                                 \DLOH\DLOV
139
                                 \ ifdmatrixInside
141
                                 \DLIH\DLIV
                                 \ fi
                                 \ifdmatrixH
143
                                 \DLOH\DLIH
145
                                 \ fi
                                 \DLOV\DLIV
147
                                 \ fi
                        }%
149
               %
151
                \end{ tikzpicture }%
153
               \ fi %
155
157
               % Diagrams
159
               \ usetikzlibrary {shapes, arrows, decorations.markings, shapes.misc}
161
               \ tikzstyle {ddiagram}=[minimum height=0pt,inner sep=0pt,outer sep=0pt,scale=0.65]
163
```

```
\newif\ifddiagramTikz
165
                 \newif\ifddiagramNoNum
                 \newif\ifddiagramNoArr
167
                 \pgfkeys{
                          /ddiagram/.is family
169
                          , /ddiagram
                          , default /. style =
171
                                   \{ name = \ensuremath{\mbox{empty}}\%
                                    , up =\empty%
                                    , no tikz = false
173
                                    , no numbers = false
175
                                     , no arrow = false
                                    , xshift = 0
177
                                       yshift = 0
                                        arrow shift = 2.5
179
                          , no tikz /. is if = ddiagramTikz
181
                          , no numbers/.is if =ddiagramNoNum
                          , no arrow/. is if=ddiagramNoArr
183
                          , name/.estore in=\dot{ddiagramName}
                          , up/.estore in=\ddiagramUp
185
                          , xshift /. estore in = \diagram X
                          , yshift /. estore in=\backslashddiagram\Upsilon
                          , arrow shift /. estore in=\ddiagramArrS
187
                }
189
                 \setminus newcounter\{Dprev\}
191
                 \newcommand{\Dvar}{}
                 \\ \newcommand {\ddiagram}[2][]{\%}
                           DsizeMake{#2}%
193
                          \DheadMake{#2}%
195
                          %
                          \pgfkeys{/ddiagram, default, \#1}%
197
                          \ ifdefequal {\ddiagramUp}{\empty}%
199
                          {\operatorname{Dvar}}_{\star}  if empty
                          {\operatorname{Dvar}}{\operatorname{ddiagramUp}}% if not empty
201
                          \left\langle ifddiagramTikz\right\rangle else\%
203
                          \begin{ tikzpicture }[ddiagram,rotate=360*\Dvar/\theDsize]%
                          \ fi %
                          \foreach \x in \{0,..., \ Evaluation \{ \theDsize-1 \} \} 
205
                                    \ifddiagramNoNum\else
207
                                    \label{eq:node_scale} $$  \node [xshift = \diagram X, yshift = \diagram Y] at (90-360*\xspace x/\theDsize:2) {\xspace x}; % $$  \node [xshift = \diagram X, yshift = \diagram Y] at (90-360*\xspace x) $$  \node [xshift = \diagram X, yshift = \diagram Y] $$  \node [xshift = \diagram X, yshift = \diagram Y] $$  \node [xshift = \diagram X, yshift = \diagram Y] $$  \node [xshift = \diagram X, yshift = \diagram Y] $$  \node [xshift = \diagram X, yshift = \diagram Y] $$  \node [xshift = \diagram X, yshift = \diagram Y] $$  \node [xshift = \diagram X, yshift = \diagram Y] $$  \node [xshift = \diagram X, yshift = \diagram Y] $$  \node [xshift = \diagram X, yshift = \diagram Y] $$  \node [xshift = \diagram X, yshift = \diagram Y] $$  \node [xshift = \diagram X, yshift = \diagram Y] $$  \node [xshift = \diagram X, yshift = \diagram Y] $$  \node [xshift = \diagram X, yshift = \diagram Y] $$  \node [xshift = \diagram X, yshift = \diagram Y] $$  \node [xshift = \diagram X, yshift = \diagram Y] $$  \node [xshift = \diagram X, yshift = \diagram Y] $$  \node [xshift = \diagram X, yshift = \diagram Y, yshift = \diagram Y,
                                    209
                          };%
                          %
211
                          \setcounter{Dprev}\{-1\}%
213
                          \foreach \x in \{\#2\}{\%
                                   \ifnum \theDprev=\theDfirst%
215
                                             \ifddiagramNoArr
                                             \label{lem:definition} $$ \operatorname{xshift} = \operatorname{ddiagram}X, \operatorname{yshift} = \operatorname{ddiagram}Y \ (\theDprev) -- (\x); % 
217
                                             \ else
                                             \draw \ [xshift = \draw \ ] xshift = \draw \ [xshift = \draw \ ] xshift = \draw \ ]
219
                                                       decoration =
                                                      {markings,mark=at position 0.099*\ddiagramArrS with
```

```
221
                                                                                                   {\operatorname{scale}=1.25,>=triangle 45}{>}},
                                                                                     postaction = {decorate}
223
                                                                      ] (\t - (\x);\%
225
                                                       \verb|\else| \verb|\ifnum| \verb|\theDprev=-1| else%|
