Cost Analysis of a facility

Cost is defined as $c_{i,j} = \sum_{(k,l)} \sum_p \frac{w_{p,(k,l)}}{d_{(i,j),(k,l)}}$

$w_{p,(k,l)}$ is the weight of a product to point (k, l)

$d_{(i,j),(k,l)}$ is the distance from (i, j) to (k, l)

To derive the weight, it will be calculated from product of relative volume, and CORELAP score

```
In [2]:  sf = 1 # Facility scaling factor
         ## Create facility
         Wfacility = sum([205 233 208 206 71 265 265 281 286 282 289 289 288 285 276
          395]) # width of facility [inches]
         Lfacility = sum([328 326 326 372 394 138]) # length of facility [inches]

         Wfacility = div(Wfacility, sf) # put in terms of scaling factor
         Lfacility = div(Lfacility, sf);
```

```
In [3]:  ## Set areas that are important
         # Shredder
         shrdRow = div(148,sf)
         shrdCol = div(sum([205 233 208 206 71 265 265 281 286 282 289 288 285]), sf
         )
         shredder = [shrdRow shrdCol]

         # Bailer
         blRow = div(sum( [328,326,326,336/2] ), sf)
         blCol = div( sum([205 233 233 277 265 265 281 286 282 289] ), sf)
         bailer = [blRow blCol]

         # Omnisource
         omRow = Lfacility
         omCol = 1
         omnisource = [omRow omCol]

         # Printer Station
         prntRow = div( sum([328 326 326]), sf)
         prntCol = div( sum([205 233 233 277/2]), sf)
         printer = [prntRow prntCol]

         # TV Station
         tvRow = div( sum([328,326,326]), sf)
         tvCol = div( sum([205 233 233 277 265/2]), sf)
         tv = [tvRow, tvCol]

         # Misc Station
         miscRow = div( sum([328,326,326]), 46)
         miscCol = div( sum([205 233 233 277 265 265/2]), sf)
         misc = [miscRow miscCol];
```

In [4]:
```
## Create Distance Matrices to important points
function getdist(Lfacility, Wfacility, point)
    distances = zeros(Lfacility, Wfacility)
    for j=1:Lfacility
        for k=1:Wfacility
            if j == point[1] && k == point[2]
                distances[j,k] = 1
            else
                distances[j,k] = sqrt((point[1]-j)^2 + (point[2]-k)^2)
            end
        end
    end
    return distances
end
```

Out[4]: getdist (generic function with 1 method)

In [5]:
```
shredDist = getdist(Lfacility, Wfacility, shredder)
blDist = getdist(Lfacility, Wfacility, bailer)
omniDist = getdist(Lfacility, Wfacility, omnisource)
prntDist = getdist(Lfacility, Wfacility, printer)
tvDist = getdist(Lfacility, Wfacility, tv)
miscDist = getdist(Lfacility, Wfacility, misc)
;
```

At this point the weights will be calculated using the scores given by a CORELAP, the sum across the row. This will be multiplied by the weekly volume at these stations.

In [6]:
```
# CORELAP Scores
shredCOR = [6 6 6 6 5 5 6 5 2 2 0 6 5 4 4 4 2 4 2]
blCOR =    [5 5 5 5 3 4 4 4 0 6 2 2 6 5 5 2 2 6 2]
omniCOR =  [2 2 2 2 2 2 2 2 2 2 4 5 6 2 2 0 2 6 2]
prntCOR =  [2 6 2 2 6 2 0 2 4 5 6 4 3 4 5 2 2 5 2]
tvCOR =    [6 2 2 2 6 0 2 2 4 5 5 4 3 4 5 2 5 6 3]
miscCOR =  [2 2 6 2 6 2 2 0 4 5 5 4 3 5 5 2 2 5 5]

# Volume
shredV = 300 * 500 # number of gaylords multiplied by average weight of a g
aylord
blV =    37 * 500
omniV =  300 * 500
prntV =  55000
tvV = prntV
miscV =  10000
totalV = sum([shredV, blV, omniV, prntV, tvV, miscV])

# weights
shredW = sum(shredCOR) * shredV#/totalV
blW = sum(blCOR) * blV#/totalV
omniW = sum(omniCOR) * omniV#/totalV
prntW = sum(prntCOR) * prntV#/totalV
tvW = sum(tvCOR) * tvV#/totalV
miscW = sum(miscCOR) * miscV#/totalV
;
```

In [7]:
```
cost = 1./shredDist .* shredW
cost += 1./blDist .* blW
cost += 1./omniDist .* omniW
cost += 1./prntDist .* prntW
cost += 1./tvDist .* tvW
cost += 1./miscDist .* miscW
;
```

In [8]:
```
using FileIO
using Images
using ImageMagick
save("costsNotNormed.png",grayim(cost/maximum(cost)))
```

In [21]:
```
using DataFrames
writecsv("cost.csv", cost)
```