The \texttt{mahjong} package\footnote{This document corresponds to \texttt{mahjong v1.0.1}, dated 2021/04/16}*

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Abstract

The \texttt{mahjong} package provides a \LaTeX{} 2ε and \LaTeX{} 3 interface for typesetting mahjong tiles using an extended version of MPSZ algebraic notation. Features include spaces, rotated, blank, and concealed tiles, as well as red fives. The size of the mahjong tiles can be controlled using a package option and an optional argument of \texttt{mahjong}. It is primarily aimed at Riichi (aka. Japanese) Mahjong but can be used to typeset any style of mahjong. However, flower tiles and jokers are currently missing.
1 Introduction

Mahjong is a tile-based game originating from China which is popular in East and South-East Asia and has since spread throughout the world. The mahjong package provides an interface for typesetting mahjong tiles and hands using MPSZ algebraic notation. This documentation assumes familiarity with the game in general but none of its many styles. Nonetheless, some basic terms will be defined because of differing vocabulary among players.

2 Mahjong Tiles

2.1 Suited Tiles

The suited tiles are referred to as follows:

<table>
<thead>
<tr>
<th>Suit</th>
<th>Tiles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bamboo</td>
<td><img src="image" alt="Bamboo Tiles" /></td>
</tr>
<tr>
<td>Dots</td>
<td><img src="image" alt="Dots Tiles" /></td>
</tr>
<tr>
<td>Character</td>
<td><img src="image" alt="Character Tiles" /></td>
</tr>
</tbody>
</table>

Suited tiles are referred to using the pattern \(\langle value\rangle \langle suit\rangle\). For instance, \(\langle 4 \rangle \langle Bamboo\rangle\) is called \(4\) \(Bamboo\).

2.2 Honor Tiles

This documentation refers to the seven honor tiles as follows:

<table>
<thead>
<tr>
<th>Winds</th>
<th><img src="image" alt="Winds" /></th>
</tr>
</thead>
<tbody>
<tr>
<td>East Wind (E)</td>
<td>South Wind (S)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dragons</th>
<th><img src="image" alt="Dragons" /></th>
</tr>
</thead>
<tbody>
<tr>
<td>White Dragon</td>
<td>Green Dragon</td>
</tr>
</tbody>
</table>
Table 1: MPSZ notation reference. Each tile is identified by its column’s number and its row’s letter.

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>s</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>p</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>m</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>z</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3 MPSZ Algebraic Notation

3.1 Standard Notation

MPSZ notation assigns each tile an identifier consisting of a digit and a letter (table 1). For suited tiles, the digit corresponds to the tile’s value and the letter to its suit, Bamboo (s), Dots (p) or Character (m). For instance, 2m identifies (2 Character). The only exception to this rule are red fives, whose numeric value is 0. Red 5 Bamboo, for example, has identifier 0s. Honor tiles are assigned the ’suit’ z, with 1z – 4z corresponding to E, S, W and N, and 5z – 7z to the white, green and red dragon, respectively.

Collections of tiles, such as melds or hands, are represented by concatenating the identifiers of the tiles they comprise. For instance, 3s4s5s corresponds to 345s. Groups of tiles sharing the same suit can be abbreviated by omitting all but the last suit identifier. The above example can also be expressed as 345s. Spaces are ignored and the notation is case-insensitive.

3.2 Extensions

Spaces. Spaces can be inserted using -. 444s–567s produces 444s-567s.

Concealed Tiles. Concealed (or face-down) tiles are represented by X. They don’t need a suit identifier and don’t act as one. 123s X 456s and 123 X 456s are therefore equivalent.

Blank Tiles. Blank or unknown tiles are represented by ?. Just like concealed tiles, they don’t change the current suit. 123s ? 456s and 123 ? 456s are equivalent, for instance.
Rotation. Inserting an apostrophe (’) rotates the preceding tile counter-clockwise. For instance, 6’66m is rendered as 🍀مثال. This can only be done once per tile, i.e. it is not possible to rotate them 180° or 270°. When you want to rotate the last tile of a group, it doesn’t matter whether the apostrophe appears before or after the suit, so 77’m and 77m’ are equivalent.

