CPP Complexity Report

BCC algorithm analysis with graph

```
library(basicTrendline)
library(spatialEco)

genGraph <- function(file){
  data=read.csv(file,sep="\t")
  data=data[order(data$num),]
  attach(data)

  par(mfrow=c(2,2))
  lm1<-lm(v1 ~ num + I(num**2))
  lm2<-lm(v2 ~ num+I(num*(log(num))))
  lm3<-lm(v3 ~ num+I(num*log(num)))
  print(lm1)
  print(lm2)
  print(lm3)

  trendline(num, v1, model='line3P',
            main="V1 n^2 y=a*x^2+b*x+c",
            xlab="number",ylab="time",pch=20)
  plot(num, v2, pch=20,xlab="number",ylab="time",
       main="V2 O(n(log(n))^2)")
  lines(num,lm2$fitted.values,col=2,lwd=2)
  plot(num, v3, pch=20,xlab="number",ylab="time",
       main="V3 O(nlog(n))")
  lines(num,lm3$fitted.values,col=2,lwd=2)

  par(mfrow=c(1,1))
  plot(num, v2, pch = 20, col = "red",
       xlab="number", ylab="time",
       main="v2 vs v3 Comparison")
  legend("topleft", legend = c("v2", "v3"),
         col=c("red", "cyan"), lwd = 3)
  points(num, v3, pch = 20, col="cyan")
  lines(num,lm2$fitted.values,col=2,lwd=2)
  lines(num,lm3$fitted.values,col="cyan",lwd=2)

  par(mfrow=c(1,1))

  trendline(num, v1, ePos.x = NA, model='line3P',
