FLOW

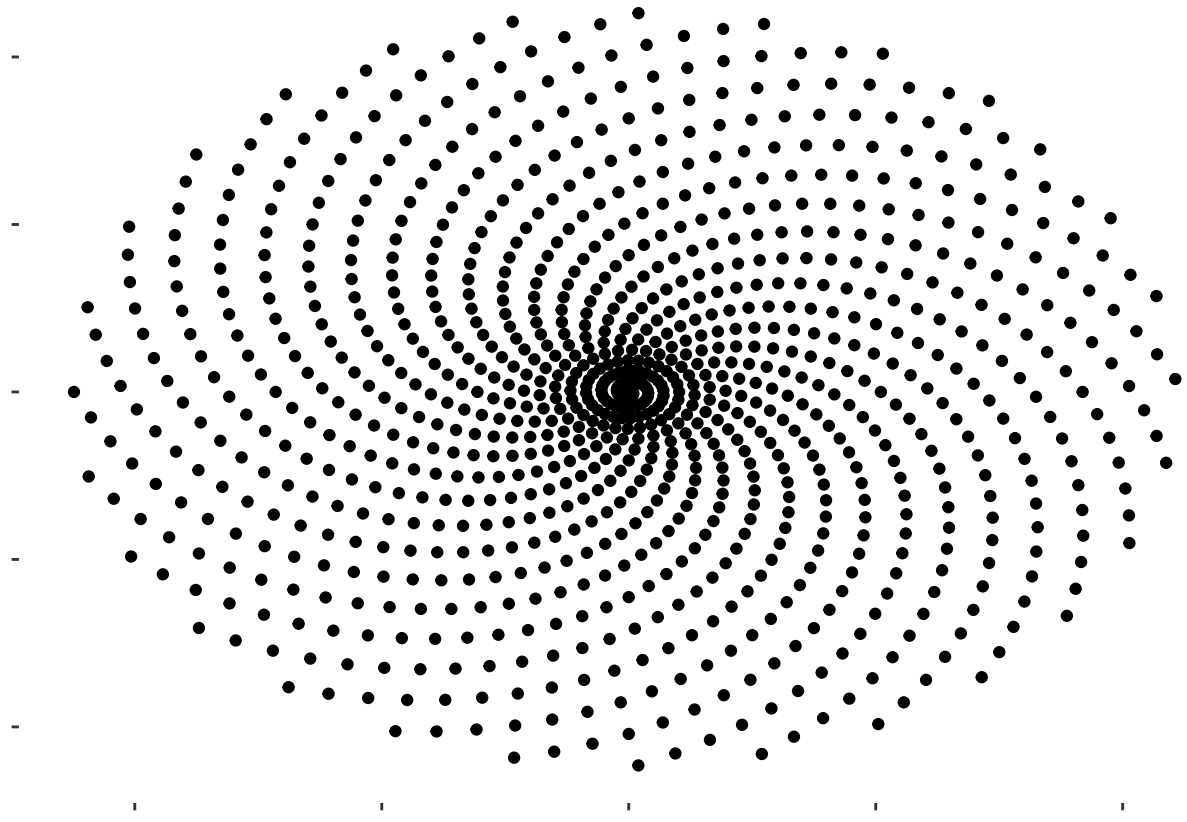
ME

01/07/2020

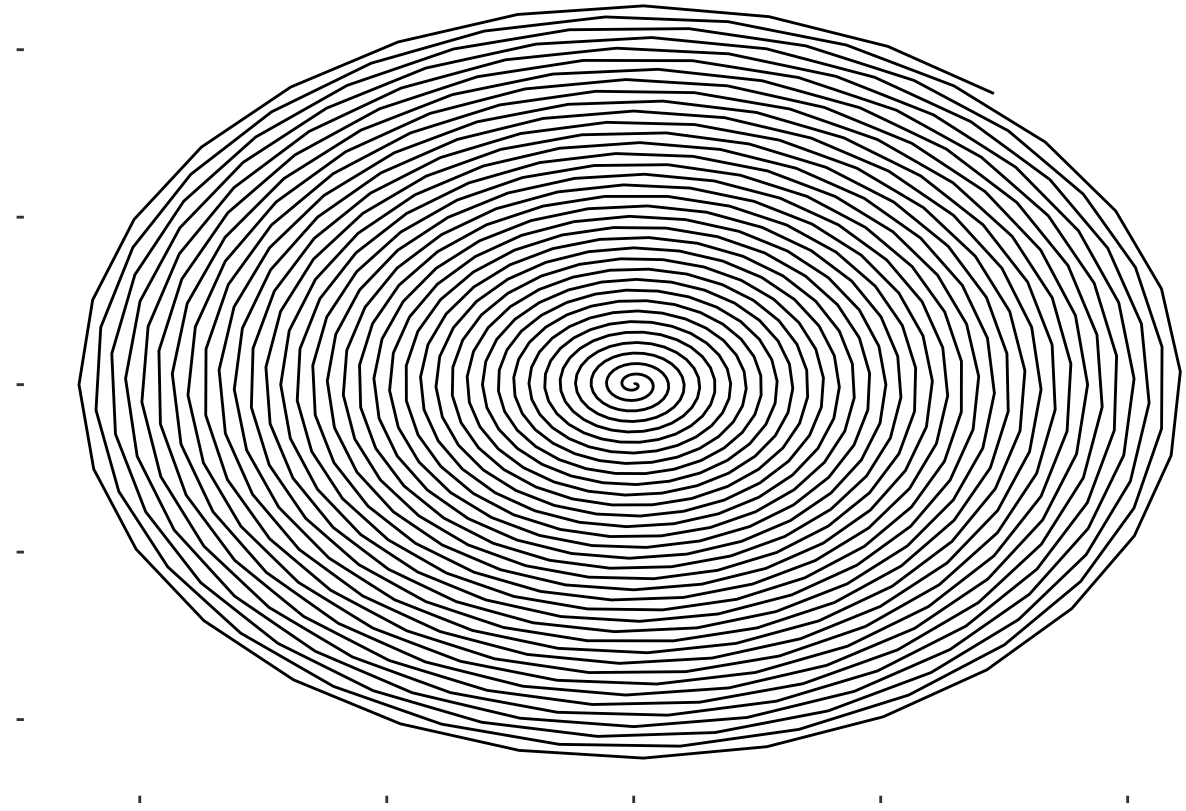
```
# Let's Start with a spiral image
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 3.6.3
```

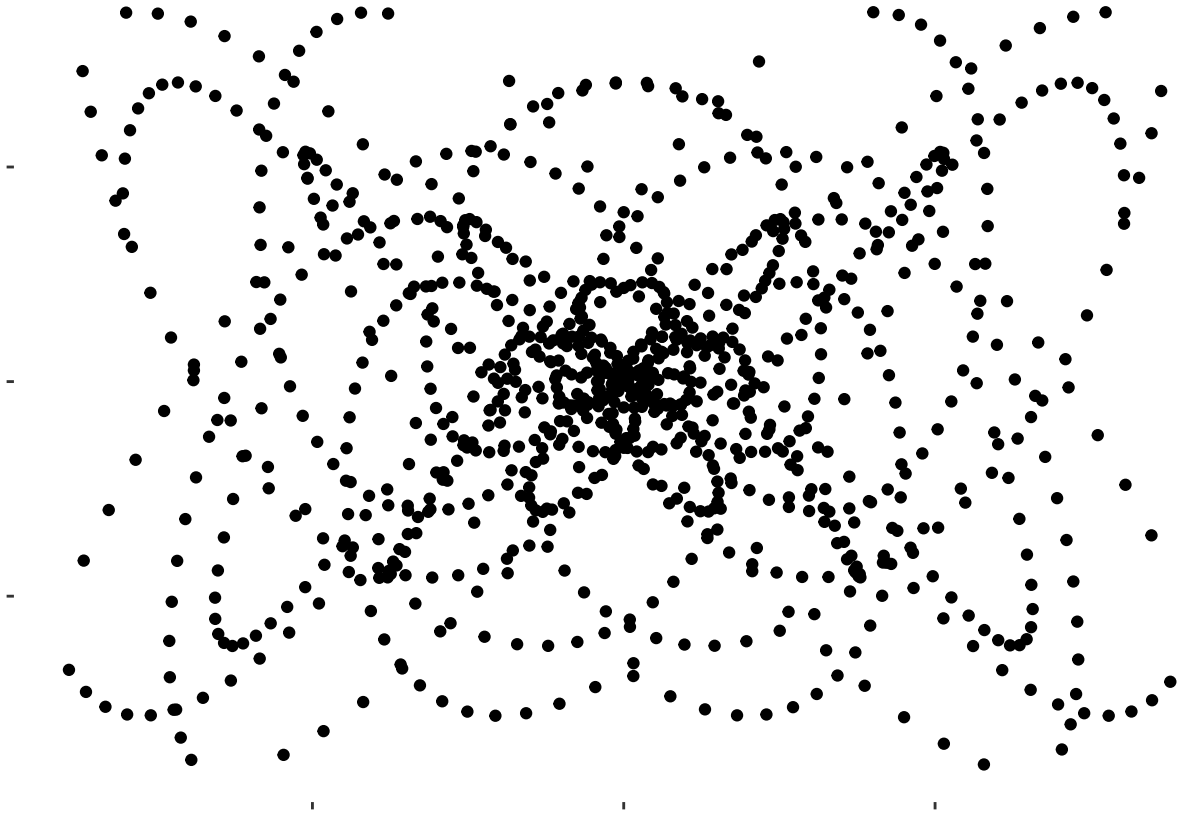
```
angle<-13*pi/180
a<-seq(1,1000)*angle #plottting 1000 points
x<-sin(a)
y<-cos(a)
df<-data.frame(x,y,a)
plot<-ggplot(data=df,aes(x*a,y*a))
