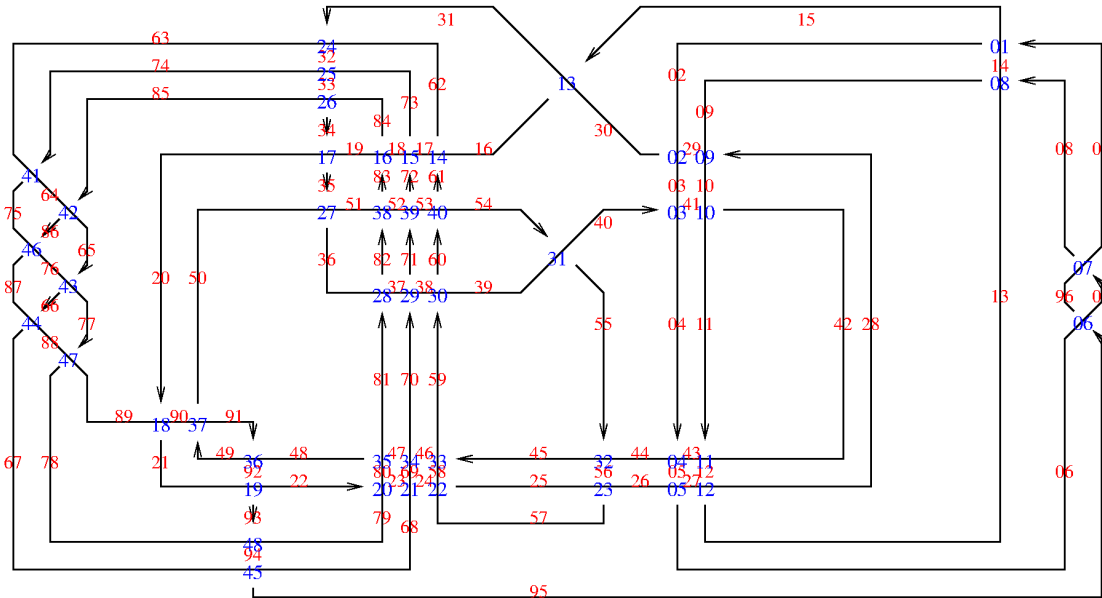


Pensieve header: Seam carving for the GST-48 knot, following <http://community.wolfram.com/groups/-/m/t/960843>.

```
SetDirectory["C:\\drorbn\\AcademicPensieve\\2016-09"]
```

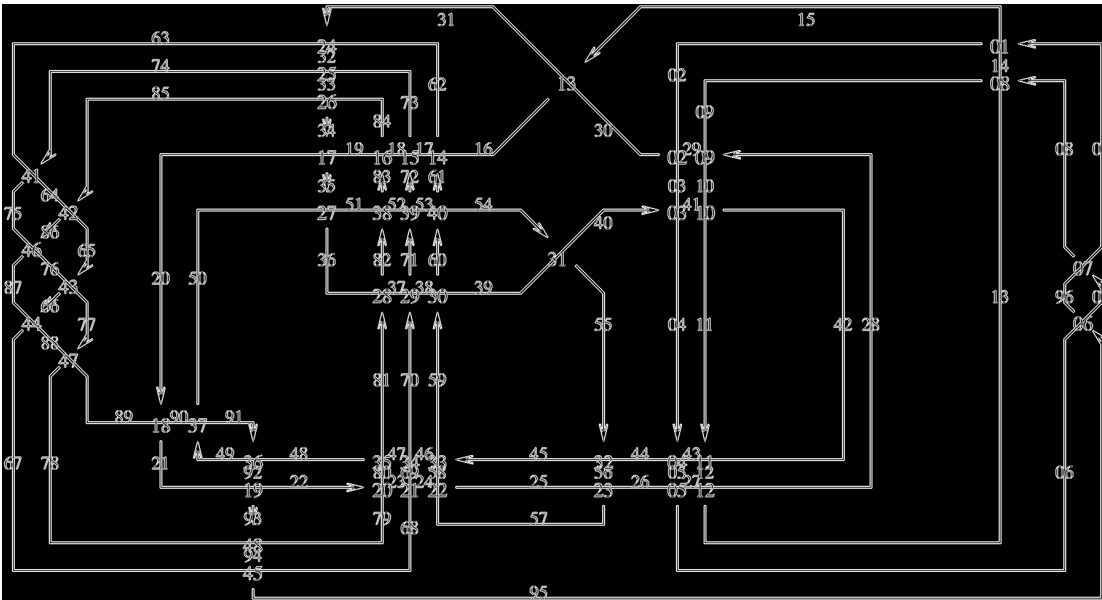
```
C:\\drorbn\\AcademicPensieve\\2016-09
```

```
img = Import["../2016-09/GST48-Marked.png"]
```



```
EnergyFunction[img_Image] := GradientFilter[img, 1, Method -> "ShenCastan"]
```

```
EnergyFunction[img]
```

