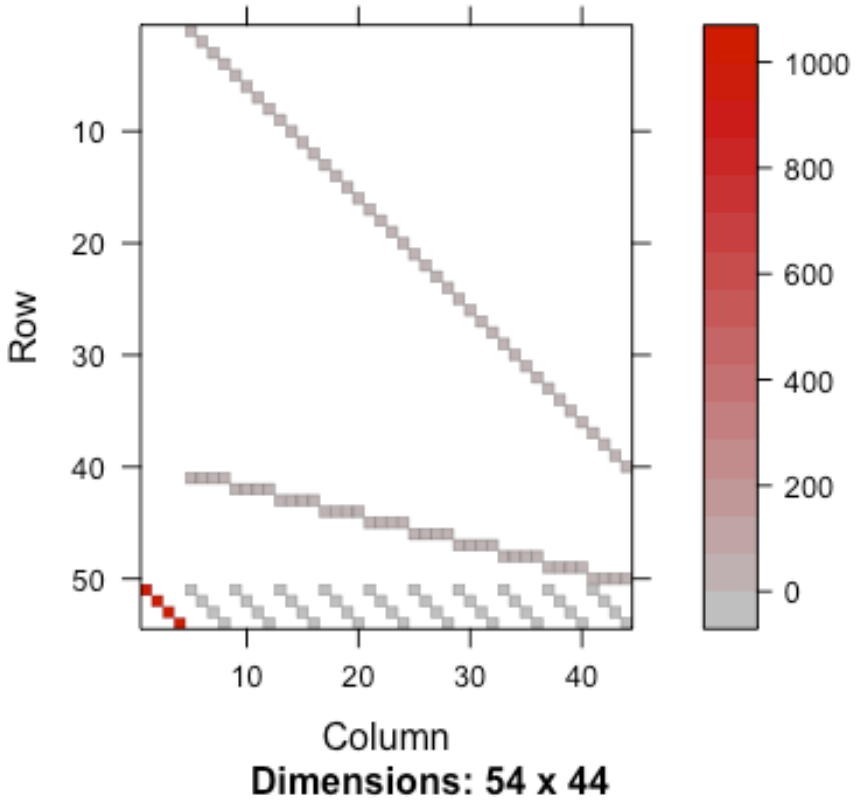
A1_Problem3

```
library("gurobi")

## Loading required package: slam

library("Matrix")
library("igraph")

##
## Attaching package: 'igraph'

## The following objects are masked from 'package:stats':
##
##     decompose, spectrum

## The following object is masked from 'package:base':
##
##     union

library("rdist")

K <- 4
K

## [1] 4

C = 10
Pmin = 10
P = matrix(sample(0:30,K*C,replace = T), nrow=K, ncol=C, byrow=T)
cvec = c(rep(1,each=K), rep(0,each=K*C))

Amat = matrix(0, nrow=(K*C+K+C), ncol=(K+K*C))
bvec = c(rep(0,each=K*C),rep(1,each=C),rep(0,each=K))
dir = c(rep("<=",each=K*C),rep(">=",each=C+K))

row = 1
for(i in 1:C){
  for(j in 1:K){
    bvec[row] = P[j,i]
    row = row + 1
  }
}

for(i in 1:(K*C)){
  Amat[i,K+i] = Pmin
}

row = K
```

```
for(i in (K*C+1):(K*C+C)){
  for(j in 1:K){
    Amat[i,row + j] = 1
  }
  row = row + K
}

row = 1
for(i in (K*C+C+1):(K*C+C+K)){
  Amat[i,i - (K*C+C)] = 1000
  Amat[i,seq(i - (K*C+C) + K, by=K, length.out=C)] = -1
}

image(Matrix(Amat))
```




```
myLP = list()
myLP$obj = cvec
myLP$A = Amat
myLP$sense = dir
myLP$rhs = bvec
myLP$vtypes = "B"
myLP$ub = 1
```

```
mysol = gurobi(myLP)
```

```
## Warning for adding variables: zero or small (< 1e-13) coefficients,
ignored
## Optimize a model with 54 rows, 44 columns and 124 nonzeros
## Variable types: 0 continuous, 44 integer (44 binary)
## Coefficient statistics:
##   Matrix range     [1e+00, 1e+03]
##   Objective range  [1e+00, 1e+00]
##   Bounds range     [1e+00, 1e+00]
##   RHS range        [1e+00, 3e+01]
## Found heuristic solution: objective 4.0000000
## Presolve removed 50 rows and 40 columns
## Presolve time: 0.02s
## Presolved: 4 rows, 4 columns, 9 nonzeros
## Variable types: 0 continuous, 4 integer (4 binary)
##
## Root relaxation: objective 1.666667e+00, 4 iterations, 0.01 seconds
##
##     Nodes    |    Current Node    |     Objective Bounds      |
Work
##  Expl Unexpl |  Obj  Depth IntInf | Incumbent    BestBd   Gap | It/N
ode Time
##
##      0     0    1.66667    0    4    4.00000    1.66667  58.3%     -
0s
## H    0     0                       2.0000000    1.66667  16.7%     -
0s
##
## Explored 1 nodes (4 simplex iterations) in 0.05 seconds
## Thread count was 4 (of 4 available processors)
##
## Solution count 2: 2 4
##
## Optimal solution found (tolerance 1.00e-04)
## Best objective 2.000000000000e+00, best bound 2.000000000000e+00, ga
p 0.0000%
```

```
mysol$objval
```

```
## [1] 2
```

```
mysol$x
```

```
##  [1] 1 1 0 0 1 0 0 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1 0 0 1 0 0 0 0 1 0 0
1 1 0
## [36] 0 1 1 0 0 1 0 0 0
```