Atractor de Ikeda

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https://codingclubuc3m.rbind.io/post/2019-10-15/

One of the best-known examples of strange attractors was discovered by Kiyohiro Ikeda and bears his name. It is defined by the next equations:

```r
siguiente <- function( xn, yn, N = 1 ) {

  if ( N <= 0 ) { N <- 1 }

  for ( n in 1:N ) {

      tn <- 0.4 - 6 / ( 1 + xn^2 + yn^2 )

      xnm <- 1 + u * ( xn * cos( tn ) - yn * sin( tn ) )

      ynm <- u * ( xn * sin( tn ) + yn * cos( tn ) )

      xn <- xnm; yn <- ynm

    }

  return( c(xnm, ynm) )

}

# Puntos a dibujar
N <- 4000

# contenedores
x <- y <- rep( 0, N )

# parámetro U
# número de 'fotos' = valores de u
nf <- 10

# rango del parámetro u
U1 <- 1; U2 <- 1.01

U <- c( 0.9, 0.99, .992, .994, .996, .998, 1 )
#U <- seq( U1, U2, length.out = nf )
#U <- seq( U1, U2, by = 0.05 )

for ( u in U ) {

    # iteramos pero no almacenamos
    xy <- siguiente( x[ N ], y[ N ], 100000 )

    x[ 1 ] <- xy[1]
```

```
y[ 1 ] <- xy[2]

for ( n in 1:(N-1) ) {