plot+ geom_point() + theme(text=element_blank(),rect=element_blank()) #adding plot layers
```



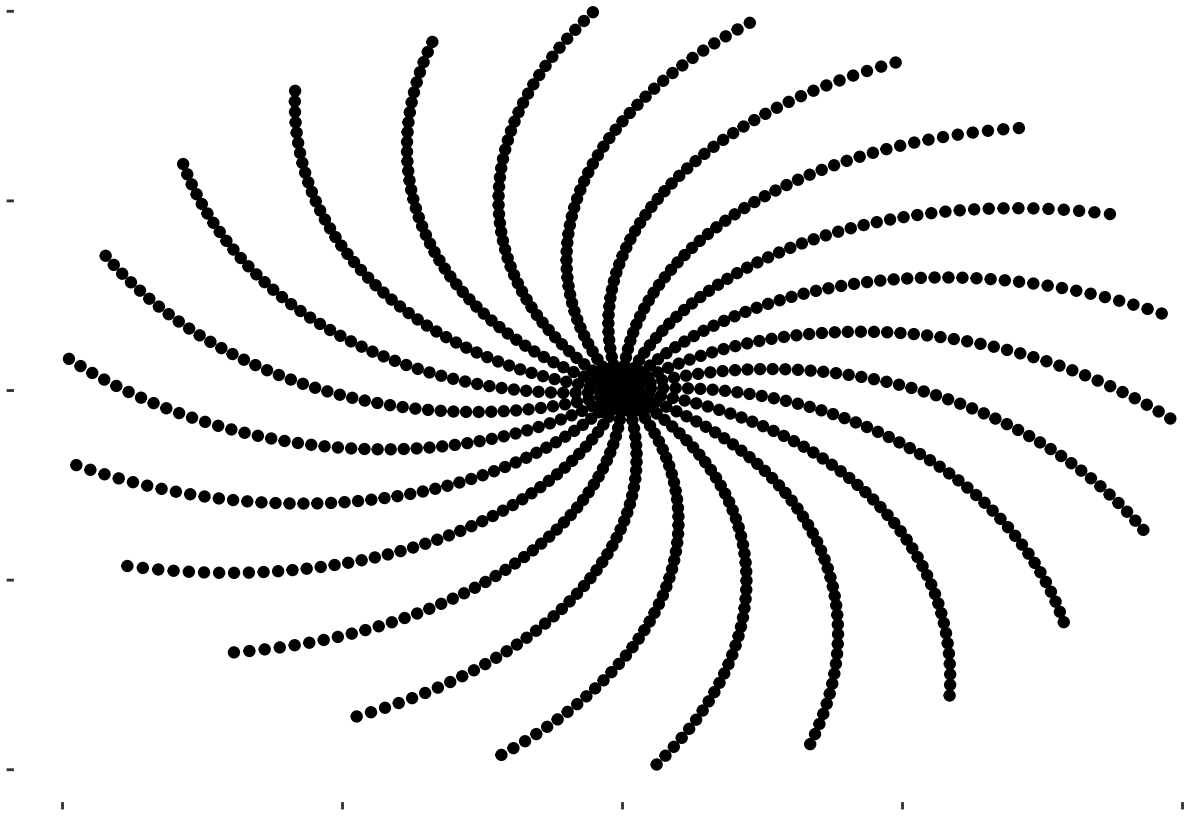
```
# let's look at the spiral path
plot+ geom_path() + theme(text=element_blank(),rect=element_blank())
```



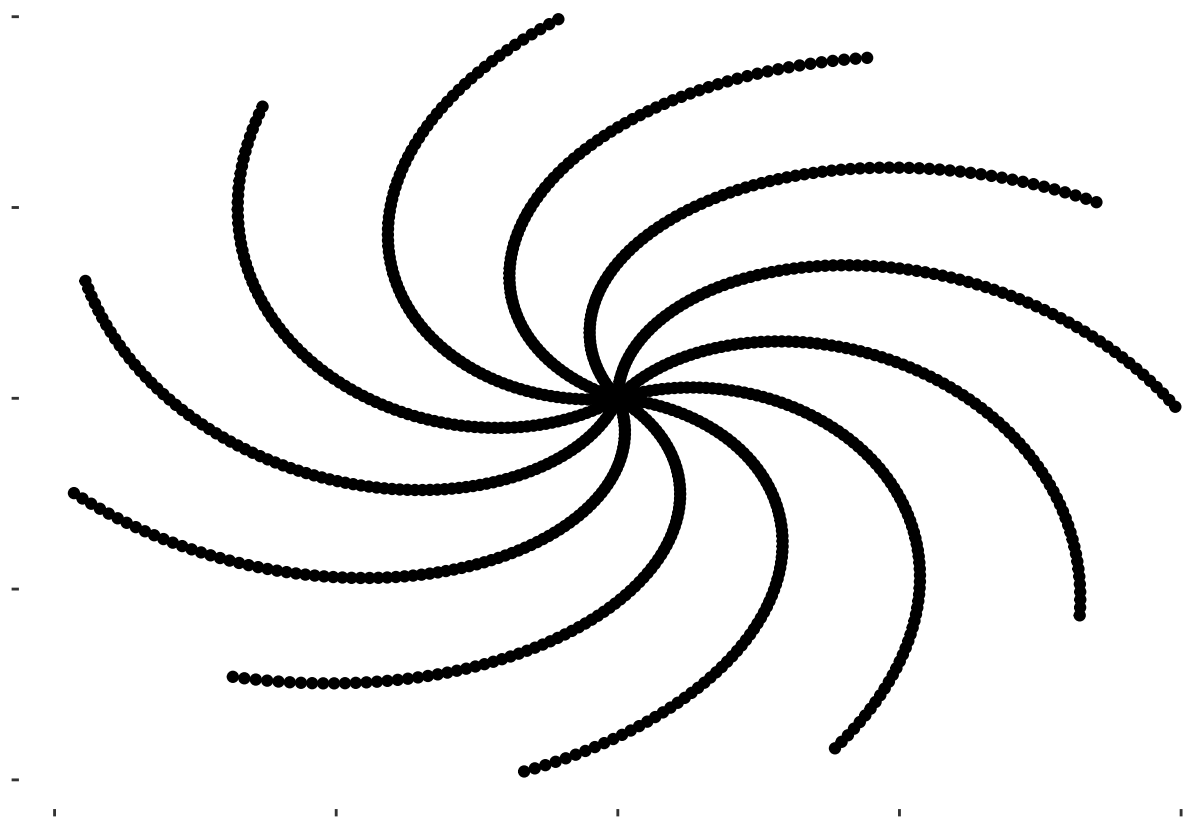
```
# effect of changing angle
angle<-1.8
a<-seq(1,1000)*angle
y<-cos(a)
df<-data.frame(x,y,a)
plot<-ggplot(data=df,aes(x*a,y*a))
plot+ geom_point() + theme(text=element_blank(),rect=element_blank())