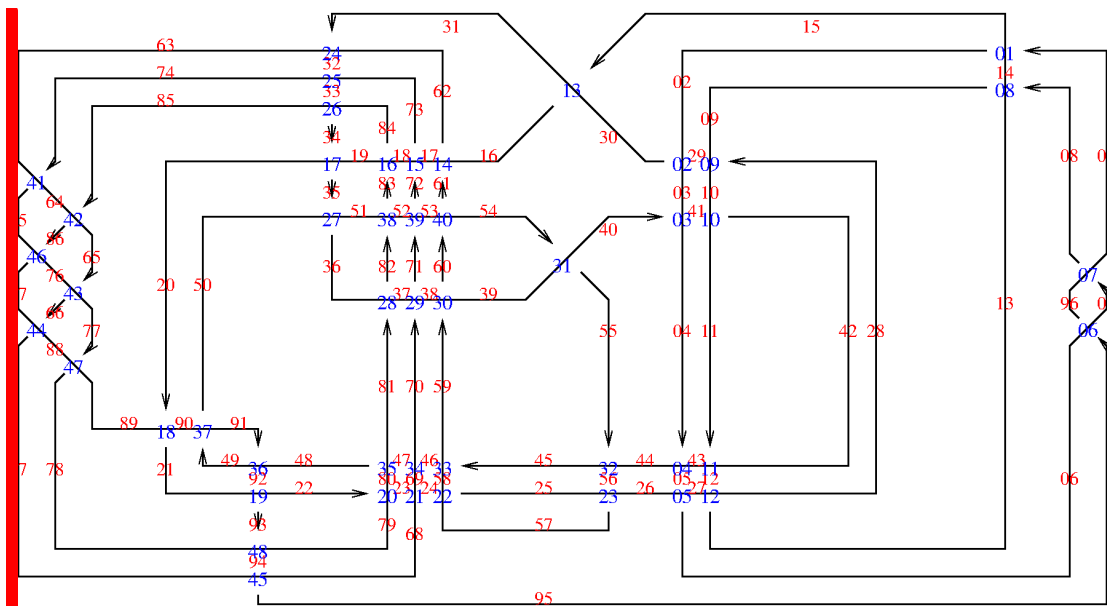


```

MinFilter1[x_List] := Min /@ Partition[x, 3, 1, {2, 2}, 1.0 × 10^6]
(*same as MinFilter[x,1] but 10x faster*)
MinPosition[x_List] := First[Ordering[x, 1]] (*position of min element*)
Neighbours[n_Integer?Positive, Len_Integer?Positive] := Which[n == 1,
  If[Len > 1, {1, 2}, {1}], n == Len, If[Len > 1, {Len, Len - 1}, {1}], True, {n - 1, n, n + 1}]
FindSeam[mat_List?MatrixQ] := Module[{dimx, dimy, seam, neighbours, values, newpos, ii},
  {dimy, dimx} = Dimensions[mat];
  seam = ConstantArray[-1, dimy];
  seam[[-1]] = MinPosition[mat[[-1]]];
  Do[neighbours = Neighbours[seam[[ii + 1]], dimx];
    values = mat[[ii, neighbours]];
    newpos = neighbours[[MinPosition[values]]];
    seam[[ii]] = newpos, {ii, dimy - 1, 1, -1}];
  seam]
ComputeEnergyField[img_Image] :=
  FoldList[#2 + MinFilter1[#1] &, ImageData[EnergyFunction[img]]]
ComputeEnergyField[mat_List] := ComputeEnergyField[Image[mat]]

seam = FindSeam[ComputeEnergyField[img]];
HighlightImage[img, Transpose[{seam, Range[Length[seam]}]]]

