

# spect

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## R Generate signal and its fft

This generates a sinusoid 4 Hz, 1 second, sampled 200 Hz.

```
../bin/spect sin
```

## Plot the signal freq analysis

```
library(ggplot2)
library(dplyr)
```

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##   filter, lag

## The following objects are masked from 'package:base':
##
##   intersect, setdiff, setequal, union
```

```
signalfft<-read.csv("sin.csv",header=FALSE,sep=",")
names(signalfft)<-c("freq","rex","imx","mod","arg")
```

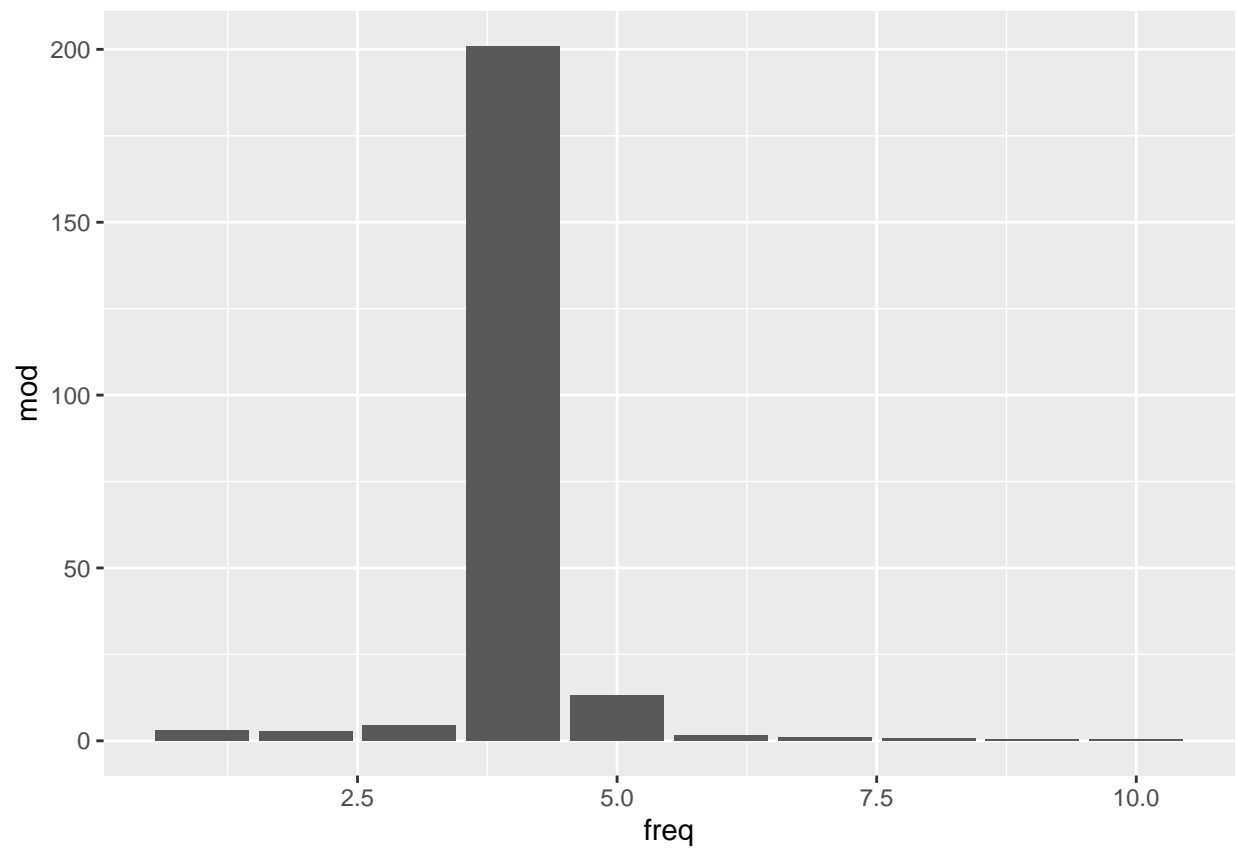
## Dominant frequencies

The top 5 frequencies are

