

# Generative Art with Truchet Tiles in R

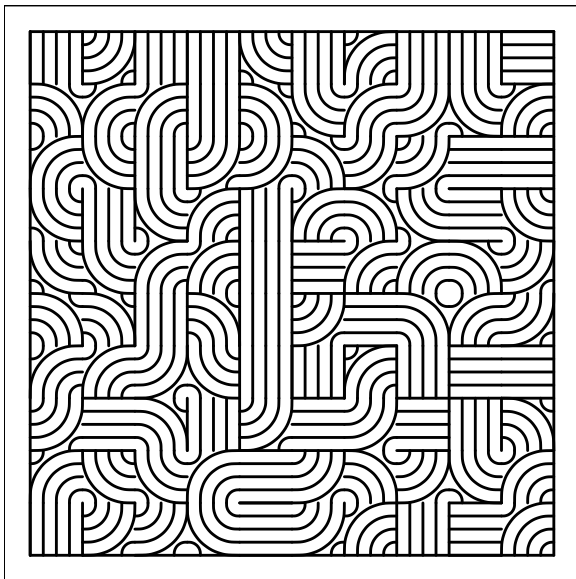
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05/03/2022

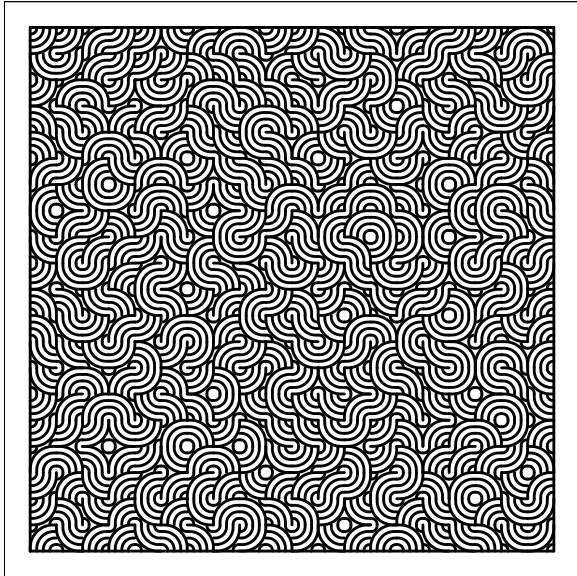
```
## Function arguments
# grid_max    number of tiles on each axis (e.g. 5 = 5x5 grid)
# seed        set seed for random tile selection
# all_tiles   T == straight and curved tiles, F == curved tiles only
# line_col    line colour
# line_size   line size
# line_alpha  line alpha value
# bg_col      background colour
# line_end    shape at end of each line (butt, square, round)
```

## Plot examples

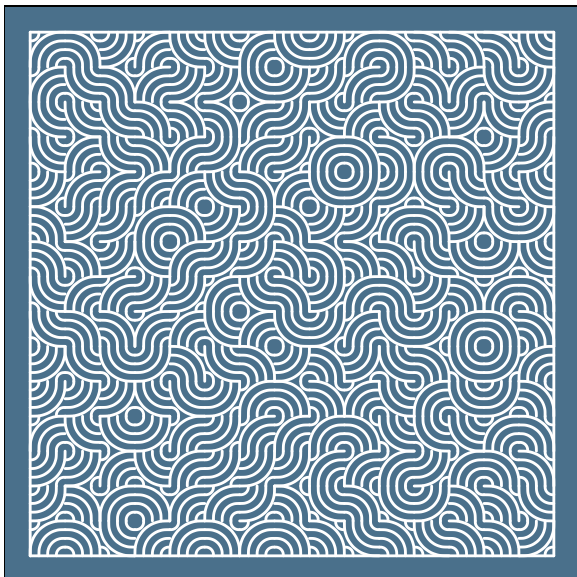
```
## Example plots using the function
# Plot 10x10 grid
plot.truchet(grid_max = 10, seed = 16)
```



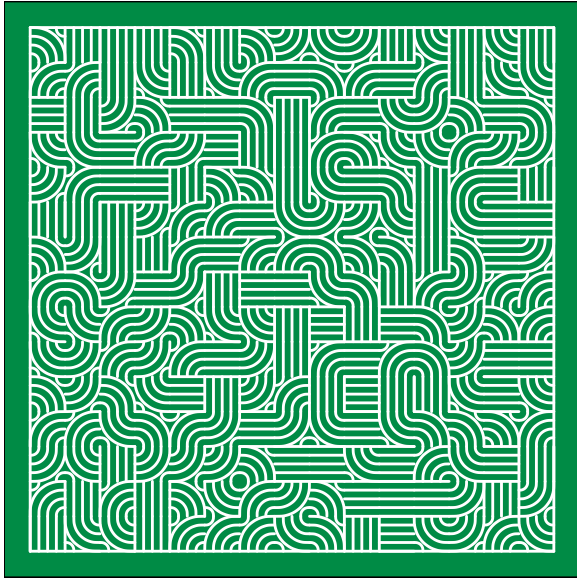
```
# Curved tiles only
plot.truchet(grid_max = 20, seed = 16,
             all_tiles = F)
```



```
# Change colours
plot.truchet(grid_max = 15, seed = 16,
             all_tiles = F,
             line_size = .5,
             line_col = 'white',
             bg_col = 'skyblue4')
```



```
# All tile types
plot.truchet(grid_max = 15, seed = 16,
             all_tiles = T,
             line_size = .5,
             line_col = 'white',
             bg_col = 'springgreen4')
```



