MKEL 1273: VLSI Design Automation

Semester: 2017/2018-1

Project 2

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**Objective**

The objective of this second part of the project is to develop algorithms to minimize the

floorplan area of terminal nodes in the ISP2005 benchmark circuits – Adaptec1 and Bigblue1.

we will build upon the profiler tool that you have developed in the first part of project. we are

free to implement (and modify) any placement algorithm we like. our task is to develop the

algorithm and show how we could iteratively minimize the total floorplan area. we will place

only the terminal cells (i.e. ignore non-terminal cells) and estimate the floorplan area.

**Design requirements**

The cells should be placed in a slicing fashion, i.e. the resulting floorplan must be a slicing

floorplan. For example, you can place the cells in rows or columns adjacent to each other. Each

cell should have a coordinate for location, with or without separation between rows/columns.

Figure 1 below shows an example. Total area is given by the dotted border of the floorplan.

Note that unoccupied space in the floorplan counts in the total area.

The cells should be placed in a way that you will obtain close to a square block. You will be

penalized if floorplan width/height or height/width ratio exceeds 1.2.

The placement should also be legal, i.e. no overlapping cells are allowed in the final floorplan.

**Algorithm**

We are using simple algorithm to minimize the floorplan as follow:

1. Load bench mark circuit
2. Extract terminal nodes and scale down the node to draw on the GUI
3. Sort the nodes according to their height from tall to short
4. Estimate possible area by adding all the area of the node (by multiplying height and width) and multiply the possible area by 10 as the floorplan should have larger area then the total area of the nodes
5. Estimate the width by square rooting (assuming the floorplan is a square) the estimated possible area
6. Enumerate the X and Y coordinate and push into array, for the 1st iteration, X and Y coordinates set to 0.
7. Estimated width = Estimated width / 1.2
8. For the next i iteration, X coordinate = previous nodes X coordinate + previous nodes width, totalRowWidth = totalRowWidth + CurrentNode Width
9. If totalRowWidth+ CurrentNodeWidth > Estimated Width then go to Step 8

Else

Y Coordinate = Previous y coordinate + Previous node height,

totalheight = totalheight + Current height

1. If totalWidth <totalRowWidth then totalWidth = totalRowWidth
2. If Ratio of height and width > 1.2 and Posible width >10 then go to step 7
3. Draw floor plan, print out total width height ration and area.

Start

Load Bench mark circuit

Extract terminal nodes

Scale down the area nodes

Sort nodes according to height

Estimated Possible Area= all (nodes width \* nodes height)\*10

Estimated width =

Estimated width = Estimated width / 1.2

Xcoordinate = PrevXcoordinate + Prevnodes Width  
totalRowWidth = totalRowWidth + CurrentWidth  
Push to Array

Xcoordinate = 0  
Ycoordinate = 0  
Push to Array

Ycoordinate = PrevYcoordinate + Prevnodes Height  
totalheight = totalheight + CurrentHeight  
Push to Array