```



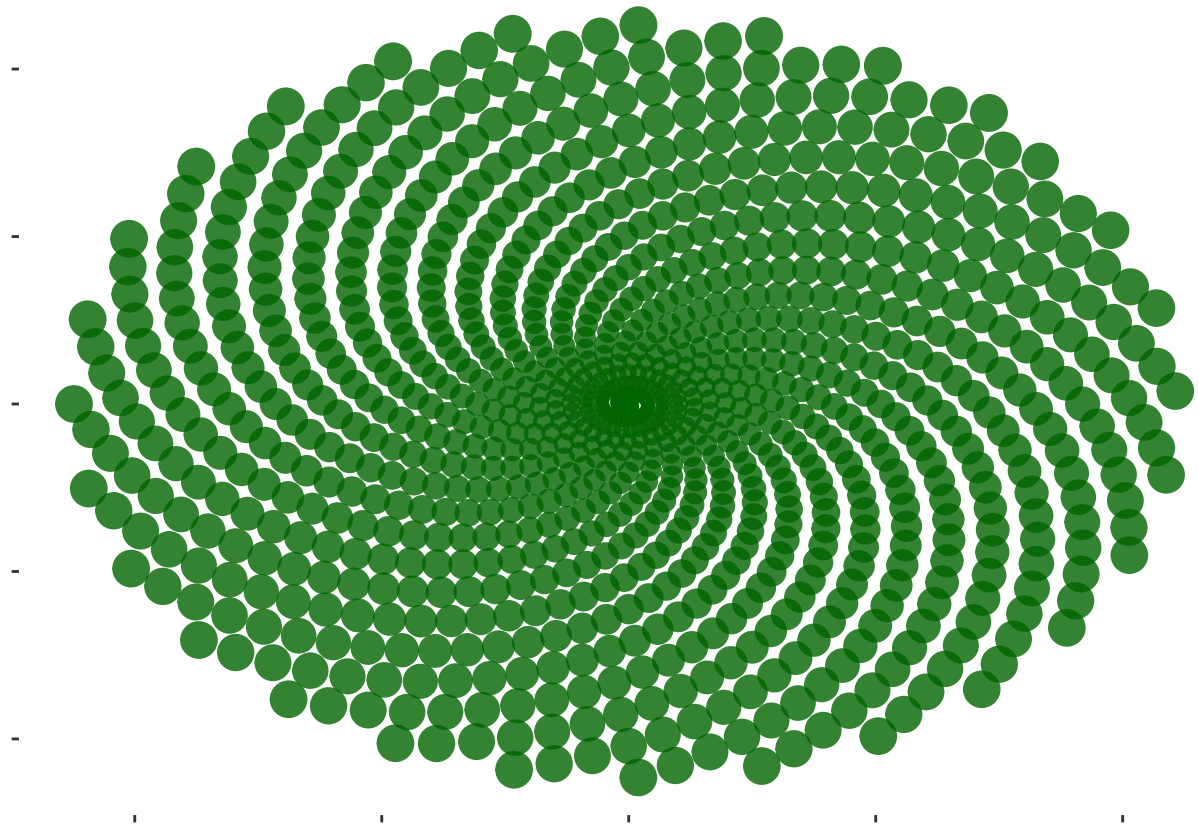
```
angle<-2
a<-seq(1,1000)*angle
x<-sin(a)
y<-cos(a)
df<-data.frame(x,y,a)
plot<-ggplot(data=df,aes(x*a,y*a))
plot+ geom_point() + theme(text=element_blank(),rect=element_blank())
```



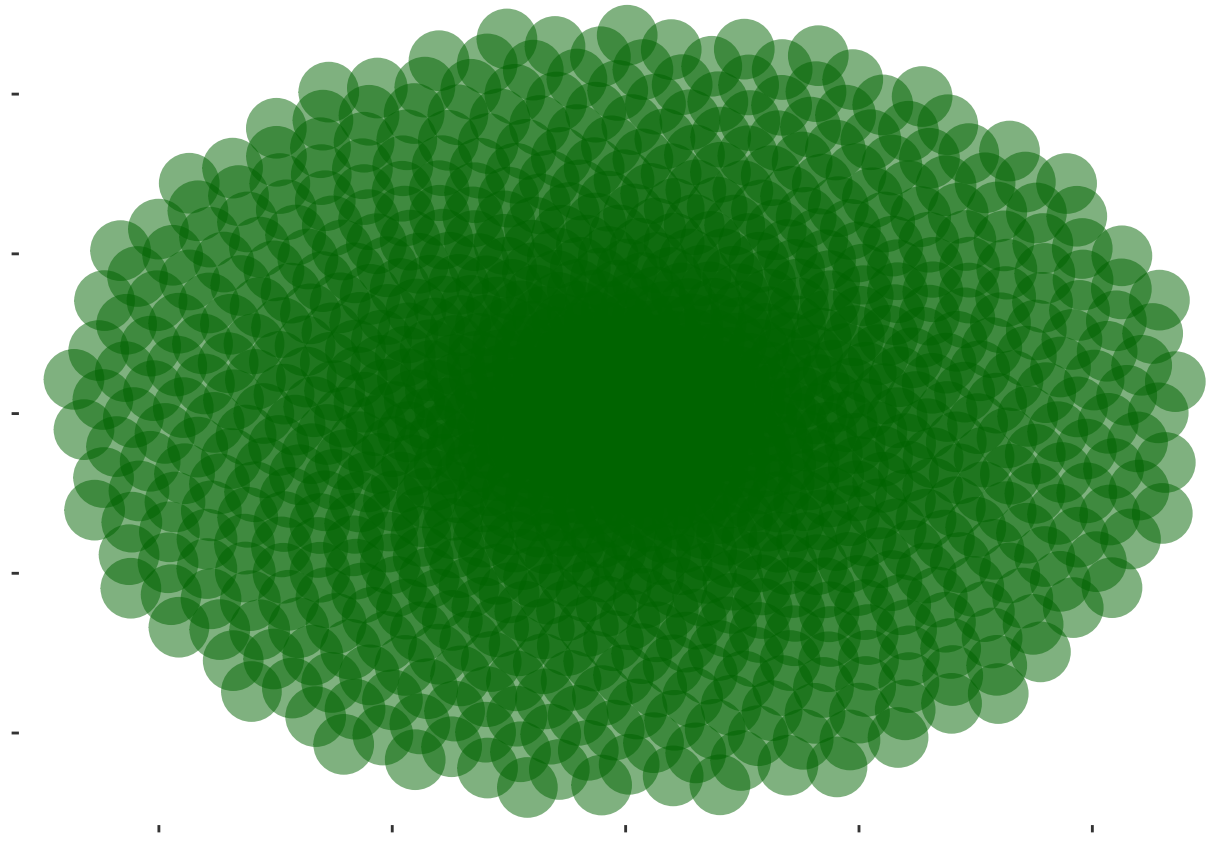
```
angle<-4
a<-seq(1,1000)*angle
x<-sin(a)
y<-cos(a)
df<-data.frame(x,y,a)
plot<-ggplot(data=df,aes(x*a,y*a))