## Code to create function

```
## Packages used
# install.packages('dplyr')
# install.packages('magrittr')
# install.packages('ggplot2')
library(dplyr)
library(magrittr)
library(ggplot2)

## Custom Function

# Create function to plot grid of truchet tiles
plot.truchet <- function(grid_max, seed, all_tiles = T,
                          line_col = 'black',
                          line_size = 0.5,
                          line_alpha = 1,
                          bg_col = 'white',
                          line_end = 'round'){

  # Set seed for random tile selection
  set.seed(seed)

  # Create set of tiles to sample from. Tiles can be either:
  # 1) Vertical or horizontal straight lines
  # 2) Curved lines, where each tile is rotated 90 degrees

  # If all_tiles is true, include all tiles.
  # If false, only include curved tiles
  if(all_tiles == T){
    tiles <- c('V', 'H', 'C1', 'C2', 'C3', 'C4')
  } else {
    tiles <- c('C1', 'C2', 'C3', 'C4')
  }

  # Create initial dataframe for plotting, where each row is a single line
  dat <-
    data.frame(xs = NA, # X axis value for line start
              xe = NA, # X axis value for line end
              ys = NA, # Y axis value for line start
              ye = NA, # Y axis value for line end
              x = rep(rep(1:grid_max, grid_max), 5), # tile X position
              y = rep(rep(1:grid_max, each = grid_max), 5)) %>% # tile Y position
    # unique XY coordinate for each tile
    mutate(xy = paste0(formatC(x, flag=0, width=4), formatC(y, flag=0, width=4))) %>%
    arrange(xy) %>%
    # each tile contains 5 lines, so label these 1:5
    mutate(line_no = rep(1:5, grid_max*grid_max)) %>%
    # for each tile, randomly select a tile type
    mutate(type = rep(sample(tiles, grid_max*grid_max, replace = T), each = 5))
```

*# Now we input start and end coordinates for each line  
# depending on the type of tile that has been selected*