totalWidth = totalRowWidth

totalRowWidth + CurrentWidth > Estimated width

totalRowWidth>totalWidth

Ratio of totalHeight and total Width > 1.2   
Possible total Width > 10

Draw Floor plan   
Print totalwidth, total height, ratio

End

No

Yes

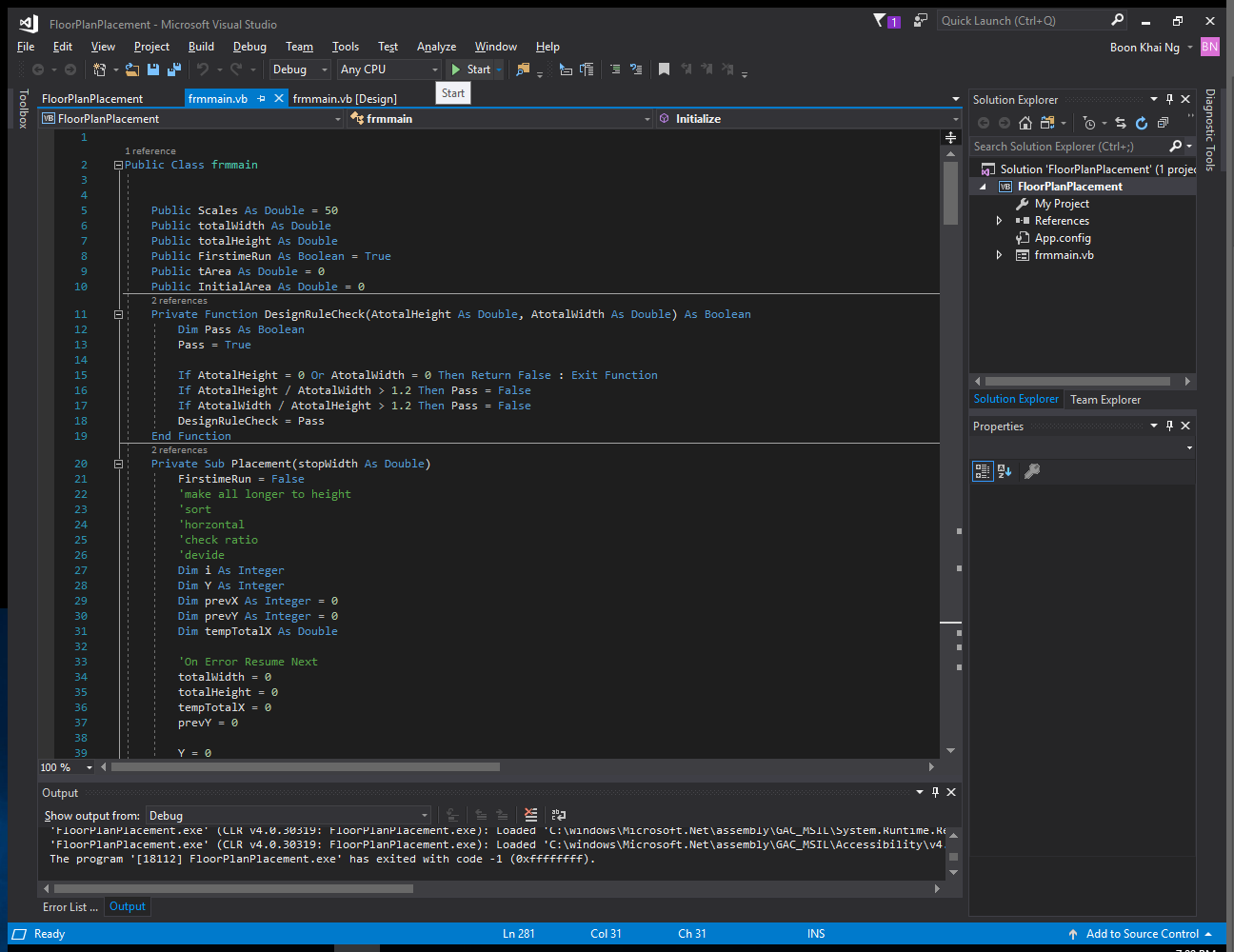
No

Yes

Yes

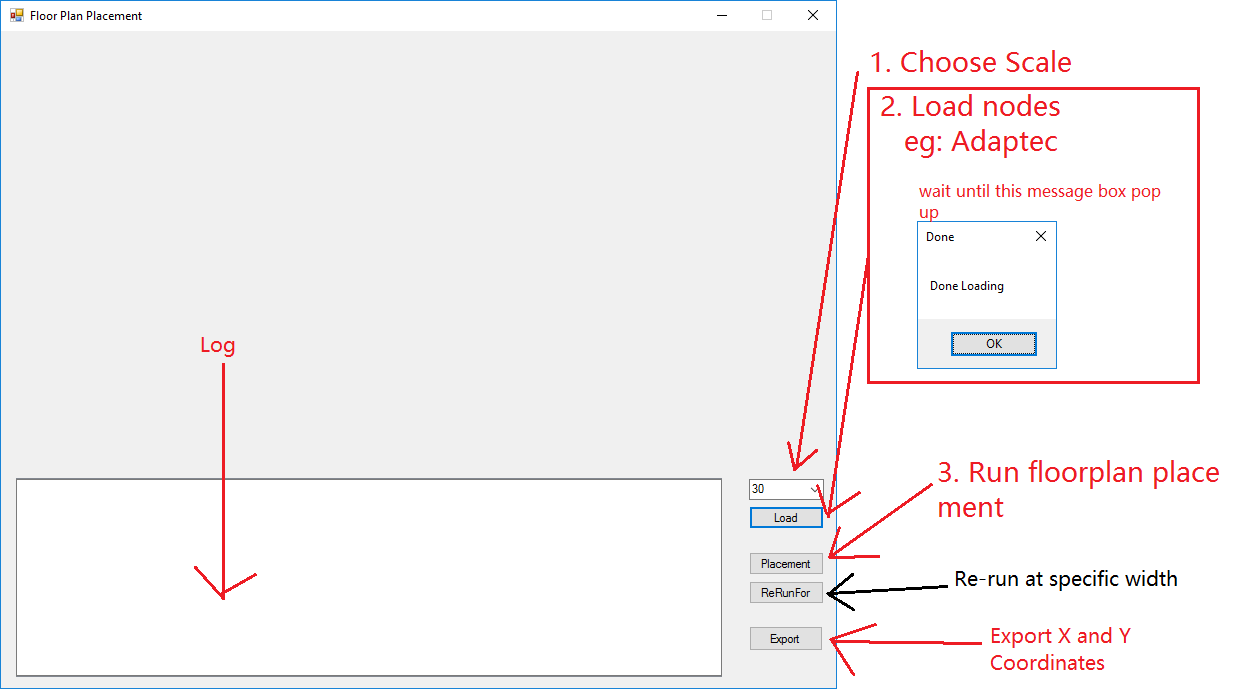
No

**Instruction to build the program**



Using Microsoft Visual studio 2017 Open the floorplanplacement.sln and press the start button above to run the program, or build the program under the build menu build > Build solution. The output file will located at your project path bin/debug/floorplanplacement.exe.

**Instruction to Use the Floor plan minimization program**



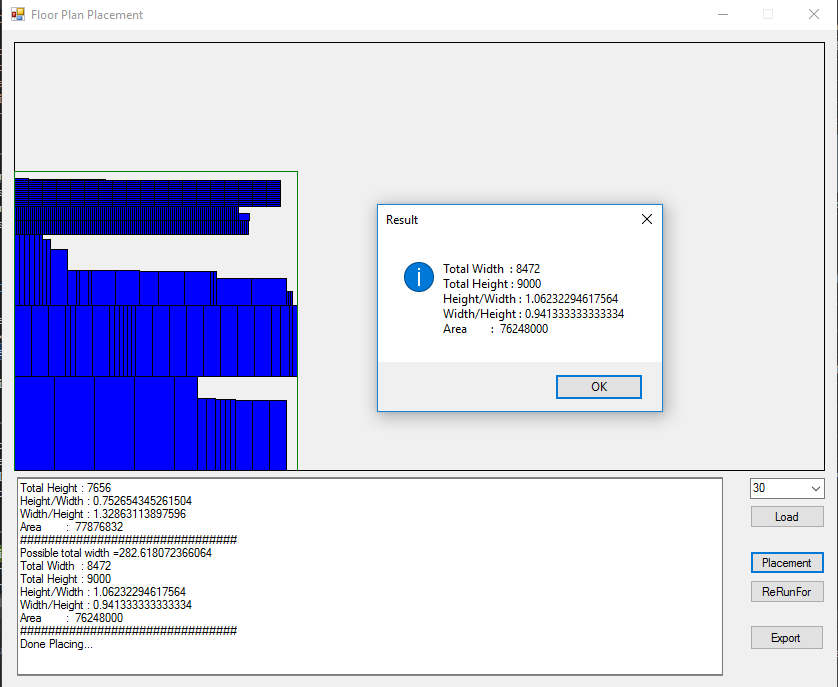
To use the program,

1. you need to select the scale, the reason for the scale is due to the size of the terminal nodes is way to big to fit inside the GUI, the optimal scale that can show perfectly on the GUI is 30.
2. Next you need to load the .nodes file and it will automatically grab the terminal nodes out from the file. Wait until the done loading message box before proceed to the next step
3. Next run the placement algorithm and the output is shown at the result
4. You can Re run the algorithm for specific width that you like to see the floor plan arrangement
5. You can export the X and Y coordinates by clicking the export button and specify the save file.

**Result**

Adaptec

It runs about six iterations to get the result



-Log-

Load file : C:\Users\boonkhai\Desktop\adaptec1\adaptec1.nodes

Estimated Initial Area: 64093992

Sorting the height

Sorted

Start Placing...