            main="Overall Comparison",
            xlab="number", ylab="time",pch=20,
            linecolor="black",lwd=5)

  legend("topleft", legend = c("v1", "v2", "v3"),
         col=c("black", "red", "cyan"), lwd = 3)

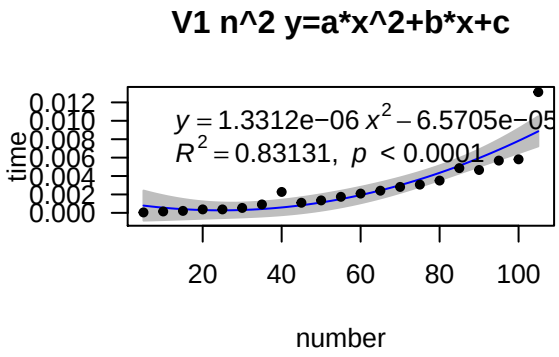
  points(num, v2, pch = 20, col="red")
```

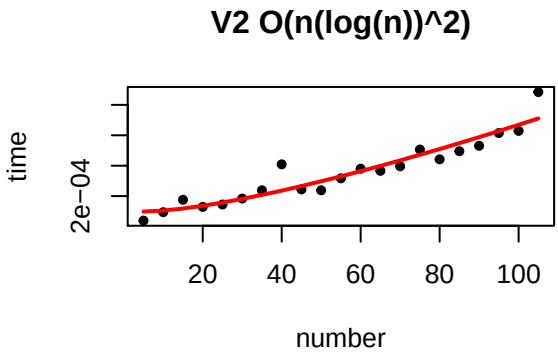
```
  points(num, v3, pch = 20, col="cyan")
  lines(num,lm2$fitted.values,col=2,lwd=15)
  lines(num,lm3$fitted.values,col="cyan",lwd=5)
  detach(data)
}
```

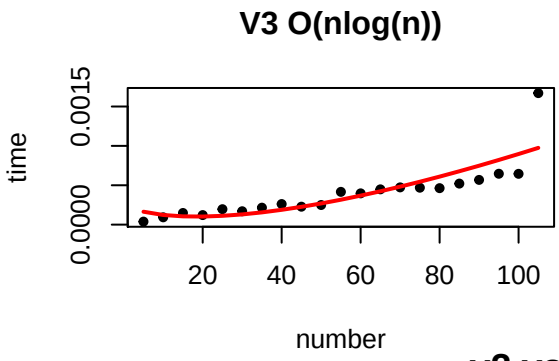
```
file1="./outRand.csv"
genGraph(file1)
```

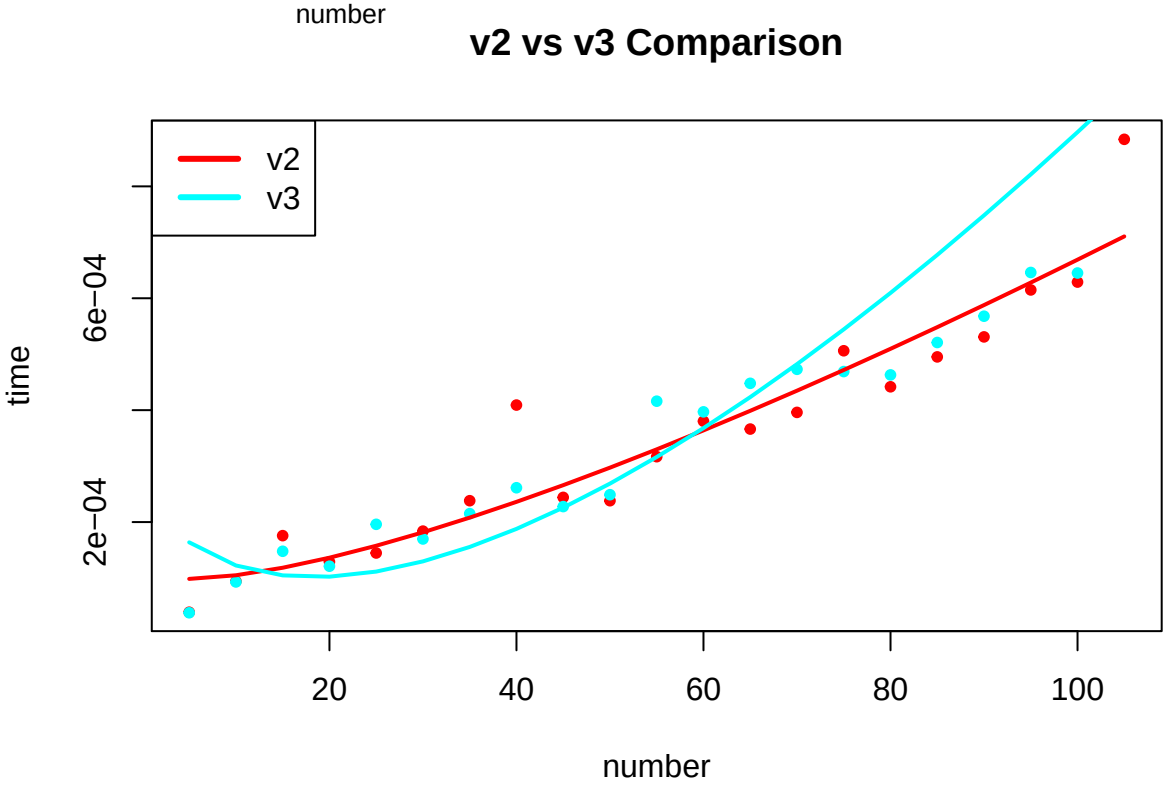
```
##
## Call:
## lm(formula = v1 ~ num + I(num^2))
##
## Coefficients:
## (Intercept)          num     I(num^2)
##   1.085e-03   -6.571e-05    1.331e-06
##
##
## Call:
## lm(formula = v2 ~ num + I(num * (log(num))))
##
## Coefficients:
##         (Intercept)                  num  I(num * (log(num)))
##           1.104e-04           -6.694e-06            2.666e-06
##
##
## Call:
## lm(formula = v3 ~ num + I(num * log(num)))
##
## Coefficients:
##       (Intercept)                num  I(num * log(num))
##         