*# For each tile*

```
for(i in unique(dat$xy)){
  if(any(k <- which(dat$xy == i & dat$type == 'V'))){

    dat$xs[k] = c(dat$x[k][1]*10 - 10,
                  dat$x[k][1]*10 - 7.5,
                  dat$x[k][1]*10 - 5,
                  dat$x[k][1]*10 - 2.5,
                  dat$x[k][1]*10)

    dat$xe[k] = c(dat$x[k][1]*10 - 10,
                  dat$x[k][1]*10 - 7.5,
                  dat$x[k][1]*10 - 5,
                  dat$x[k][1]*10 - 2.5,
                  dat$x[k][1]*10)

    dat$ys[k] = dat$y[k]*10 - 10
    dat$ye[k] = dat$y[k]*10

  }
  if(any(k <- which(dat$xy == i & dat$type == 'H'))){

    dat$ys[k] = c(dat$y[k][1]*10 - 10,
                  dat$y[k][1]*10 - 7.5,
                  dat$y[k][1]*10 - 5,
                  dat$y[k][1]*10 - 2.5,
                  dat$y[k][1]*10)

    dat$ye[k] = c(dat$y[k][1]*10 - 10,
                  dat$y[k][1]*10 - 7.5,
                  dat$y[k][1]*10 - 5,
                  dat$y[k][1]*10 - 2.5,
                  dat$y[k][1]*10)

    dat$xs[k] = dat$x[k]*10 - 10
    dat$xe[k] = dat$x[k]*10

  }
  if(any(k <- which(dat$xy == i & dat$type == 'C1'))){

    dat$xs[k] = c(dat$x[k][1]*10 - 10,
                  dat$x[k][1]*10 - 7.5,
                  dat$x[k][1]*10 - 5,
                  dat$x[k][1]*10 - 2.5,
                  dat$x[k][1]*10 - 10)

    dat$xe[k] = c(rep(dat$x[k][1]*10, 4),
                  dat$x[k][1]*10 - 7.5)
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dat$ys[k] = c(rep(dat$y[k][1]*10 -10, 4),
              dat$y[k][1]*10 -2.5)

dat$ye[k] = c(dat$y[k][1]*10,
              dat$y[k][1]*10 - 2.5,
              dat$y[k][1]*10 - 5,
              dat$y[k][1]*10 - 7.5,
              dat$y[k][1]*10)

}

if(any(k <- which(dat$xy == i & dat$type == 'C2'))){

  dat$xe[k] = c(dat$x[k][1]*10,
                dat$x[k][1]*10 - 2.5,
                dat$x[k][1]*10 - 5,
                dat$x[k][1]*10 - 7.5,
                dat$x[k][1]*10)

  dat$xs[k] = c(rep(dat$x[k][1]*10 -10, 4),
                dat$x[k][1]*10 - 2.5)

  dat$ye[k] = c(rep(dat$y[k][1]*10 -10, 4),
                dat$y[k][1]*10 -2.5)

  dat$ys[k] = c(dat$y[k][1]*10,
                dat$y[k][1]*10 - 2.5,
                dat$y[k][1]*10 - 5,
                dat$y[k][1]*10 - 7.5,
                dat$y[k][1]*10)

}

if(any(k <- which(dat$xy == i & dat$type == 'C3'))){

  dat$xs[k] = c(rep(dat$x[k][1]*10 -10, 4),
                dat$x[k][1]*10 - 2.5)

  dat$xe[k] = c(dat$x[k][1]*10 - 7.5,
                dat$x[k][1]*10 - 5,
                dat$x[k][1]*10 - 2.5,
                dat$x[k][1]*10,
                dat$x[k][1]*10)

  dat$ye[k] = c(rep(dat$y[k][1]*10, 4),
                dat$y[k][1]*10 - 7.5)

  dat$ys[k] = c(dat$y[k][1]*10 - 2.5,

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        dat$y[k][1]*10 - 5,
        dat$y[k][1]*10 - 7.5,
        dat$y[k][1]*10 - 10,
        dat$y[k][1]*10 - 10)

    }

    if(any(k <- which(dat$xy == i & dat$type == 'C4'))){

        dat$xs[k] = c(dat$x[k][1]*10 - 10,
                      dat$x[k][1]*10 - 7.5,
                      dat$x[k][1]*10 - 5,
                      dat$x[k][1]*10 - 2.5,
                      dat$x[k][1]*10 - 10)

        dat$xe[k] = c(rep(dat$x[k][1]*10, 4),
                      dat$x[k][1]*10 - 7.5)

        dat$ys[k] = c(rep(dat$y[k][1]*10, 4),
                      dat$y[k][1]*10 - 7.5)

        dat$ye[k] = c(dat$y[k][1]*10 - 10,
                      dat$y[k][1]*10 - 7.5,
                      dat$y[k][1]*10 - 5,
                      dat$y[k][1]*10 - 2.5,
                      dat$y[k][1]*10 - 10)

    }
}

# Now the line values are present we can create the plot

ggplot() +
  geom_segment(aes(x = c(0, grid_max*10, grid_max*10, 0), # plot grid border
                  y = c(0, 0, grid_max*10, grid_max*10),
                  xend = c(grid_max*10, grid_max*10, 0, 0),
                  yend = c(0, grid_max*10, grid_max*10, 0)),
              colour = line_col,
              size = line_size,
              alpha = line_alpha,
              lineend = line_end) +
  xlim(0,grid_max*10) +
  ylim(0,grid_max*10) +
  # plot straight vertical and horizontal tiles
  geom_segment(data = filter(dat, !grepl('C', type)),
              aes(x = xs,
                  y = ys,
                  xend = xe,
                  yend = ye),
              colour = line_col,

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        size = line_size,
        alpha = line_alpha,
        lineend = line_end) +
# Plot curved lines for tile type 1 & 2, apart from lines number 5
geom_curve(data = filter(dat, type %in% c('C1', 'C2'), line_no == 5),
  aes(x = xs,
      y = ys,
      xend = xe,
      yend = ye),
  curvature = .5,
  colour = line_col,
  size = line_size,
  alpha = line_alpha,
  lineend = line_end) +
# We plot line 5 separately because it curves in the opposite direction
geom_curve(data = filter(dat, type %in% c('C1', 'C2'), line_no != 5),
  aes(x = xs,
      y = ys,
      xend = xe,
      yend = ye),
  curvature = -.5,
  colour = line_col,
  size = line_size,
  alpha = line_alpha,
  lineend = line_end) +
# Repeat for the remainign two curved tiles (curve direction reversed)
geom_curve(data = filter(dat, type %in% c('C3', 'C4'), line_no != 5),
  aes(x = xs,
      y = ys,
      xend = xe,
      yend = ye),
  curvature = .5,
  colour = line_col,
  size = line_size,
  alpha = line_alpha,
  lineend = line_end) +
geom_curve(data = filter(dat, type %in% c('C3', 'C4'), line_no == 5),
  aes(x = xs,
      y = ys,
      xend = xe,
      yend = ye),
  curvature = -.5,
  colour = line_col,
  size = line_size,
  alpha = line_alpha,
  lineend = line_end) +
theme_void() +
# Add in background colour
theme(panel.background = element_rect(fill = bg_col))
}

```