                                                        \label{lem:decomposition} $$ \operatorname{xshift} = \operatorname{ddiagram}X, yshift = \operatorname{ddiagram}Y \ (\theDprev) -- (\x); % \ (\theDprev) -- 
227
                                                       \ fi \ fi %
                                                       \strut {\sf Dprev} \{ \x \} \%
                                        };%
229
                                        \label{lem:definition} $$ \operatorname{xshift} = \operatorname{ddiagram}X, \operatorname{yshift} = \operatorname{ddiagram}Y \ (\theDprev) -- (\theDfirst); % \ (\theDfir
231
                                        233
                                        {}% if empty
                                         {\node [xshift = \diagram X, yshift = \diagram Y] at (0,0) [circle, fill = \white] {\diagram Name};}\% if not empty}
                                         \ifddiagramTikz\else%
235
                                        \end{ tikzpicture }%
237
                                        \ fi %
                         }
239
241
                         % Dihedral diagrams
243
                         \ tikzstyle ddihedralArrow=[decoration=
245
                                                       {\text{markings,mark}=at position 1 with } {\text{varrow[scale}=1.5,>=angle 60]}},
                                         postaction = {decorate}]
247
                         \ tikzstyle { ddihedral }=[inner sep=0,minimum height=18pt]
249
                           \newif\ ifddihedralTikz
251
                           \pgfkeys{
                                        /ddihedral/ is family, /ddihedral,
253
                                        default /. style = \{t = 0, c = 0, s = 0, v = 0, no \ tikz = false\},
                                        no tikz /. is if =ddihedralTikz,
255
                                        t /. estore in = \ddihedralT,
                                        c/. estore in = \displaylimits \displaylimits
                                        s/. estore in = \ddihedralS,
257
                                        v/. estore in = \ddihedralV,
259
                         }
                          \newif\ifdarrowsTikz
261
                           \pgfkeys{
                                        /darrows/.is family, /darrows,
263
                                        default /. style = \{no tikz = false\},\
265
                                        no tikz /. is if =darrowsTikz,
                           267
                                        DsizeMake{#2}%
269
                                        %
                                        \pgfkeys{/darrows, default, \#1}%
271
                                        \ \ ifdarrowsTikz\ \ else\%
273
                                        \begin{ tikzpicture }%
                                        \draw foreach \x in \{0,..., \ Evaluation \{ \ the Dsize -1 \} \} 
275
                                                      (90-360*\xfi) \ node[circle] \ (\xfi) \ \{\}\%
277
```

```
\foreach \x [count=\y] in \{#2\} {%
279
                                                                                                              \label{lem:condition} $$ \operatorname{style} = \operatorname{ddihedralArrow} (90-360*\operatorname{Evaluation} \{y-1\}/\operatorname{theDsize}: 1.25) -- (\x); % $$ \operatorname{dihedralArrow} (y-1) -- (\x); % $$ \operatorname{din
281
                                                                                    \ \ ifdarrowsTikz\ else\%
                                                                                    \end{ tikzpicture }%
283
                                                                                   \ fi %
285
                                                     \newcommand\ddihedral[2][]{%
287
                                                                                   DsizeMake{#2}%
289
                                                                                   \verb| pgfkeys{/ddihedral, default, \#1}%|
291
                                                                                   \verb|\begin{ tikzpicture }|[ddihedral]|%|
293
                                                                                   \draw foreach \x in \{0,..., \ Evaluation \{ \ the Dsize - 1 \} \} {%
295
                                                                                                              (\text{Evaluation}\{(90+\text{ddihedralT}*360/\text{theDsize})+(2*\text{ddihedralS}-1)*\\\times *360/\text{theDsize}\}:2.5)\%
                                                                                                                node[very thin, circle, draw] (\x) {\x}%
297
                                                                                   };%
                                                                                   %
299
                                                                                   \draw foreach \xim \{0,..., \xim \{valuation \{ \the Dsize -1 \} \} 
                                                                                                              (\ensuremath{\mbox{\sc Evaluation}}\ensuremath{\mbox{\sc Evaluation}}\en
301
                                                                                                              node[very thin, circle, draw] \{\x\}%
                                                                                   };%
%
303
                                                                                   \del{def:decomposition} \del{decomposition} \delor \decomposition \decompositio