2.679e-04         -3.538e-05          9.050e-06
##
##
## Call:
## lm(formula = y ~ I(x^2) + x)
##
## Residuals:
##         Min          1Q      Median          3Q         Max
## -0.00201094 -0.00057859 -0.00003216  0.00022260  0.00425635
##
## Coefficients:
##                Estimate  Std. Error t value Pr(>|t|)
## (Intercept)  1.0846e-03  9.4024e-04  1.1536 0.263771
## I(x^2)       1.3312e-06  3.4762e-07  3.8294 0.001228 **
## x           -6.5705e-05  3.9372e-05 -1.6688 0.112452
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.0013016 on 18 degrees of freedom
## Multiple R-squared:  0.83131,    Adjusted R-squared:  0.81257
## F-statistic: 44.353 on 2 and 18 DF,  p-value: 1.1059e-07
##
##
```

```
## N: 21 , AIC: -214.7 , BIC:  -210.52
## Residual Sum of Squares:  3.0496e-05
```










```
##
## Call:
## lm(formula = y ~ I(x^2) + x)
```

```
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## Residuals:
##         Min          1Q      Median          3Q         Max
## -0.00201094 -0.00057859 -0.00003216  0.00022260  0.00425635
##
## Coefficients:
##                Estimate  Std. Error t value Pr(>|t|)
## (Intercept)  1.0846e-03  9.4024e-04  