plot+ geom_point() + theme(text=element_blank(),rect=element_blank())
```



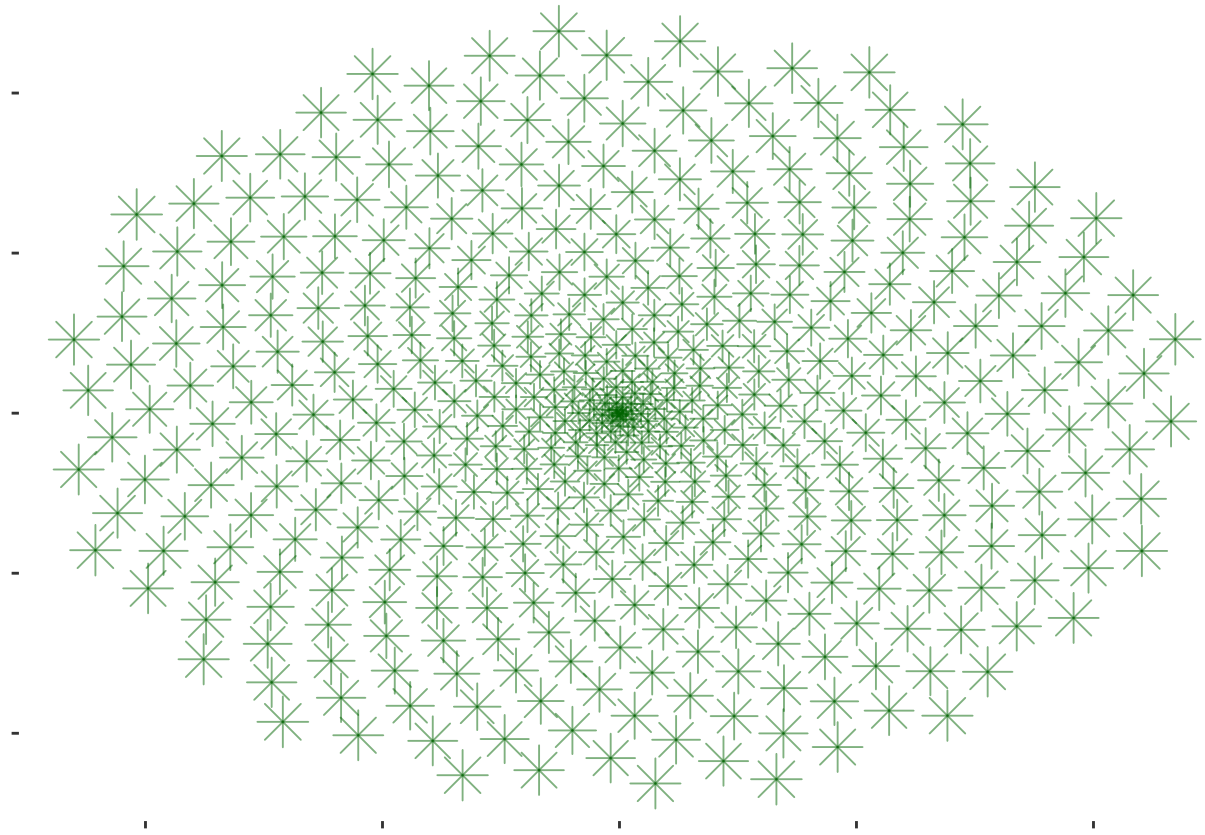
```
#add some color
angle<-13*pi/180
a<-seq(1,1000)*angle
x<-sin(a)
y<-cos(a)
df<-data.frame(x,y,a)
plot<-ggplot(data=df,aes(x*a,y*a))
plot+ geom_point(color="darkgreen",alpha=0.8,aes(size=a)) + theme(text=element_blank(),rect=element_bla
```



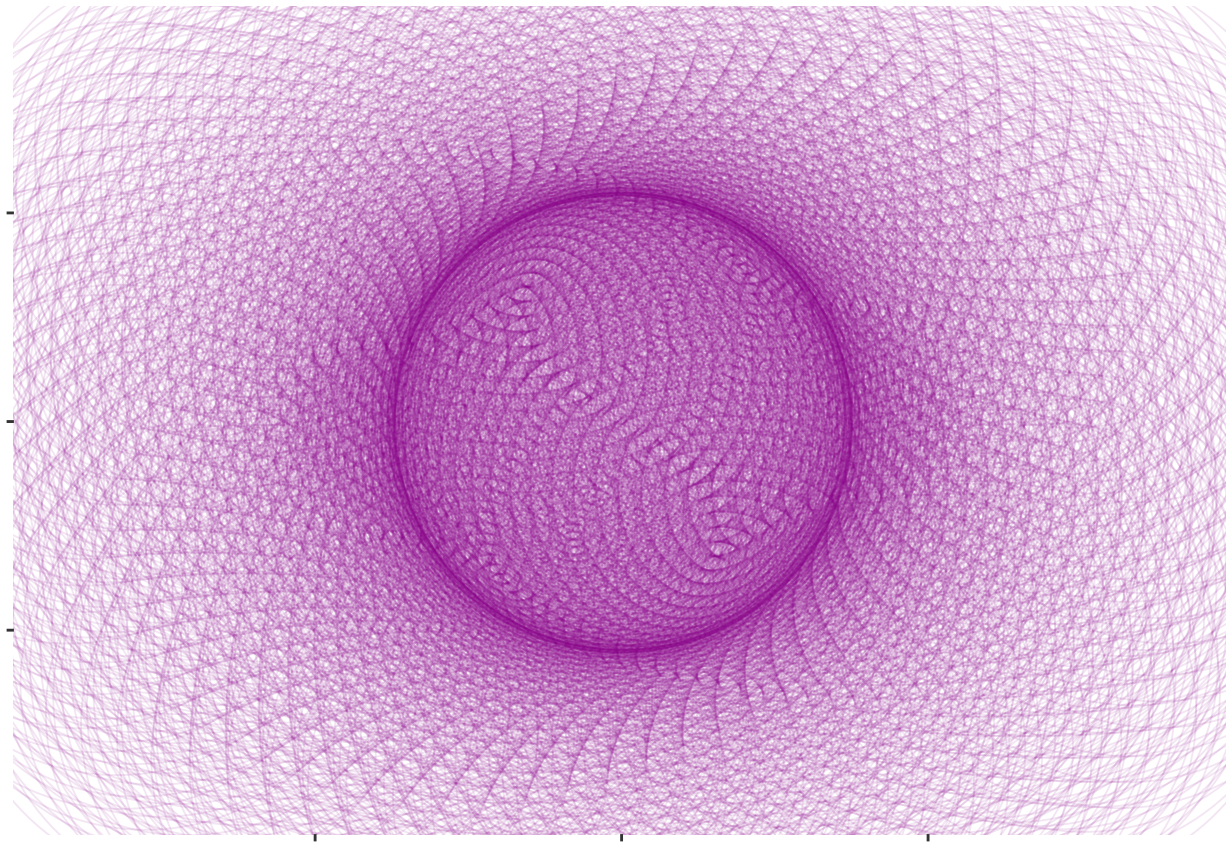
```
angle<-pi*(3-sqrt(5)) #golden angle
a<-seq(1,1000)*angle