Possible total width =21097.3260548977

Total Width : 21076

Total Height : 4428

Height/Width : 0.210096792560258

Width/Height : 4.75971093044264

Area : 93324528

###############################

Possible total width =17581.1050457481

Total Width : 17520

Total Height : 5688

Height/Width : 0.324657534246575

Width/Height : 3.08016877637131

Area : 99653760

###############################

Possible total width =14650.9208714568

Total Width : 14629

Total Height : 6000

Height/Width : 0.410144234055643

Width/Height : 2.43816666666667

Area : 87774000

###############################

Possible total width =12209.100726214

Total Width : 12208

Total Height : 6888

Height/Width : 0.564220183486238

Width/Height : 1.77235772357724

Area : 84088704

###############################

Possible total width =10174.2506051783

Total Width : 10168

Total Height : 7644

Height/Width : 0.75177025963808

Width/Height : 1.3301936159079

Area : 77724192

###############################

Possible total width =8478.54217098192

Total Width : 8472

Total Height : 9000

Height/Width : 1.06232294617564

Width/Height : 0.941333333333333

Area : 76248000

###############################

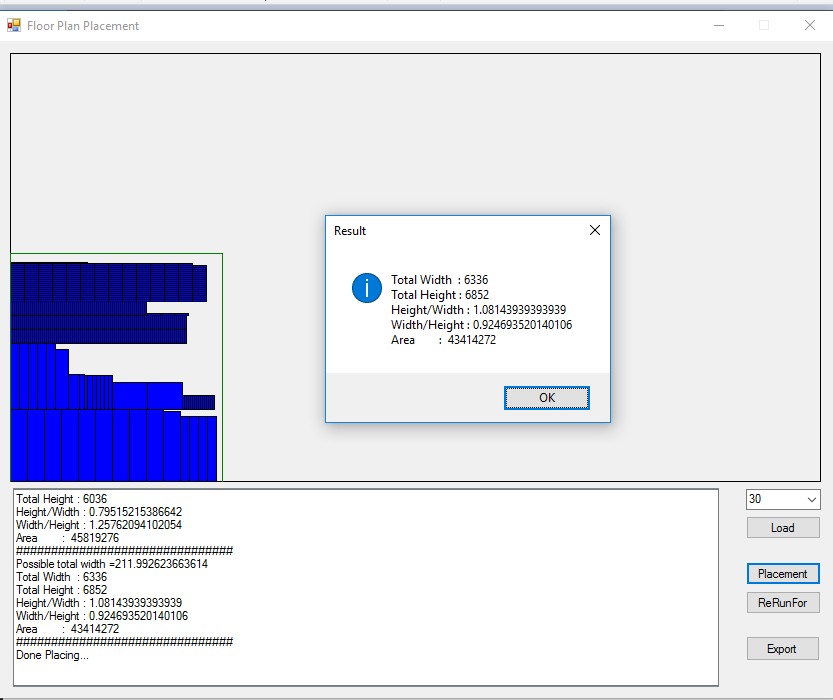
Done Placing...

-X and Y Coordinates-

**(Refer to attachment)**

Bigblue

It runs about six iterations to get the result



-Log-

Load file : C:\Users\boonkhai\Desktop\bigblue1\bigblue1.nodes

Estimated Initial Area: 36062760

Sorting the height

Sorted

Start Placing...

Possible total width =527.505485314643

Total Width : 15795

Total Height : 3204

Height/Width : 0.202849002849004

Width/Height : 4.92977528089886

Area : 50607180

###############################

Possible total width =439.587904428869

Total Width : 13176

Total Height : 3708

Height/Width : 0.281420765027323

Width/Height : 3.55339805825242

Area : 48856608

###############################

Possible total width =366.323253690724

Total Width : 10984

Total Height : 4236

Height/Width : 0.385651857246905

Width/Height : 2.59301227573182

Area : 46528224

###############################

Possible total width =305.269378075604

Total Width : 9144

Total Height : 5016

Height/Width : 0.548556430446194

Width/Height : 1.82296650717703

Area : 45866304

###############################

Possible total width =254.391148396336

Total Width : 7591

Total Height : 6036

Height/Width : 0.79515215386642

Width/Height : 1.25762094102054

Area : 45819276

###############################

Possible total width =211.992623663614

Total Width : 6336

Total Height : 6852

Height/Width : 1.08143939393939

Width/Height : 0.924693520140106

Area : 43414272

###############################

Done Placing...

-X and Y Coordinates-

**(Refer to attachment)**

**Attachment**

Source Code

Public Class frmmain

Public Scales As Double **=** **50**

Public totalWidth As Double

Public totalHeight As Double

Public FirstimeRun As Boolean **=** True

Public tArea As Double **=** **0**

Public InitialArea As Double **=** **0**

Private Function DesignRuleCheck**(**AtotalHeight As Double**,** AtotalWidth As Double**)** As Boolean

Dim Pass As Boolean

Pass **=** True

If AtotalHeight **=** **0** Or AtotalWidth **=** **0** Then Return False **:** Exit Function

If AtotalHeight **/** AtotalWidth **>** **1.2** Then Pass **=** False

If AtotalWidth **/** AtotalHeight **>** **1.2** Then Pass **=** False

DesignRuleCheck **=** Pass

End Function

Private Sub Placement**(**stopWidth As Double**)**

FirstimeRun **=** False

'make all longer to height

'sort

'horzontal

'check ratio

'devide

Dim i As Integer

Dim Y As Integer

Dim prevX As Integer **=** **0**

Dim prevY As Integer **=** **0**

Dim tempTotalX As Double

'On Error Resume Next

totalWidth **=** **0**

totalHeight **=** **0**

tempTotalX **=** **0**

prevY **=** **0**

Y **=** **0**

lstcordX.Items.Clear**()**

lstcordY.Items.Clear**()**

Logging**(**"Possible total width =" **+** CStr**(**stopWidth**))**

For i **=** **0** To lstNodeWidth.Items.Count **-** **1**

Application.DoEvents**()**

If **(**tempTotalX **+** CDbl**(**lstNodeWidth.Items**(**i**))** **<=** stopWidth Or tempTotalX **+** CDbl**(**lstNodeWidth.Items**(**i**))** **<=** totalWidth**)** Then