Rotation and Stacking. Quotes (“) cause the preceding tile to be rendered as two rotated and stacked tiles. For instance, 77”7z produces 🍀مثال.

4 Typesetting Mahjong Tiles in Your Document

The main interface is \texttt{mahjong \{\langle height\rangle\} \{\langle hand\rangle\}}. \langle hand\rangle refers to a tile sequence in MPSZ notation as discussed above and \langle height\rangle specifies the height of the rendered mahjong tiles. If \langle height\rangle is not specified, the default height is used.

The \LaTeX~3 interface for rendering mahjong tiles are \texttt{mahjong_typeset_hand:n} and its variants. This macro accepts the hand to be rendered in MPSZ notation. The height can be specified by setting \texttt{l_mahjong_tile_height} and the default height is saved in \texttt{g_mahjong_default_height}.

The default height can be set using the package’s \texttt{height} parameter. For instance, \texttt{\usepackage[height=2\baselineskip]{mahjong}} sets the default size of mahjong tiles to double the value of \texttt{\baselineskip} in the context they are rendered in. The parameter defaults to \texttt{\baselineskip}.

5 Acknowledgments

The mahjong tiles used in this package were created by GitHub user FluffyStuff. The original repository is FluffyStuff/riichi-mahjong-tiles, used under CC-BY Version 4.0.
\msg_new:nnnn {mahjong} {unknown_orientation}
\msg {Orientation - #1 - is - unknown}
\msg {This - should - not - happen. - Please - create - a - bug - report.}
\keys_define:nn {mahjong} {
    height .dim_gset:N = \g_mahjong_default_height
}

% Identifiers for all suits
\cs_new:Npn \c__mahjong_suits_tl {mpsz}
% Allowed tokens
\cs_new:Npn \c__mahjong_allowed_tokens_tl {0123456789mpsz-?x'"}

% Variables have to be declared globally
\tl_new:N \l__mahjong_suit_tl
\tl_new:N \l__mahjong_tiles_tl
\tl_new:N \l__mahjong_reversed_tl
\tl_new:N \l__mahjong_hand_tl
\tl_new:N \l__mahjong_current_suit_tl
\tl_new:N \l__mahjong_current_group_tl
\tl_new:N \l__mahjong_current_char

\dim_set:Nn \g_mahjong_default_height \baselineskip
\dim_new:N \l_mahjong_tile_height
\int_new:N \l__mahjong_tile_orientation_int
\seq_new:N \l__mahjong_tile_maps_seq
\str_new:N \l__mahjong_file_path_str
\ProcessKeysPackageOptions{mahjong}

\_mahjong_make_tile:nn \_mahjong_make_tile:VV \_mahjong_make_tile:xV \_mahjong_make_tile:nV

Inserts a mahjong tile into the input stream. This functions only handles that use the
front background and have a foreground, i.e. regular and blank tiles.

\cs_set:Npn \_mahjong_make_tile:nn #1#2 {
    \file_if_exist:nTF {#1} {
        \int_case:nnF {#2} {
            {0} {
                \stackinset{c}{0pt}{c}{0pt}{
                    \includegraphics[
                        angle=0,
                        height=.85\l_mahjong_tile_height]
                    {#1}}
            } {1} {
                \stackinset{c}{0pt}{c}{0pt}{
                    \includegraphics[
                        angle=0,
                        height=\l_mahjong_tile_height]
                    {\l__mahjong_tile_maps_seq}}
            }
        }
    }
    \includegraphics[
        angle=0,
        height=\l_mahjong_tile_height]
        {\l__mahjong_file_path_str}
}
\mahjong_typeset_hand:n \mahjong_typeset_hand:x

Parses and typesets a mahjong hand in MPSZ notation. Set \l\_mahjong\_tile\_height to control the tiles' size.