x<-sin(a)
y<-cos(a)
df<-data.frame(x,y,a)
plot<-ggplot(data=df,aes(x*a,y*a))
plot+ geom_point(color="darkgreen",alpha=0.5,size=10) + theme(text=element_blank(),rect=element_blank()
```



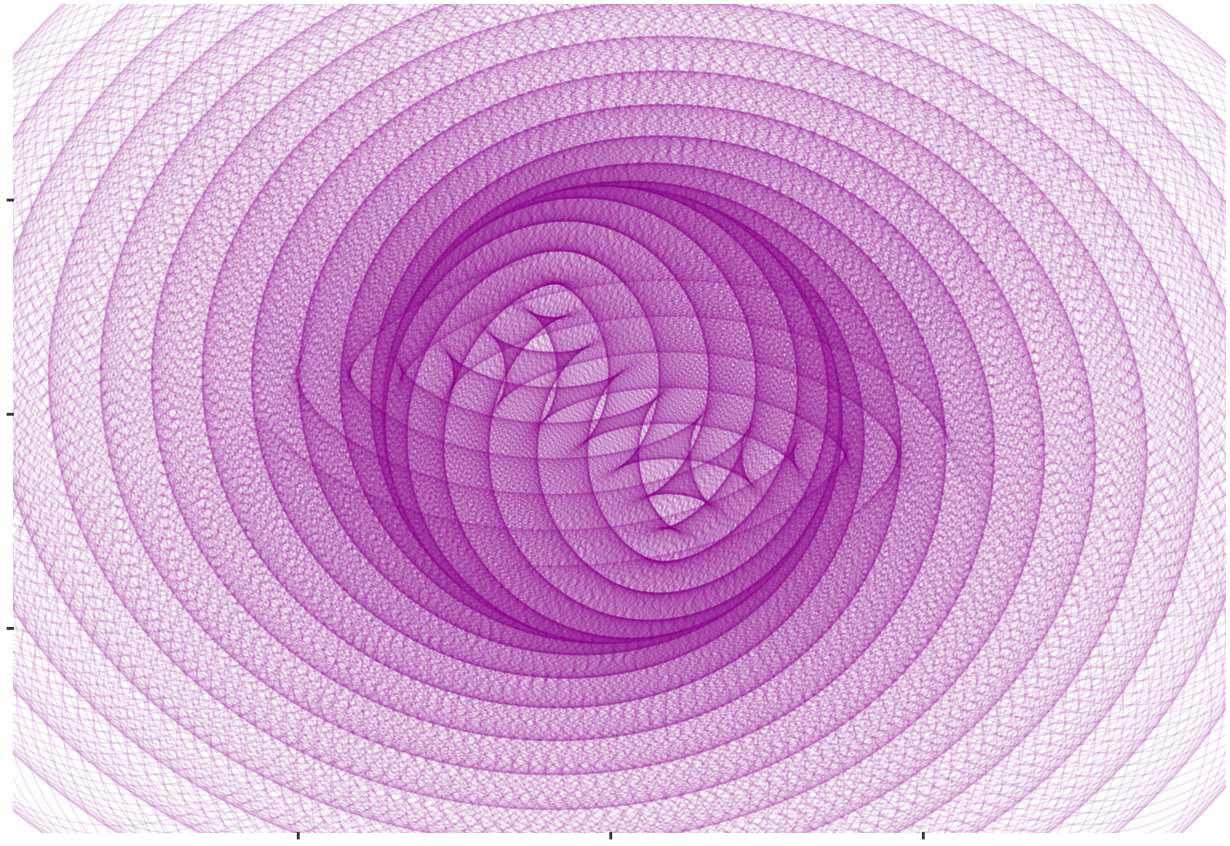
```
# change shape
angle<-(3-sqrt(5))*pi
a<-seq(1,500)*angle
x<-sin(a)
y<-cos(a)
df<-data.frame(x,y,a)
plot<-ggplot(data=df,aes(x*a,y*a))
plot+ geom_point(color="darkgreen",shape=8,alpha=0.5,aes(size=a)) + theme(text=element_blank(),rect=ele
