



Seam Carving

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Before start...



(3745X600)



(3390X893)



(2000x1078)



Any solution to adjust
size but no distortion?

*Seam Carving!

Seam Carving?

- * Algorithm of image resizing
- * known as content-aware image resizing, content-aware scaling, liquid resizing, or liquid rescaling...
- * Shai Avidan and Ariel Shamir from MERL
(Mitsubishi Electric Research Laboratories)

What is Seam Carving?

- * Resize image without losing important part
- * Display images without distortion on various media



How to do it?

- * Establish seams (path of energy)
- * Removes seams to reduce image size
- * My Project:
 - * --Use GPU and OpenCL to do Horizontal Seam Carving
 - * --Based on the dependency, use different work group-size to do parallel computing

Project:Seam Carving

- * In CPU
- * --Import image and new size
- * --Calculate "Grayscale Image"
 $(gray = 0.299r + 0.587g + 0.114b)$
- * --Preparation for kernels

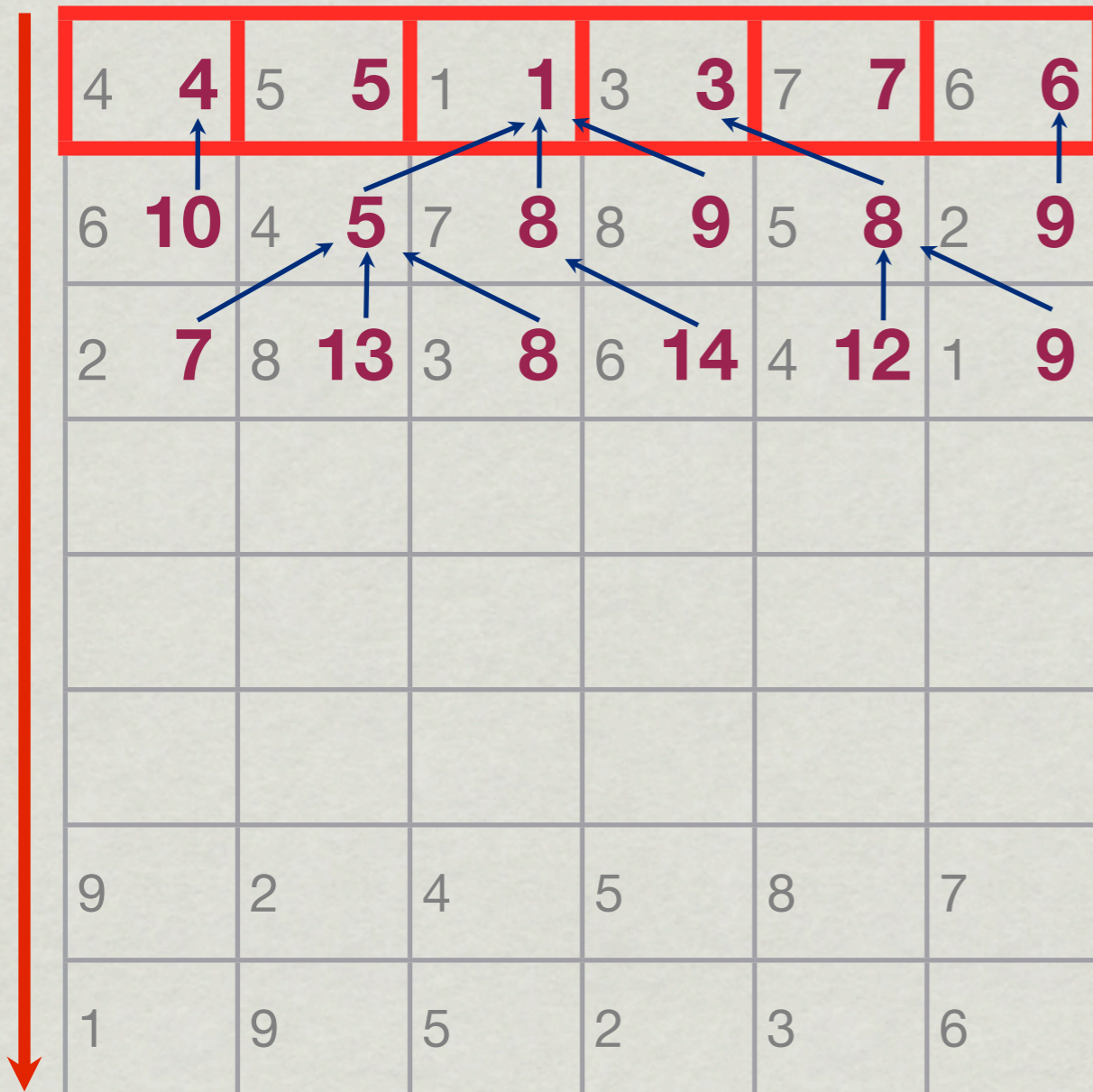


- * Kernels
- * --Calculate gradient of each pixel (HPC on whole matrix)
- * --**Calculate Seam(Dynamic Programming)**
- * --Find Seam with lowest Energy
- * --Delete it!

