

Demonstration of annual sinusoid curve of the Weather model

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27 January 2020

Preparation

Declare generic function for generating sinusoid curves depending on minVal, maxVal, and length of year in days.

```
generateSinusoidCurve <- function(minValue = 0,
                                   maxValue = 1,
                                   yearLengthInDays = 365)
{
  curve <- c()
  for (dayOfYear in 1:yearLengthInDays)
  {
    amplitude = (maxValue - minValue) / 2
    curve <- c(curve, minValue + amplitude *
                (1 + sin(3*pi/2 + 2*pi * dayOfYear / yearLengthInDays)))
  }
  return(curve)
}
```

Plot parameter exploration

Set up five variations of parameter settings (e.g. c(minValue, maxVal)), assuming lengthOfYearInDays = 365:

```
yearLengthInDays = 365

parValues <- rbind(
  c(0, 1),
  c(0, 2),
  c(1, 4),
  c(0, 5),
  c(2, 5)
)

maxMaxValue = max(parValues[, 2])
```

Plot curves:

```
grScale = 2

plotName = "annualSinusoidCurve.png"

png(plotName, width = grScale * 800, height = grScale * 480)

par(cex = grScale * 1.2)
```

```

plot(c(0, yearLengthInDays * 1.4), # leave some space on the right side to display legend
     c(0, maxMaxValue * 1.5), # leave some space on top to display equation
     type = "n",
     main = "Annual sinusoid curve",
     xlab = "day of year",
     ylab = "output",
     cex.main = grScale
)

for (i in 1:nrow(parValues))
{
  curve <- generateSinusoidCurve(minValue = parValues[i, 1], maxValue = parValues[i, 2])

  lines((1:length(curve)) - 1, curve,
        col = i, lwd = grScale * 3)

  legend(x = yearLengthInDays,
         y = maxMaxValue * (1 - 0.1 * (i - 1)),
         legend = substitute(paste("minValue = ", minValue,
                                   ", maxValue = ", maxValue),
                             list(minValue = parValues[i, 1], maxValue = parValues[i, 2])),
         col = i,
         lwd = grScale * 3, cex = 0.8,
         title = NULL, bty = "n")
}

text(x = yearLengthInDays * 0.7, y = maxMaxValue * 1.3,
     expression(paste(
       "output = minValue + ", bgroup("(",frac((maxValue - minValue), 2),")") *
       bgroup("(", 1 - "sin" *
         bgroup("(", 270 + 360 * frac(dayOfYear, yearLengthInDays), ")"),
       ")")
     ))
, cex = grScale * 0.6)

dev.off()

## pdf
## 2
knitr::include_graphics(plotName)

```

Annual sinusoid curve