```



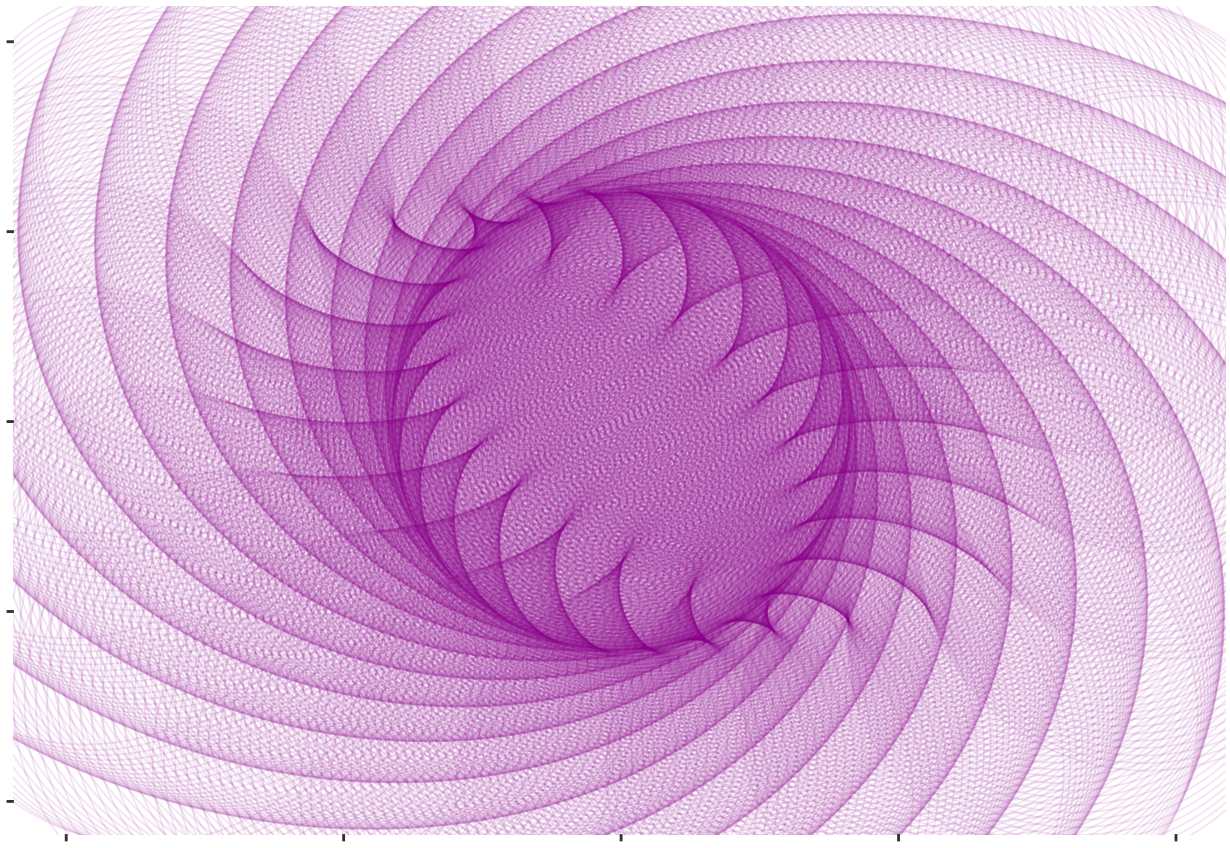
```
# The best part
angle<-13*pi/180
a<-seq(1,2000)*angle
x<-sin(a)
y<-cos(a)
df<-data.frame(x,y,a)
plot<-ggplot(data=df,aes(x*a,y*a))
plot+ geom_point(color="darkmagenta",shape=1,alpha=0.1,size=80) + theme(text=element_blank(),rect=eleme
```



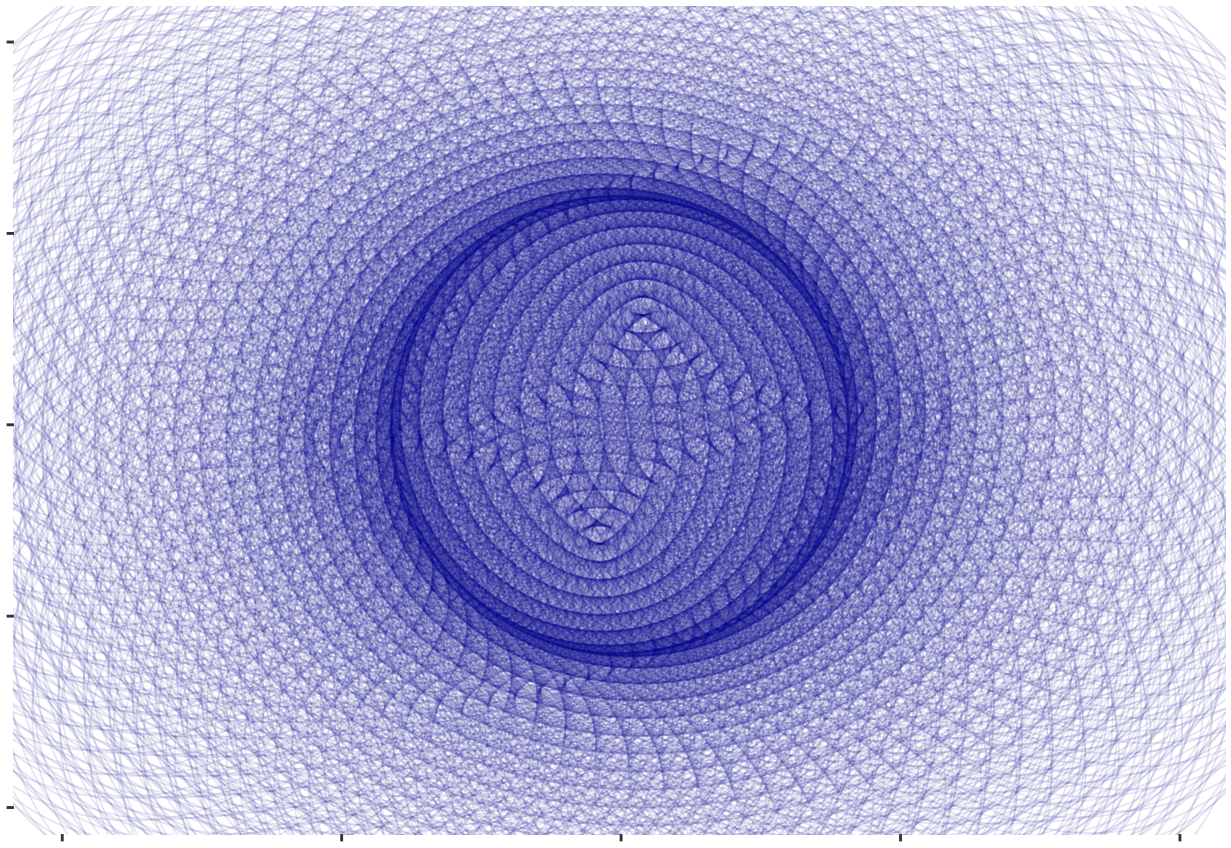
```
# Change angle and see the difference

angle<-1.8