```
head(signalfft,5)
```

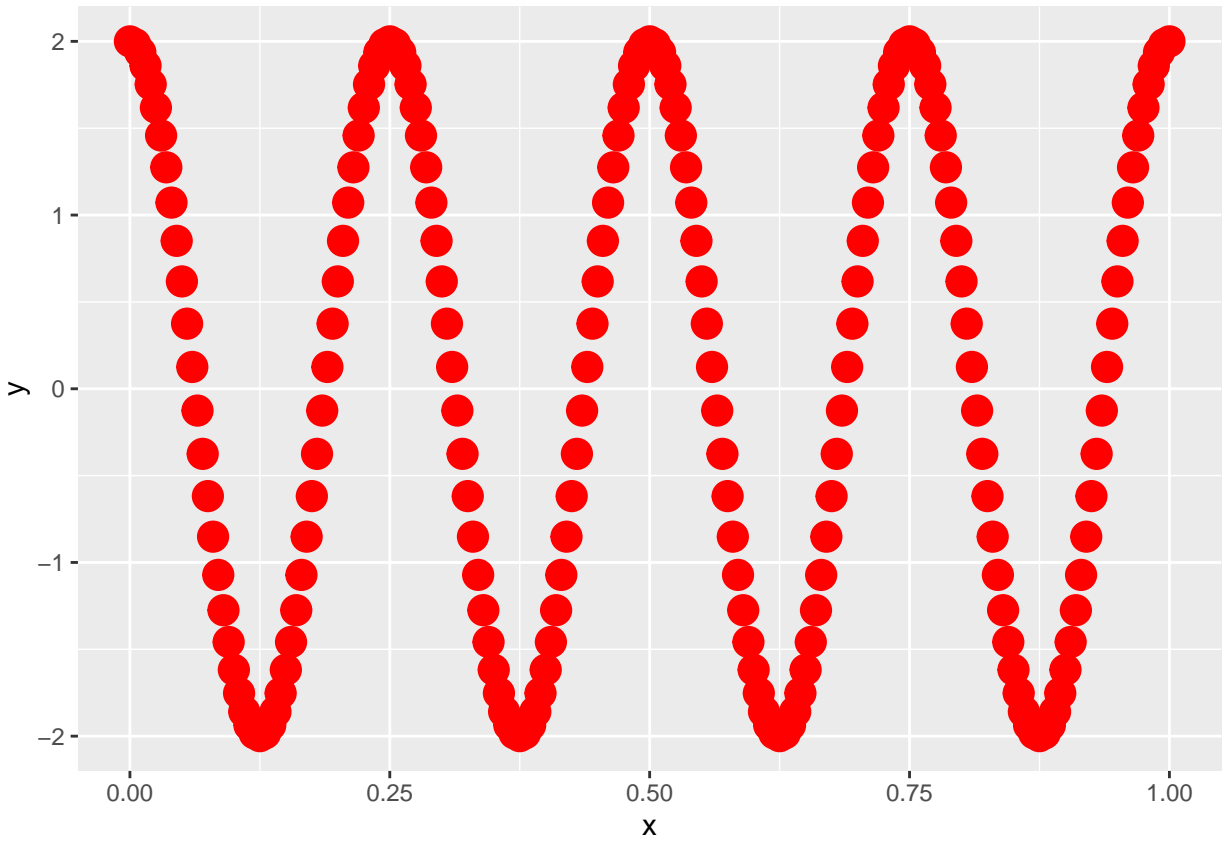
```
##   freq      rex      imx      mod      arg
## 1    1  1.9997100  2.13128  2.92253  0.817236
## 2    2  0.0333027  2.65588  2.65609  1.558260
## 3    3  0.0846389  4.50653  4.50732  1.552020
## 4    4  0.2114050 200.97700 200.97700  1.569740
## 5    5 12.5798000 -3.64110 13.09610 -0.281741
```