% Parses a full hand
\cs_set:Npn \mahjong_typeset_hand:n #1 {
  \tl_set:Nx \l__mahjong\_hand_tl {\text\_lowercase:n {#1}}
  % MPSZ notation is easier to parse right-to-left, so reverse string
  % There is no string reversal function but we can reverse token lists
  % Token lists and strings are freely convertible between each other
  \tl_set:Nx \l__mahjong\_reversed_tl {\tl_reverse:V \l__mahjong\_hand_tl}
  \tl_map_variable:NNn \l__mahjong\_reversed_tl \l__mahjong\_current_char {
    % Check if we recognize the current token
    \exp_args:NVV \tl_if_in:nnF \c\_mahjong\_allowed\_tokens\_tl \l__mahjong\_current_char {
      \msg\_error:nxx {mahjong} {invalid\_token} {\l__mahjong\_current_char}
    }
    \exp_args:NVV \tl_if_in:nnTF \c\_mahjong\_suits\_tl \l__mahjong\_current_char {
      % If we've found a suit identifier, change the current suit
      \tl_set:NV \l__mahjong\_current\_suit\_tl \l__mahjong\_current\_char
    }
    \str_case:VnF \l__mahjong\_current\_char {
      '{' {
        % An apostrophe indicates that the next tile is rotated
        \int_set:Nn \l__mahjong\_tile\_orientation\_int {1}
      }
      '*' {
      }
    }
% Quotes mean the next tile is actually 2 rotated tiles stacked on top of each other
\int_set:Nn \l__mahjong_tile_orientation_int {2}
\}
\}
% Default case: We’ve got a complete tile identifier
\prop_clear:N \l_tmpa_prop
\prop_put:NnV \l_tmpa_prop {suit} \l__mahjong_current_suit_tl
\prop_put:NnV \l_tmpa_prop {face} \l__mahjong_current_char
\prop_put:NnV \l_tmpa_prop {orientation} \l__mahjong_tile_orientation_int
% Add it to the beginning of the sequence (we are parsing in reverse)
\seq_put_left:NV \l__mahjong_tile_maps_seq \l_tmpa_prop
\int_set:Nn \l__mahjong_tile_orientation_int {0}
\}
\}
\}
% Typesetting begins here. Sequence is in correct order
\seq_map_variable:NNn \l__mahjong_tile_maps_seq \l_tmpa_prop {
\prop_get:NnN \l_tmpa_prop {face} \l_tmpa_tl
\prop_get:NnN \l_tmpa_prop {orientation} \l_tmpa_int
\str_case:VnF \l_tmpa_tl {
\{ - \} {
% If the current face is a dash, insert a space
\includegraphics[height=\l_mahjong_tile_height]{tiles/mahjong-Space.pdf}
\} {x} {
% Insert a flipped tile
\int_case:nn \l_tmpa_int {n} {
\{0\} { % Upright
\includegraphics[
angle=0,
height=\l_mahjong_tile_height]
{tiles/mahjong-Back.pdf}
\} {1} { % Rotated
\includegraphics[
angle=90,
width=\l_mahjong_tile_height]
{tiles/mahjong-Back.pdf}
\} {2} { % Rotated and stacked
\stackon [0pt] {
\includegraphics[
angle=90,
width=\l_mahjong_tile_height]
{tiles/mahjong-Back.pdf}
}\}
\}
\} {?} { % Blank tile
\__mahjong_make_tile:nV {tiles/mahjong-Blank.pdf} \l_tmpa_int
\} { % Any other tile identified by a code.
\mahjong

This is the only \LaTeX\ macro in this package. It typesets a mahjong hand.

\NewDocumentCommand{\mahjong}{O{\g_mahjong_default_height} m}{
  \dim_set:Nn \l_mahjong_tile_height {#1}
  \mahjong_typeset_hand:n {#2}
}

(End definition for \mahjong. This function is documented on page ??.)

Change History

\begin{tabular}{ll}
\textbf{v0.5} & \textbf{v1.0} \\
General: First working version, & General: First complete release \\
minimal error handling & . . . . . . . . . . . . . . . . . . . . . . . . \textbf{1} \\
\textbf{v0.9} & \textbf{v1.0.1} \\
General: Fully functional & General: Added package prefix to \\\n& filenames \textbf{1} \\
\end{tabular}