In the name of God

Producer:
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Subject:
different of Bysection method whith using monte carlo and normal bysection method.

Date:
12/7/2020

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Issue:We have to execute the two-part method of rooting with the help of Mont Carlo method 100 times and save the number of repetitive steps and a random number until we finally reach the root with the desired accuracy each time we execute and Then get the average of these 100 repetitions.

Our error is 10^{-5}.

Solve:

At the first we have a function with a interval.

Then we should make the c,c have a uniform distribution with a=min=min of interval,b=max=max of interval.

Then we should chek this:

Step1:if $f(c) = 0\ or\ f(c) \leq error, set\ alpha = c, else\ chek\ step2\&3$.

Step2 :if f(c)*f(a)<0,set b=c,

Step3 :if f(c)*f(a)>0,set a=c,then go to step1.

We do above algorithm until step1 condition is True.

And we do this for bysection method with slect c=(a+b)/2 in each round.

Now we can run our simulation for the above algorithm.

```
> rm(list=ls())
> n=100
> q=8
> M<-c()
> e<-10^-q
> for(i in 1:n){
+   baze<-c(0,1)
+   a<-baze[1];b<-baze[2]
+   f<-function(c){
+     f=c-(1/2)*cos(c)
+   }
+   c<-runif(1,a,b)
+
```

```
+   m=1
+   while((abs(b-a))>=(e)){
+     c<-runif(1,a,b)
+     if(f(c)*f(a)<0){b<-c
+     }else{
+       a<-c}
+     m<-m+1}
+   M[i]<-m}
>
> print(paste("the last value c in our function
is :",f(c)))
[1] "the last value c in our function is : 7.424
29451250359e-11"
> print(paste("the mean of M is :",mean(M)))
[1] "the mean of M is : 38.81"
>
>
> e<-10^-q
> r=0
> baze<-c(0,1)
> a<-baze[1];b<-baze[2]
> c<-(a+b)/2
> while((abs(b-a))>=(e)){
+   c<-(a+b)/2
+   if(f(c)*f(a)<0){b<-c
+   }else{
+     a<-c}
+   r<-r+1}
> print(r)
[1] 27
```

Conclusion:

As we have seen, the number of steps in bysection with the help of Mont Carlo has more steps than the simple bysection method(r<mean(m))