    xy <- siguiente( x[ n ], y[ n ] )

    x[ n + 1 ] <- xy[ 1 ] #+ rnorm(1, 0, .0001 )

    y[ n + 1 ] <- xy[ 2 ] #+ rnorm(1, 0, .0001 )

}

plot( x, y,

    #xlim = c( -1, 6 ),

    #ylim = c( -4, 6 ),

    main = paste( "u = ", u ),

    cex = 0.1

    )

}
```
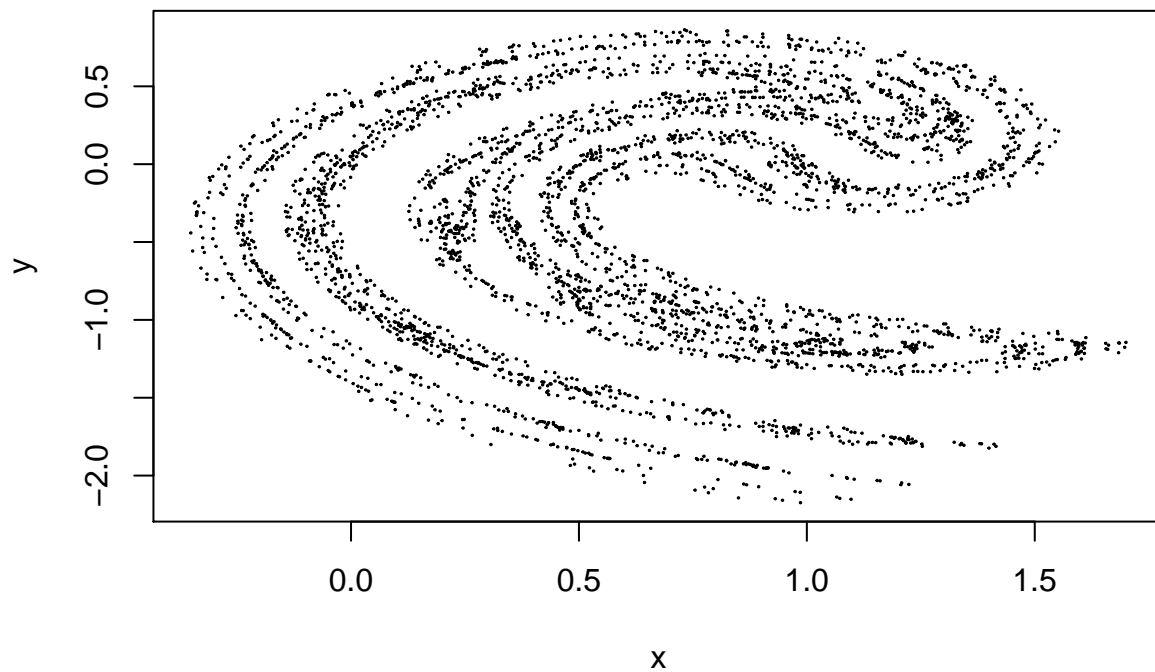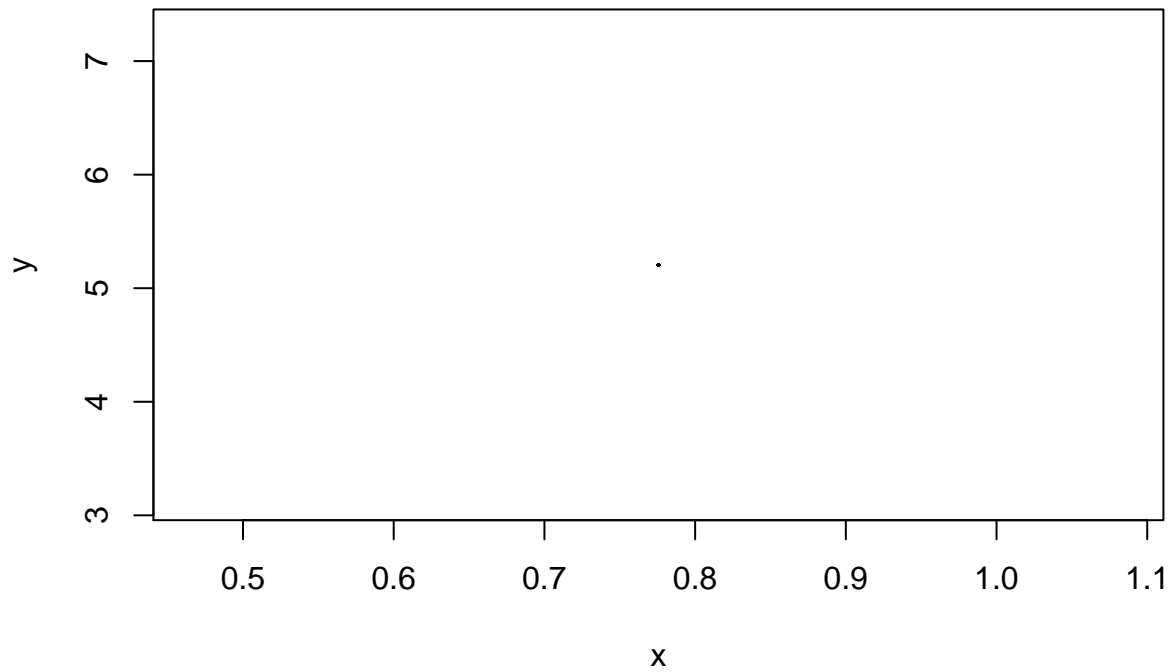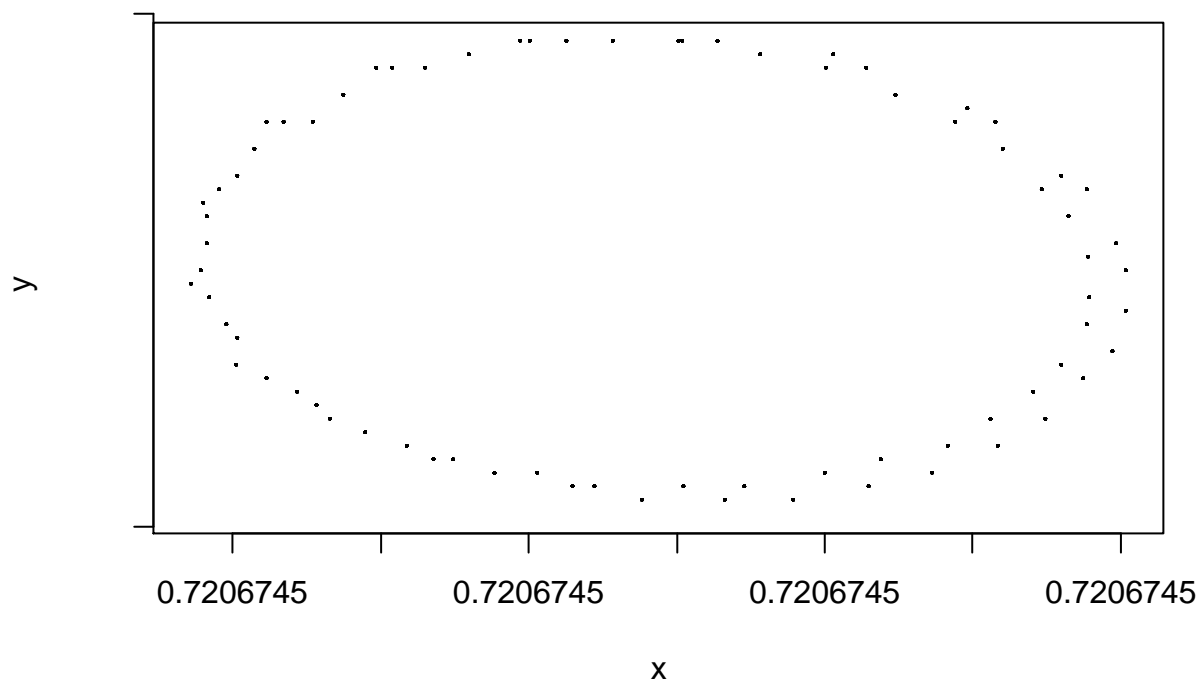
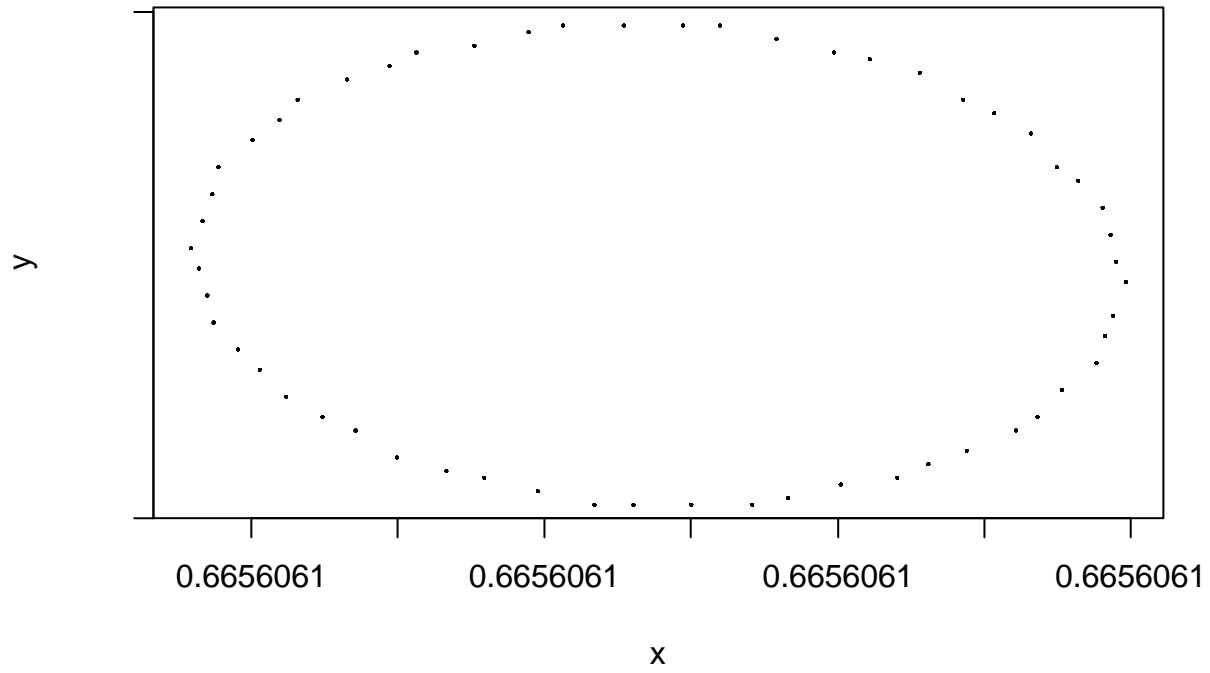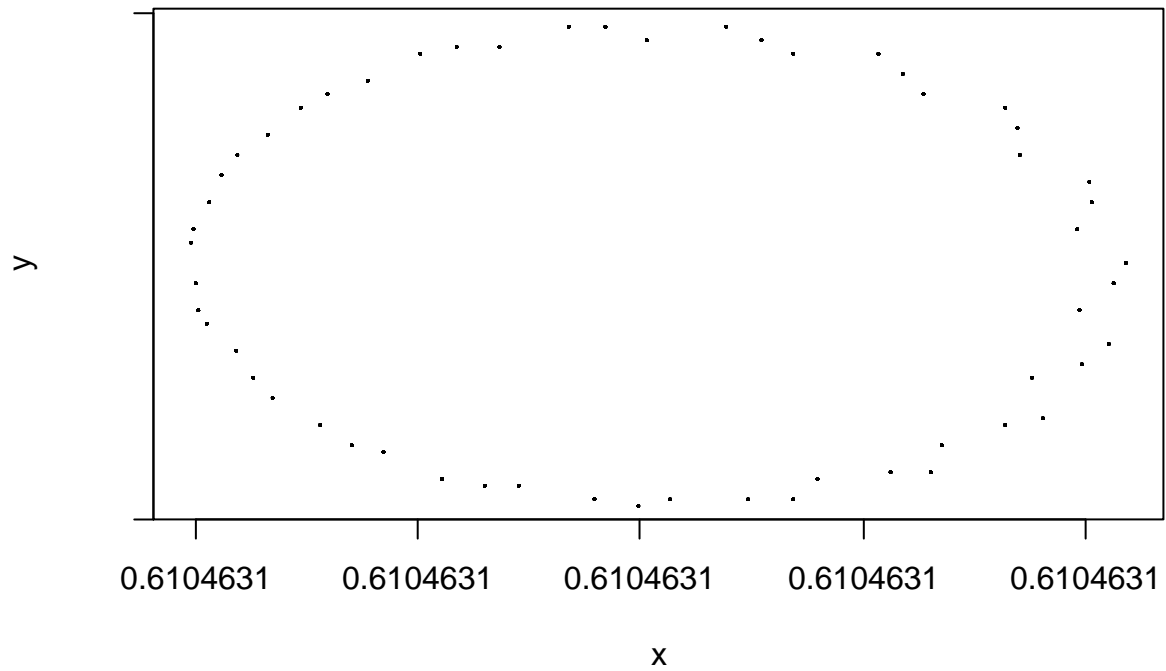**u = 0.9**

u = 0.99

Warning in plot.window(...): amplitud relativa de valores = 26 * EPS, es
pequeño (eixo 2)

u = 0.992

Warning in plot.window(...): amplitud relativa de valores = 60 * EPS, es
pequeño (eixo 2)

u = 0.994

0.6656061   0.6656061   0.6656061   0.6656061

x

```
## Warning in plot.window(...): amplitud relativa de valores = 34 * EPS, es
## pequeño (eixo 2)
```

u = 0.996

0.6104631   0.6104631   0.6104631   0.6104631   0.6104631

x

```
## Warning in plot.window(...): amplitud relativa de valores = 86 * EPS, es
## pequeño (eixo 2)
```

u = 0.998

u = 1