If i **=** **0** Then

prevY **=** i

'First Coordinate

lstcordX.Items.Add**(0)**

lstcordY.Items.Add**(**Y**)**

tempTotalX **=** tempTotalX **+** lstNodeWidth.Items**(**i**)** 'Use to calculate longest X

totalHeight **=** totalHeight **+** lstNodeHeight.Items**(**i**)**

Else

prevX **=** i **-** **1**

lstcordX.Items.Add**(**CStr**(**CInt**(**lstNodeWidth.Items**(**prevX**))** **+** CInt**(**lstcordX.Items**(**prevX**))))**

lstcordY.Items.Add**(**Y**)**

tempTotalX **=** tempTotalX **+** lstNodeWidth.Items**(**i**)** 'Use to calculate longest X

End If

Else

Y **=** Y **+** CInt**(**lstNodeHeight.Items**(**prevY**))**

prevY **=** i

totalHeight **=** totalHeight **+** lstNodeHeight.Items**(**prevY**)**

If tempTotalX **>** totalWidth Then totalWidth **=** tempTotalX

tempTotalX **=** **0**

lstcordX.Items.Add**(0)**

lstcordY.Items.Add**(**Y**)**

tempTotalX **=** tempTotalX **+** lstNodeWidth.Items**(**i**)** 'Use to calculate longest X

End If

Next

RefreshFloorPlan**()**

tArea **=** CDbl**(**totalHeight**)** **\*** CDbl**(**totalWidth**)**

tArea **=** tArea **\*** Scales **\*** Scales

Logging**(**"Total Width : " **&** CStr**(**CLng**(**totalWidth **\*** Scales**)))**

Logging**(**"Total Height : " **&** CStr**(**CLng**(**totalHeight **\*** Scales**)))**

Logging**(**"Height/Width : " **&** CStr**((**totalHeight **/** totalWidth**)))**

Logging**(**"Width/Height : " **&** CStr**((**totalWidth **/** totalHeight**)))**

Logging**(**"Area : " **&** CLng**(**tArea**))**

Logging**(**"###############################"**)**

End Sub

Public Sub RefreshFloorPlan**()**

picFloorPlan.Image **=** Nothing

picFloorPlan.Refresh**()**

For i **=** **0** To lstNodeWidth.Items.Count **-** **1**

DrawRectangle**(**CInt**(**lstcordX.Items**(**i**)),** CInt**(**lstcordY.Items**(**i**)),** CInt**(**lstNodeWidth.Items**(**i**)),** CInt**(**lstNodeHeight.Items**(**i**)))**

Next

End Sub

Private Sub SaveFile**()**

Dim FileName As String

Dim StrArray As New System.Text.StringBuilder**()**

Dim StrHeader As String **=** IIf**(**Scales **>** **1,** "Floorplan Scaled for " **+** CStr**(**Scales**)** **+** " smaller" **+** vbCr **+** vbLf**,** ""**)** **+** "Node name" **+** vbTab **+** "Width" **+** vbTab **+** "Height" **+** vbTab **+** "X" **+** vbTab **+** "Y"

Dim i As Integer

FileName **=** ""

cmOpendlg.FileName **=** ""

cmOpendlg.ShowDialog**()**

FileName **=** cmOpendlg.FileName

If FileName **=** "" Then Exit Sub

MsgBox**(**FileName**)**

StrArray.Append**(**StrHeader**)**

If lstcordX.Items.Count **=** **0** Then Exit Sub

For i **=** **0** To lstNodeName.Items.Count **-** **1**

StrArray.Append**(**vbCr **+** vbLf **+** CStr**(**lstNodeName.Items**(**i**))** **+** vbTab **+** CStr**(**CInt**(**lstNodeWidth.Items**(**i**)))** **+** vbTab **+** CStr**(**CInt**(**lstNodeHeight.Items**(**i**)))** **+** vbTab **+** CStr**(**lstcordX.Items**(**i**))** **+** vbTab **+** CStr**(**lstcordY.Items**(**i**)))**