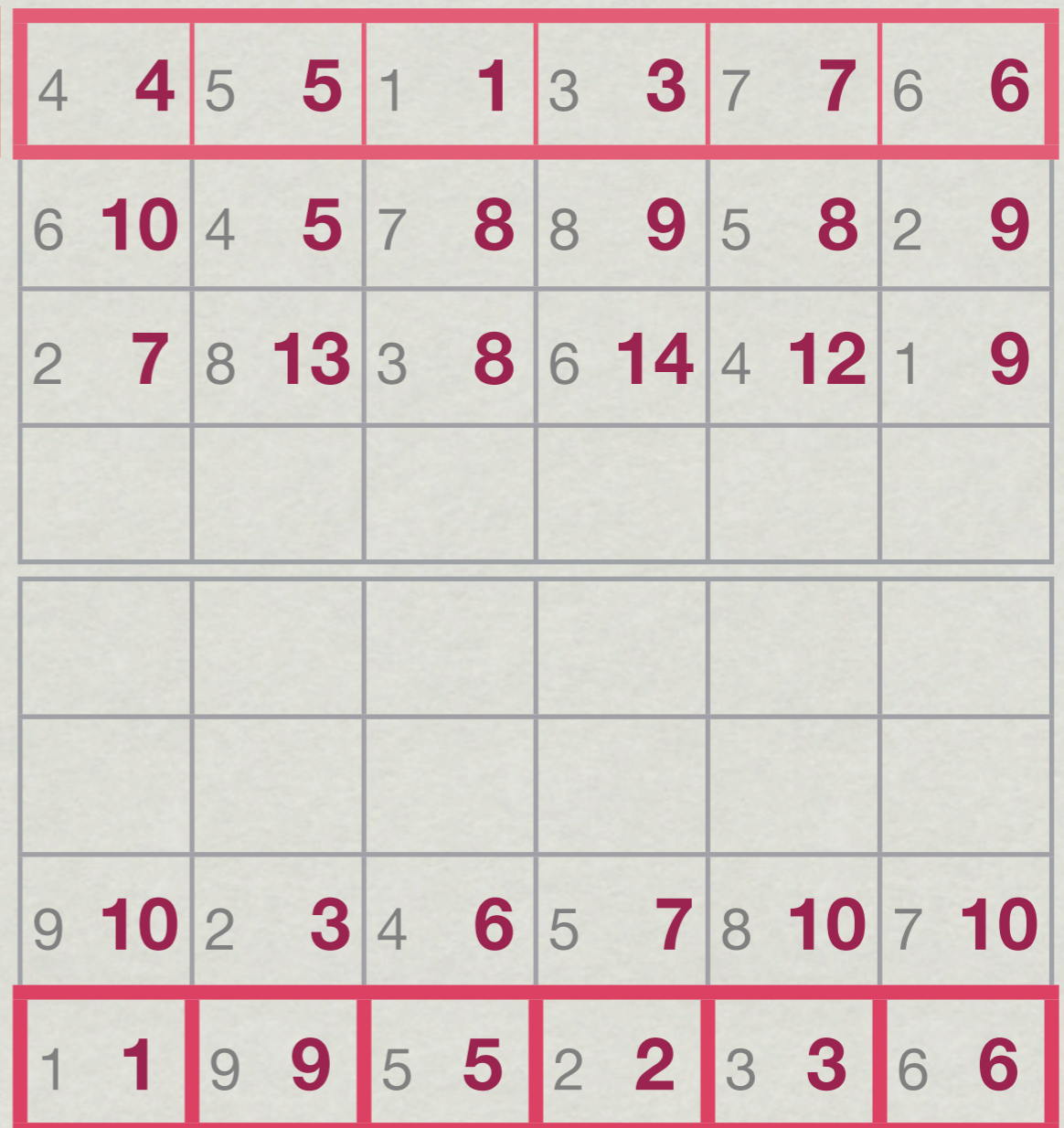


Kernel to calculate Seam

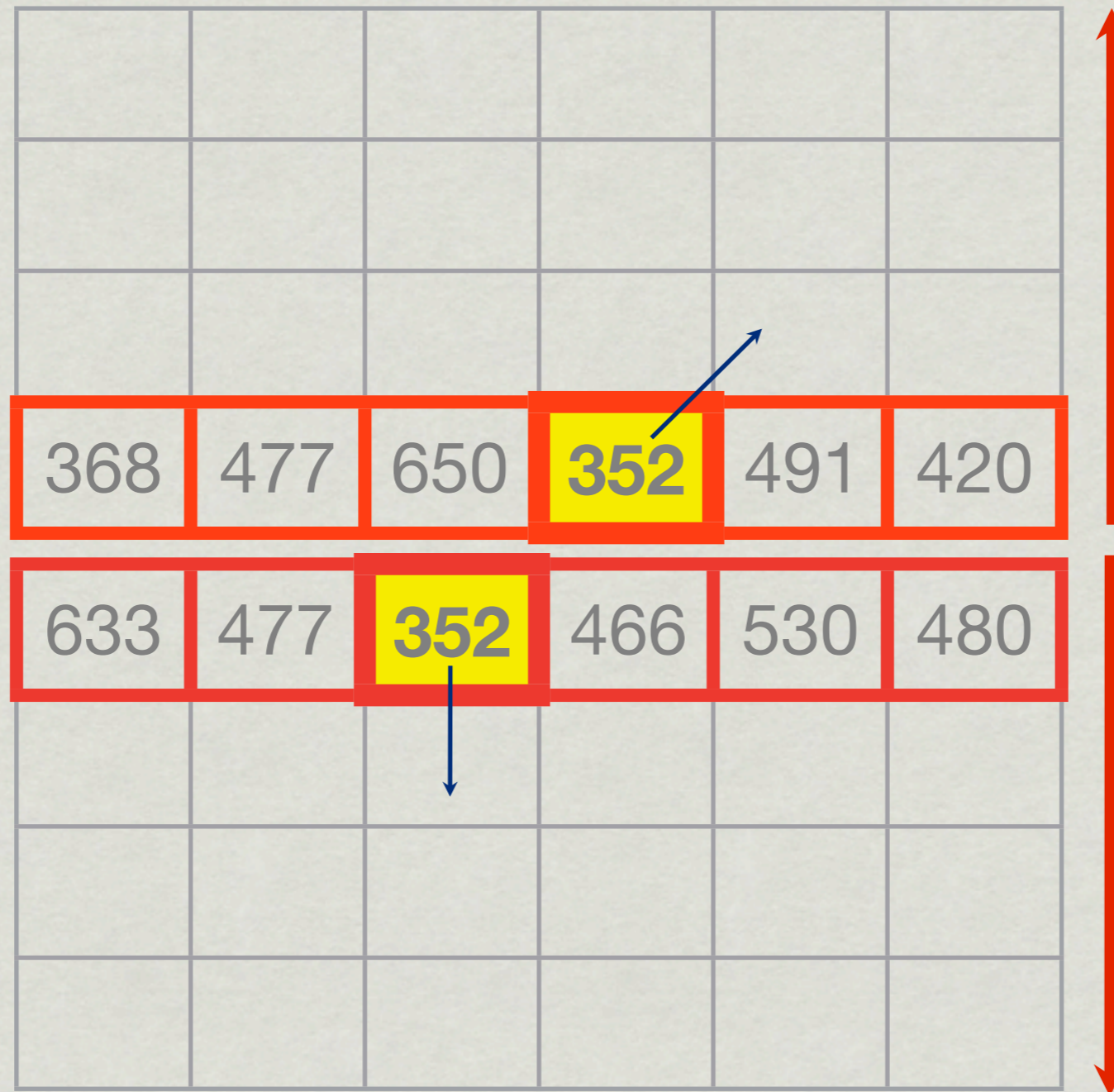
* CPU



* GPU



Find Seam and Delete



Result

- * Speed: Depend on the width and height, also the new width of the graph
- * ex.12 seconds to shrink 2000X1078 image to 1000x1078 (on Bowery)
- * Seam Calculation cost most time, then the gradient(energy) calculation part



Application!













BEFORE



BEFORE



ORIGINAL



AFTER

Further Study

- * Weakness of Seam Carving
- * Possible Improvements