```



```

ClearAll[MinFilter1, MinPosition, Neighbours, FindSeam, EnergyFunction,
ComputeEnergyField, Carve, FillNthPosition, CreateSeamcarveImageData, SeamCarve]
MinFilter1[x_List] := Min /@ Partition[x, 3, 1, {2, 2}, 1.0 × 10^6]
(*same as MinFilter[x,1] but 10x faster*)
MinPosition[x_List] := First[Ordering[x, 1]] (*position of min element*)
Neighbours[n_Integer?Positive, Len_Integer?Positive] := Which[n == 1,
If[Len > 1, {1, 2}, {1}], n == Len, If[Len > 1, {Len, Len - 1}, {1}], True, {n - 1, n, n + 1}]
FindSeam[mat_List?MatrixQ] := Module[{dimx, dimy, seam, neighbours, values, newpos, ii},
{dimy, dimx} = Dimensions[mat];
seam = ConstantArray[-1, dimy];
seam[[-1]] = MinPosition[mat[[-1]]];
Do[neighbours = Neighbours[seam[[ii + 1]], dimx];
values = mat[[ii, neighbours]];
newpos = neighbours[[MinPosition[values]]];
seam[[ii]] = newpos, {ii, dimy - 1, 1, -1}];
seam]
EnergyFunction[img_Image] := GradientFilter[img, 1, Method → "ShenCastan"]
ComputeEnergyField[img_Image] :=
FoldList[#2 + MinFilter1[#1] &, ImageData[EnergyFunction[img]]]
ComputeEnergyField[mat_List] := ComputeEnergyField[Image[mat]]
Carve[mat_List?ArrayQ, seam_List] := MapThread[Delete, {mat, seam}, 1]
FillNthPosition[x_List, n_Integer?Positive, fill_, empty_ : 0] :=
Block[{pos, out}, out = x;
pos = Position[out, empty, {1}, n, Heads → False];
out[[pos[[n]]]] = fill;
out]
CreateSeamcarveImageData[img_Image] := Block[
{imagedata, dims, dimx, dimy, carveinfo, seam, energyinfo}, imagedata = ImageData[img];
dims = {dimy, dimx} = Dimensions[imagedata, 2];
carveinfo = ConstantArray[0, dims];
PrintTemporary[Dynamic[Row[{"Calculating: ", i, "/", dimx}]]];
Do[energyinfo = ComputeEnergyField[imagedata];
seam = FindSeam[energyinfo];
carveinfo = MapThread[FillNthPosition[#1, #2, i, 0] &, {carveinfo, seam}];
imagedata = Carve[imagedata, seam];, {i, dimx}];
{img, carveinfo}]
SeamCarve[{img_Image, carveinfo_List}, n_Integer?NonNegative] :=
Block[{imgdata, pick, sel, m}, imgdata = ImageData[img];
If[Dimensions[imgdata, 2] == Dimensions[carveinfo],
m = Clip[n, {0, Length[carveinfo[[1]]] - 1}];
sel = UnitStep[m - carveinfo];
Image[Pick[ImageData[img], sel, 0], Abort[]];]
out = CreateSeamcarveImageData[img];

```