Next

System.IO.File.WriteAllText**(**FileName**,** StrArray.ToString**())**

End Sub

Private Sub Loadfile**()**

Dim ReadSplit**()** As String

Dim FileName As String

Dim i As Integer

FileName **=** ""

InitialArea **=** **0**

cmdlg.FileName **=** ""

cmdlg.ShowDialog**()**

FileName **=** cmdlg.FileName

If **(**FileName **=** ""**)** Then Exit Sub

'FileName = "C:\Users\boonkhai\Desktop\adaptec1\adaptec.txt"

Logging**(**"Load file : " **&** FileName**)**

Dim lines**()** As String **=** IO.File.ReadAllLines**(**FileName**)**

'On Error GoTo Err

lstLoad.Items.AddRange**(**lines**)**

lstLoad.Items.Remove**(**""**)**

For i **=** **0** To lstLoad.Items.Count **-** **1**

If **(**CStr**(**lstLoad.Items**(**i**))).**Substring**(0,** **1)** **=** vbTab Then

If CStr**(**lstLoad.Items**(**i**)).**Length **>** **20** Then

If CStr**(**lstLoad.Items**(**i**)).**Substring**(**CStr**(**lstLoad.Items**(**i**)).**Length **-** **8,** **8)** **=** "terminal" Then

ReadSplit **=** Split**((**CStr**(**lstLoad.Items**(**i**))),** vbTab**)**

lstNodeName.Items.Add**(**ReadSplit**(1))**

lstUnscaledNodeWidth.Items.Add**(**CInt**(**ReadSplit**(2)))**

lstUnscaledNodeHeight.Items.Add**(**CInt**(**ReadSplit**(3)))**

lstNodeWidth.Items.Add**(**CInt**(**ReadSplit**(2))** **/** Scales**)**

lstNodeHeight.Items.Add**(**CInt**(**ReadSplit**(3))** **/** Scales**)**

InitialArea **=** InitialArea **+** **(**CDbl**(**ReadSplit**(2))** **\*** CDbl**(**ReadSplit**(3)))**

End If

End If

End If

Next

Logging**(**"Estimated Initial Area: " **+** CStr**(**InitialArea**))**

Sort**()**

MsgBox**(**"Done Loading"**,** vbYes **+** vbInformation**,** "Done"**)**

Exit Sub

Err**:**

MsgBox**(**"Error Readig file"**,** vbExclamation**,** "Error"**)**

End Sub

Public Function RoundUp**(**input As Double**)** As Integer

RoundUp **=** IIf**(**input **>** CInt**(**input**),** CInt**(**input**)** **+** **1,** CInt**(**input**))**

End Function

Private Sub Sort**()**

'Sort Height

Logging**(**"Sorting the height"**)**

Dim i As Integer

Dim j As Integer

Dim MaxLoc As Integer

Dim maxCount As Integer

Dim Max As Integer **=** **0**

maxCount **=** lstNodeHeight.Items.Count **-** **1**

For j **=** **0** To maxCount

For i **=** **0** To lstNodeHeight.Items.Count **-** **1**

If Max **<** CInt**(**lstNodeHeight.Items**(**i**))** Then Max **=** CInt**(**lstNodeHeight.Items**(**i**))** **:** MaxLoc **=** i

Next i

lstNodeNameSort.Items.Add**(**lstNodeName.Items**(**MaxLoc**))**

lstNodeWidthSort.Items.Add**(**lstNodeWidth.Items**(**MaxLoc**))**

lstNodeHeightSort.Items.Add**(**lstNodeHeight.Items**(**MaxLoc**))**

lstNodeHeight.Items.RemoveAt**(**MaxLoc**)**

lstNodeWidth.Items.RemoveAt**(**MaxLoc**)**

lstNodeName.Items.RemoveAt**(**MaxLoc**)**

Max **=** **0**

MaxLoc **=** **0**

Next j

For i **=** **0** To lstNodeNameSort.Items.Count **-** **1**

lstNodeName.Items.Add**(**lstNodeNameSort.Items**(**i**))**

lstNodeWidth.Items.Add**(**lstNodeWidthSort.Items**(**i**))**

lstNodeHeight.Items.Add**(**lstNodeHeightSort.Items**(**i**))**

Next

lstNodeHeightSort.Items.Clear**()**

lstNodeWidthSort.Items.Clear**()**

lstNodeNameSort.Items.Clear**()**

Logging**(**"Sorted"**)**

End Sub

Private Sub DrawRectangle**(**posX As Integer**,** posY As Integer**,** tWidth As Integer**,** tHeight As Integer**)**