```
dominant<-signalfft %>% slice_head(n=10)
ggplot(dominant,aes(x=freq,y=mod))+geom_bar(stat="identity")
```



## Reconstructed waveform

```
signal<-read.csv("sin_re.csv",header=FALSE,sep=",")
names(signal) <- c("x","y")
ggplot(signal,aes(x=x,y=y))+geom_point(colour="red", size=5,show.legend=TRUE)+theme(legend.position = "bottom")
```

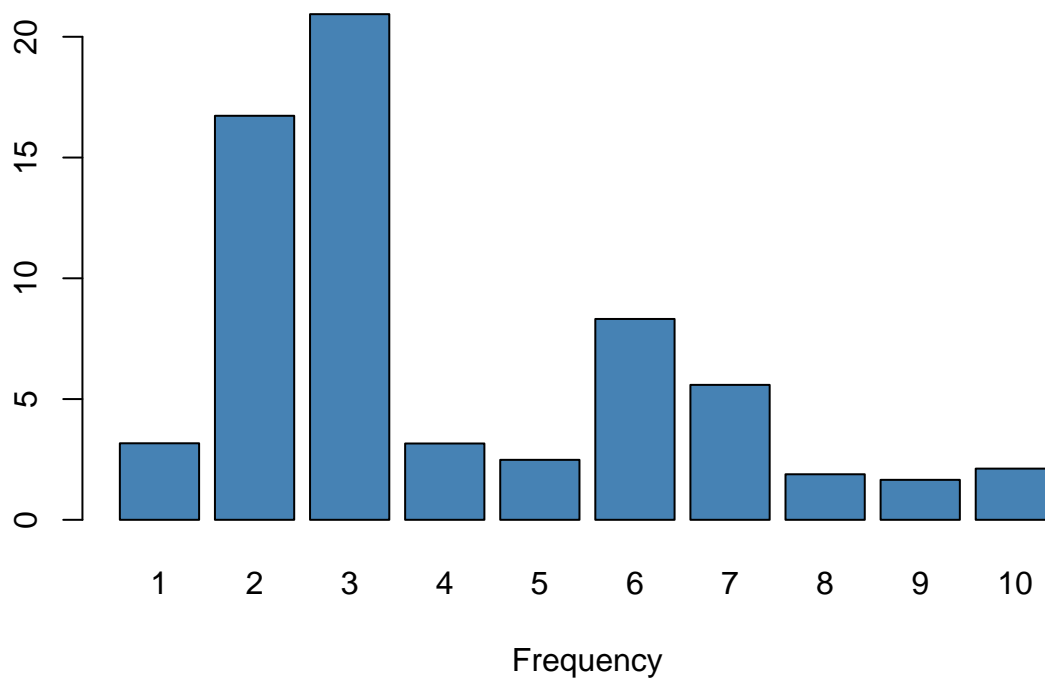


## Square Wave

```
../bin/spectsq sq
```

In this case, we use a much lower sampling frequency. The impact of the lower number of component sinusoids on the accuracy of the synthesis results should be obvious.

```
rm(signalfft)
rm(dominant)
rm(signal)
signalfft<-read.csv("sq.csv",header=FALSE,sep=",")
names(signalfft)<-c("freq","rex","imx","mod","arg")
dominant<-signalfft %>% slice_head(n=10)
barplot(dominant$mod,col="steelblue",names.arg=dominant$freq,xlab="Frequency")
```



```
signal<-read.csv("sq_re.csv",header=FALSE,sep=",")
names(signal) <- c("x","y")
signalorig<-read.csv("sq_orig.csv",header=FALSE,sep=",")
names(signalorig) <- c("x","y")
signal <- signal %>% mutate(yorig=signalorig$y)
```

## Original and Reconstructed signals

```
ggplot(signal,aes(x=x,y=y))+  
  geom_line(colour="red",linewidth=1)+  
  geom_line(aes(y=yorig),color="blue",linewidth=1)+  
  theme(legend.position = "bottom")
```