305
                                                                                   \node at (0,0) [very thin,draw,circle, fill =white] \{\%
307
                                                                                                                 \ifnum\ddihedralV=0%
                                                                                                                 309
                                                                                                                 \ifnum\ddihedralS=0%
                                                                                                                 \int T=0\%
                                                                                                              P%
311
                                                                                                                 \backslash fi \backslash fi \backslash fi \%
313
                                                                                                                 \else V\fi%
                                                                                                                 \ifnum\ddihedralC=0%
315
                                                                                                                 \ensuremath{\ }\ensuremath{\ }\ens
                                                                                                                 \ifnum\ddihedralS=0%
317
                                                                                                                   \else S\fi%
                                                                                                                 \ifnum\ddihedralT=0%
319
                                                                                                                 \ else T$^{\ddihedralT}$\fi%
                                                                                   };%
321
                                                                                    \ ifddihedralTikz \ else %
                                                                                   \end{ tikzpicture }%
323
                                                                                   \ fi %
                                                    }
325
                                                    327
                                                     % Rows
329
                                                     \setminus pgfkeys\{
                                                                                   /drow/.is family, /drow,
331
                                                                                   default /. style = {sep=\backslash arraycolsep},
333
                                                                                   sep/.estore in = \drowSep,
```

```
335
                      \label{longdef} $$ \lceil def - d
                      \newcounter{myDDcntr}
337
                      \newlength{\Dvarr}
339
                      341
                                   DsizeMake{#2}%
                                   \pgfkeys{/drow, default, \#1}%
343
                                   345
                                   \strut = 1
                                  %
347
                                   \ \left| \begin{array}{c} \left| \begin{array}{c} \left| \begin{array}{c} \left| \\ \end{array} \right| \end{array} \right| = 0\% 
                                   \left( \left( right \right) \right)
349
                                   \ensuremath{\,\setminus\,} else \ensuremath{\,\setminus\,} ifnum \ensuremath{\,\setminus\,} the Dsize = 1\%
                                   \ensuremath{\mbox{\mbox{$\%$}}}
351
                                              \ \left( \left( \left( array \right) \right) \right) = \left( \left( array \right) \right) 
                                                           0\\%
353
                                                            #2\\%
                                                \end{array}\ right)%
355
                                   }%
                                   √else %
357
                                   \strut_{myDDcntr}{0}
359
                                    \loop%
                                   361
                                   \verb|\stepcounter{myDDcntr}| \%
                                   \int The myDDcntr < Evaluation { the Dsize-1} % 
363
                                   \repeat %
                                   \addto\TableDDdata\{\themyDDcntr\\\\\\\\\
365
                                   \strut {myDDcntr}{0}%
                                   %
                                   \backslash \mathsf{ensuremath} \{ \%
367
                                               \ \ \backslash \ \mathsf{left} \ (\ \mathsf{begin} \{ \mathsf{array} \} \{ * \{ \mathsf{theDsize} \} \mathsf{c} \} \%
369
                                                            \TableDDdata%
                                                            \StrSubstitute {#2}{,}{\&}\
371
                                               \end{array}\right)\%
                                   }%
                                   ∖ fi \ fi %
373
                                   \strut { \arraycolsep } { \Dvarr }
375
                      }
377
                      \endinput
379
                      \%\% End of file 'ddphonism.sty'.
```