Dim myGraphic As Graphics

Dim myRectangle As Rectangle

Dim myFrame As Rectangle

Dim myBorder As Rectangle

Dim myFloorPlan As Rectangle

Dim myPen As New Pen**(**Color.Black**)**

Dim myBrush As New SolidBrush**(**Color.Blue**)**

Dim myFloorPlanColor As New Pen**(**Color.Green**)**

posY **=** picFloorPlan.Height **-** posY **-** tHeight 'Calibrate left bottom as origin

myGraphic **=** Graphics.FromHwnd**(**picFloorPlan.Handle**)**

myFrame **=** New Rectangle**(**x**:=0,** y**:=0,** width**:=**picFloorPlan.Width **-** **1,** height**:=**picFloorPlan.Height **-** **1)**

myRectangle **=** New Rectangle**(**x**:=**posX**,** y**:=**posY**,** width**:=**tWidth**,** height**:=**tHeight**)**

myBorder **=** New Rectangle**(**x**:=**posX**,** y**:=**posY**,** width**:=**tWidth**,** height**:=**tHeight**)**

myFloorPlan **=** New Rectangle**(**x**:=0,** y**:=**picFloorPlan.Height **-** RoundUp**(**totalHeight**),** width**:=**RoundUp**(**totalWidth**),** height**:=**RoundUp**(**totalHeight**))**

myGraphic.FillRectangle**(**myBrush**,** myRectangle**)**

myGraphic.DrawRectangle**(**pen**:=**myPen**,** rect**:=**myBorder**)**

myGraphic.DrawRectangle**(**pen**:=**myPen**,** rect**:=**myFrame**)**

myGraphic.DrawRectangle**(**pen**:=**myFloorPlanColor**,** rect**:=**myFloorPlan**)**

End Sub

Private Sub cmdPlacement\_Click**(**sender As Object**,** e As EventArgs**)** Handles cmdPlacement.Click

Logging**(**"Start Placing..."**)**

Dim PossibleArea As Double

Dim PossibletotalWidth As Double

'Get estimated Posible Area'

PossibleArea **=** InitialArea **\*** **10** **/** **(**Scales **\*** Scales**)**

PossibletotalWidth **=** PossibleArea **^** **(1** **/** **2)**

While **(**DesignRuleCheck**(**totalHeight**,** totalWidth**)** **=** False And PossibletotalWidth **>** **10)**

PossibletotalWidth **=** PossibletotalWidth **/** **1.2**

Placement**(**PossibletotalWidth**)**

End While

Logging**(**"Done Placing..."**)**

MsgBox**(**"Total Width : " **&** CStr**(**CLng**(**totalWidth **\*** Scales**))** **&** vbCr **+** vbLf **&**

"Total Height : " **&** CStr**(**CLng**(**totalHeight **\*** Scales**))** **&** vbCr **+** vbLf **&**

"Height/Width : " **&** CStr**((**totalHeight **/** totalWidth**))** **&** vbCr **+** vbLf **&**

"Width/Height : " **&** CStr**((**totalWidth **/** totalHeight**))** **&** vbCr **+** vbLf **&**

"Area : " **&** CStr**(**CLng**(**tArea**)),** vbInformation**,** "Result"**)**

End Sub

Private Sub cmdLoad\_Click**(**sender As Object**,** e As EventArgs**)** Handles cmdLoad.Click

Dim msgAns As MessageBoxOptions

If FirstimeRun **=** False Then

msgAns **=** MsgBox**(**"Are you sure? All result will be cleared"**,** vbYesNo **+** vbInformation**,** "Load File?"**)**

End If

If msgAns **=** vbNo Then Exit Sub

Scales **=** CInt**(**cboScale.Text**)**

If Scales **<=** **0** Then MsgBox**(**"Scales must be positive integer"**)** **:** Exit Sub

lstlog.Items.Clear**()**

txtLog.Text **=** ""

Initialize**()**

Loadfile**()**

End Sub

Private Sub Logging**(**tdata As String**)**

lstlog.Items.Add**(**tdata**)**

lstlog.SelectedIndex **=** lstlog.Items.Count **-** **1**

txtLog.AppendText**(**tdata **+** vbCr **+** vbLf**)**

End Sub

Public Sub Initialize**()**

totalWidth **=** **0**

totalHeight **=** **0**

lstNodeHeight.Items.Clear**()**

lstNodeHeightSort.Items.Clear**()**

lstNodeWidth.Items.Clear**()**

lstNodeWidthSort.Items.Clear**()**

lstNodeName.Items.Clear**()**

lstNodeName.Items.Clear**()**

lstcordX.Items.Clear**()**

lstcordY.Items.Clear**()**

lstLoad.Items.Clear**()**

picFloorPlan.Image **=** Nothing

End Sub

Private Sub frmmain\_Load**(**sender As Object**,** e As EventArgs**)** Handles MyBase.Load