1.1536 0.263771
## I(x^2)       1.3312e-06  3.4762e-07  3.8294 0.001228 **
## x           -6.5705e-05  3.9372e-05 -1.6688 0.112452
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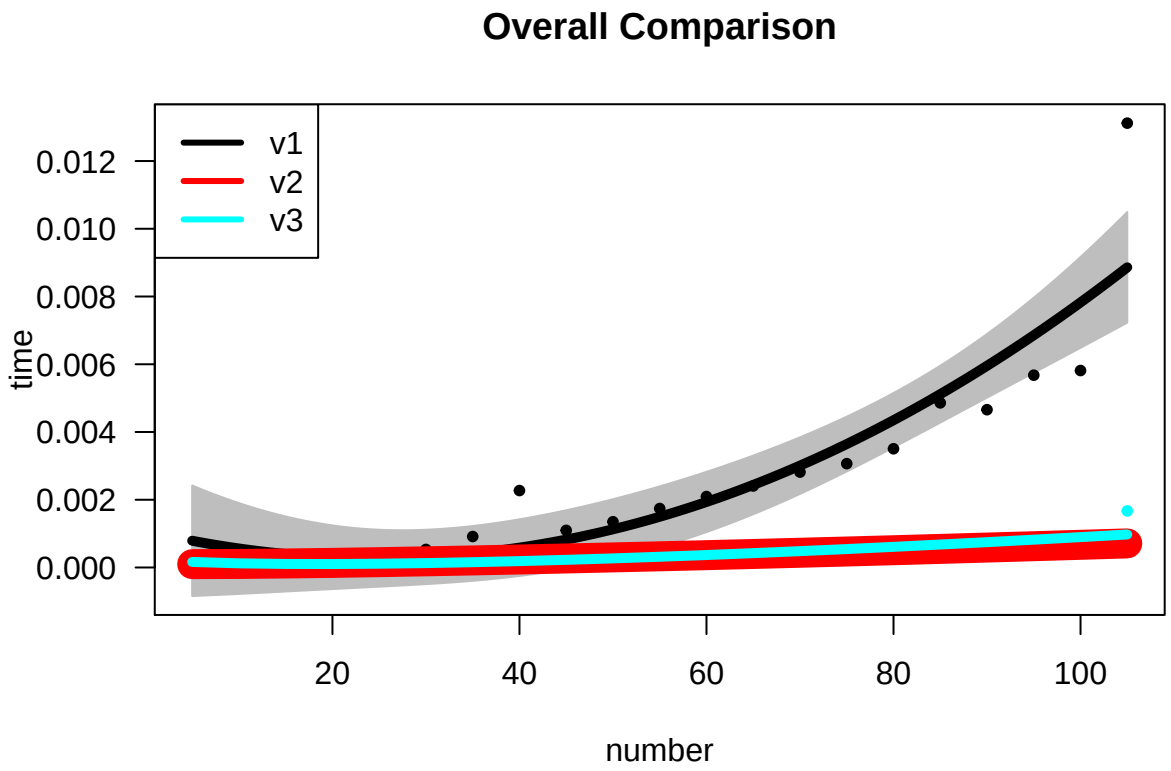
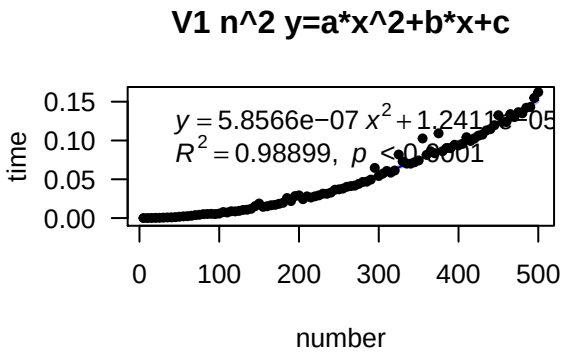
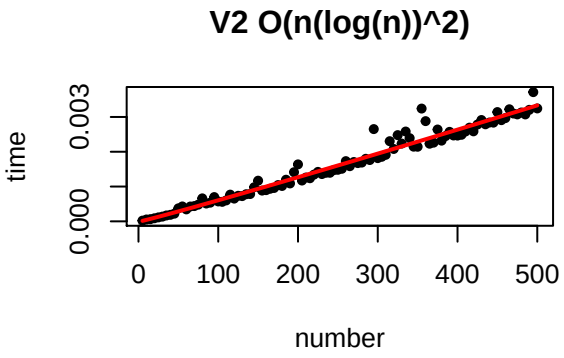


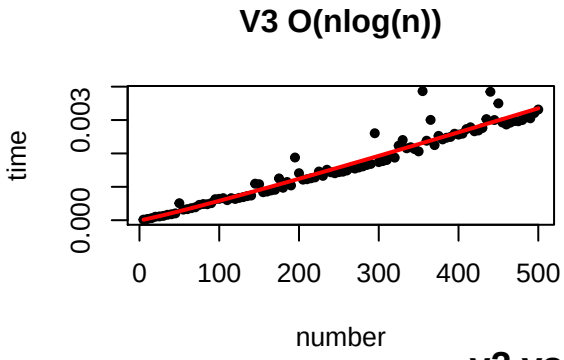

```
file2="./outVer.csv"
genGraph(file2)
```

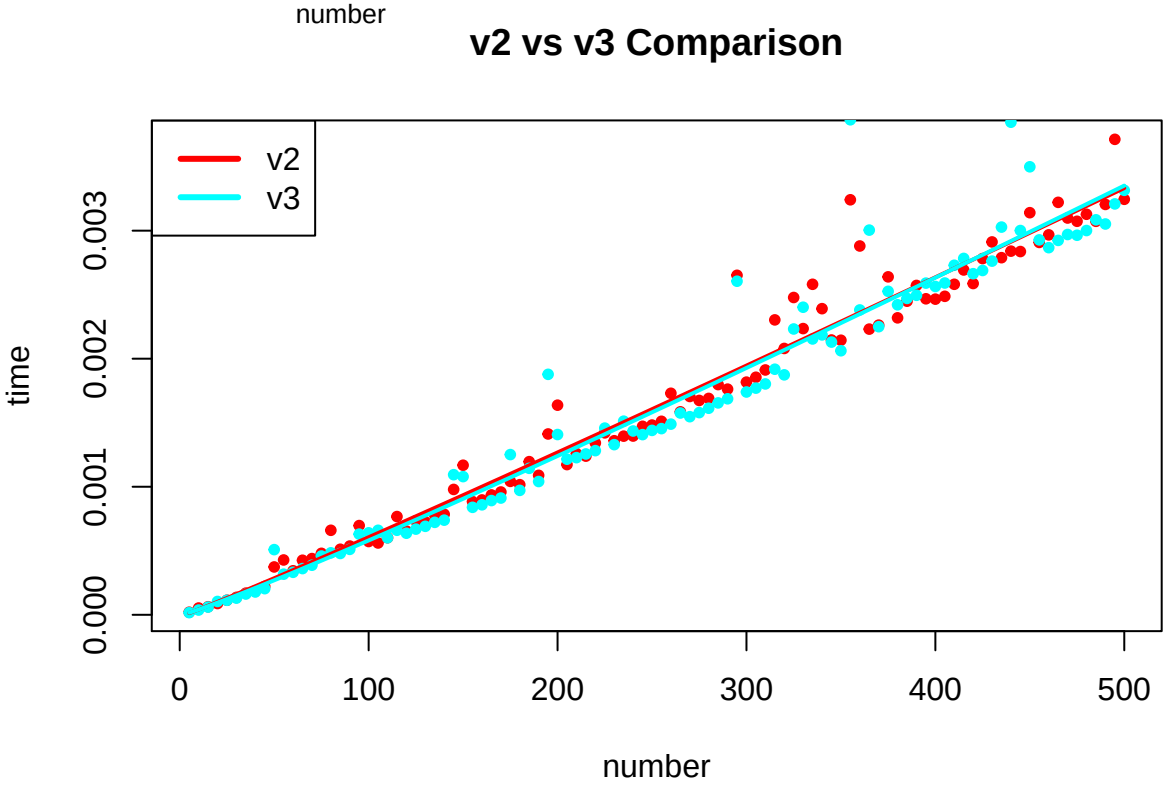
```
##
## Call:
## lm(formula = v1 ~ num + I(num^2))
##
## Coefficients:
## (Intercept)          num     I(num^2)
```

```
##  -5.318e-04    1.241e-05    5.857e-07
##
##
## Call:
## lm(formula = v2 ~ num + I(num * (log(num))))
##
## Coefficients:
##         (Intercept)                  num  I(num * (log(num)))
##          -1.283e-05            4.737e-06            3.145e-07
##
##
## Call:
## lm(formula = v3 ~ num + I(num * log(num)))
##
## Coefficients:
##       (Intercept)                num  I(num * log(num))
##        -5.354e-06          3.424e-06          5.294e-07
##
##
## Call:
## lm(formula = y ~ I(x^2) + x)
##
## Residuals:
##         Min          1Q      Median          3Q         Max
## -0.00608416 -0.00256108 -0.00093055  0.00042874  0.02492456
##
## Coefficients:
##                Estimate  Std. Error t value Pr(>|t|)
## (Intercept) -5.3175e-04  1.5019e-03  -0.354   0.7241
## I(x^2)       5.8566e-07  2.6338e-08  22.236   <2e-16 ***
## x            1.2411e-05  1.3728e-05   0.904   0.3682
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.0049066 on 97 degrees of freedom
## Multiple R-squared:  0.98899,    Adjusted R-squared:  0.98876
## F-statistic: 4355.9 on 2 and 97 DF,  p-value: < 2.22e-16
##
##
## N: 100 , AIC: -774.69 , BIC:  -764.27
## Residual Sum of Squares:  0.0023352
```







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##
## Call:
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##
## Residuals:
```

```
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## -0.00608416 -0.00256108 -0.00093055  0.00042874  0.02492456
##
## Coefficients:
##                Estimate  Std. Error t value Pr(>|t|)
## (Intercept) -5.3175e-04  1.5019e-03  -0.354   0.7241
## I(x^2)       5.8566e-07  2.6338e-08  22.236   <2e-16 ***
## x            1.2411e-05  1.3728e-05   0.904   0.3682
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