IF YOU SHRIKN **TOO MUCH...**





**KEEP IMPORTANT DATA
NOT EQUAL TO
KEEP IMPORTANT DATA UNCHANGE**

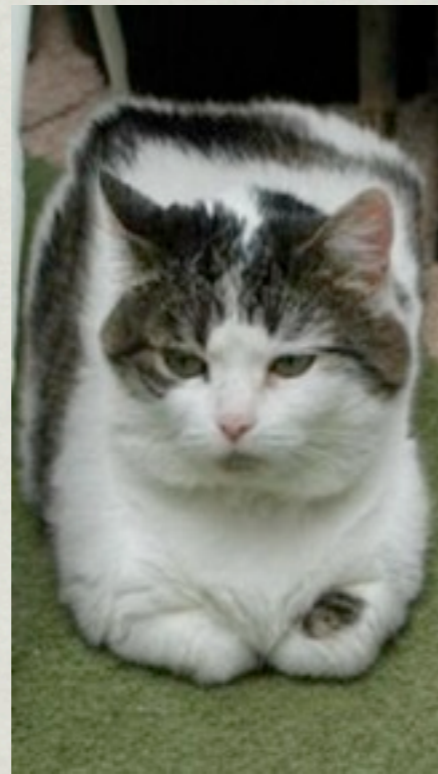
Weaknesses

- * --What's the "best shrink size"?
- * --Energy Function(Calculate Gradient)
- * --Boundary Problem
- * --Only depend on seam value
- * --Speed limitation

Possible Improvements

- * --Better energy function
- * --Deal with boundary more accurately
- * --Find other variable to adjust size
- * --Use other HPC tools to construct the program

Any Questions?



**“WHO IS THE
REAL ME?”**



Thank you!