Initialize**()**

cboScale.Text **=** "30"

For i **=** **1** To **10**

cboScale.Items.Add**(**i **\*** **10)**

Next

End Sub

Private Sub cmdRerun\_Click**(**sender As Object**,** e As EventArgs**)** Handles cmdRerun.Click

Dim stopWidth As Double

stopWidth **=** CDbl**(**InputBox**(**"Please insert width"**))**

Placement**(**stopWidth**)**

MsgBox**(**"Total Width : " **&** CStr**(**CLng**(**totalWidth **\*** Scales**))** **&** vbCr **+** vbLf **&**

"Total Height : " **&** CStr**(**CLng**(**totalHeight **\*** Scales**))** **&** vbCr **+** vbLf **&**

"Height/Width : " **&** CStr**((**totalHeight **/** totalWidth**))** **&** vbCr **+** vbLf **&**

"Width/Height : " **&** CStr**((**totalWidth **/** totalHeight**))** **&** vbCr **+** vbLf **&**

"Area : " **&** CStr**(**CLng**(**tArea**)),** vbInformation**,** "Result"**)**

End Sub

Private Sub cmdExport\_Click**(**sender As Object**,** e As EventArgs**)** Handles cmdExport.Click

SaveFile**()**

End Sub

End Class

X and Y Coordinates For Adaptec

Node name Width Height X Y

o210915 1206 2856 0 0

o210916 1206 2856 1206 0

o210917 1206 2856 2412 0

o210918 1206 2856 3618 0

o210927 701 2856 4824 0

o210920 276 2196 5525 0

o210922 276 2196 5801 0

o211414 140 2172 6077 0

o211416 140 2172 6217 0

o211418 140 2172 6357 0

o211420 140 2172 6497 0

o210904 500 2136 6637 0

o210905 500 2136 7137 0

o210906 500 2136 7637 0

o210907 500 2136 0 2856

o210908 500 2136 500 2856

o210909 500 2136 1000 2856

o210911 164 2136 1500 2856

o210912 164 2136 1664 2856

o210913 500 2136 1828 2856

o210914 500 2136 2328 2856

o210924 164 2136 2828 2856

o210925 164 2136 2992 2856

o211415 108 2136 3156 2856

o211417 108 2136 3264 2856

o211419 108 2136 3372 2856

o211421 108 2136 3480 2856

o211423 511 2136 3588 2856

o211424 511 2136 4099 2856

o211425 511 2136 4610 2856

o211426 511 2136 5121 2856

o211427 511 2136 5632 2856

o211428 511 2136 6143 2856

o211429 511 2136 6654 2856

o211430 511 2136 7165 2856

o211431 276 2136 7676 2856

o211432 276 2136 7952 2856

o211433 80 2136 8228 2856

o211435 164 2136 8308 2856

o211436 164 2136 0 4992

o211437 164 2136 164 4992

o211438 164 2136 328 4992

o211439 164 2136 492 4992

o211440 164 2136 656 4992

o211441 80 2136 820 4992

o210921 108 1968 900 4992

o210923 108 1968 1008 4992

o210930 516 1692 1116 4992

o211442 720 1056 1632 4992

o211443 720 1056 2352 4992

o210910 276 1044 3072 4992

o210919 80 1044 3348 4992

o210926 276 1044 3428 4992

o210931 80 1044 3704 4992

o211422 80 1020 3784 4992

o211434 80 1020 3864 4992

o210928 572 1008 3944 4992

o211412 792 1008 4516 4992

o211413 792 1008 5308 4992

o211444 1048 816 6100 4992

o211445 1048 816 7148 4992

o210932 72 432 8196 4992

o210933 72 432 8268 4992

o210934 72 432 8340 4992

o210935 72 432 0 7128

o210936 72 432 72 7128

o210937 72 432 144 7128

o210943 72 432 216 7128

o210955 72 432 288 7128

o210956 72 432 360 7128

o210957 72 432 432 7128

o210958 72 432 504 7128

o210960 72 432 576 7128

o211025 72 432 648 7128

o211026 72 432 720 7128

o211027 72 432 792 7128

o211028 72 432 864 7128

o211029 72 432 936 7128

o211030 72 432 1008 7128

o211031 72 432 1080 7128

o211032 72 432 1152 7128

o211033 72 432 1224 7128

o211034 72 432 1296 7128

o211035 72 432 1368 7128

o211036 72 432 1440 7128

o211037 72 432 1512 7128

o211038 72 432 1584 7128

o211039 72 432 1656 7128

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