a<-seq(1,2000)*angle
x<-sin(a)
y<-cos(a)
df<-data.frame(x,y,a)
plot<-ggplot(data=df,aes(x*a,y*a))
plot+ geom_point(color="darkmagenta",shape=1,alpha=0.1,size=80) + theme(text=element_blank(),rect=eleme
```



```
angle<-2
a<-seq(1,2000)*angle
x<-sin(a)
y<-cos(a)
df<-data.frame(x,y,a)
plot<-ggplot(data=df,aes(x*a,y*a))
plot+ geom_point(color="darkmagenta",shape=1,alpha=0.1,size=80) + theme(text=element_blank(),rect=eleme
```



```
angle<-2.5
a<-seq(1,2000)*angle
x<-sin(a)
y<-cos(a)
df<-data.frame(x,y,a)
plot<-ggplot(data=df,aes(x*a,y*a))
plot+ geom_point(color="darkblue",shape=1,alpha=0.1,size=80) + theme(text=element_blank(),rect=element_
```



```
angle<-1.3
a<-seq(1,2000)*angle
x<-sin(a)
y<-cos(a)
df<-data.frame(x,y,a)
plot<-ggplot(data=df,aes(x*a,y*a))
plot+ geom_point(color="darkmagenta",shape=1,alpha=0.1,size=80) + theme(text=element_blank(),rect=eleme
```