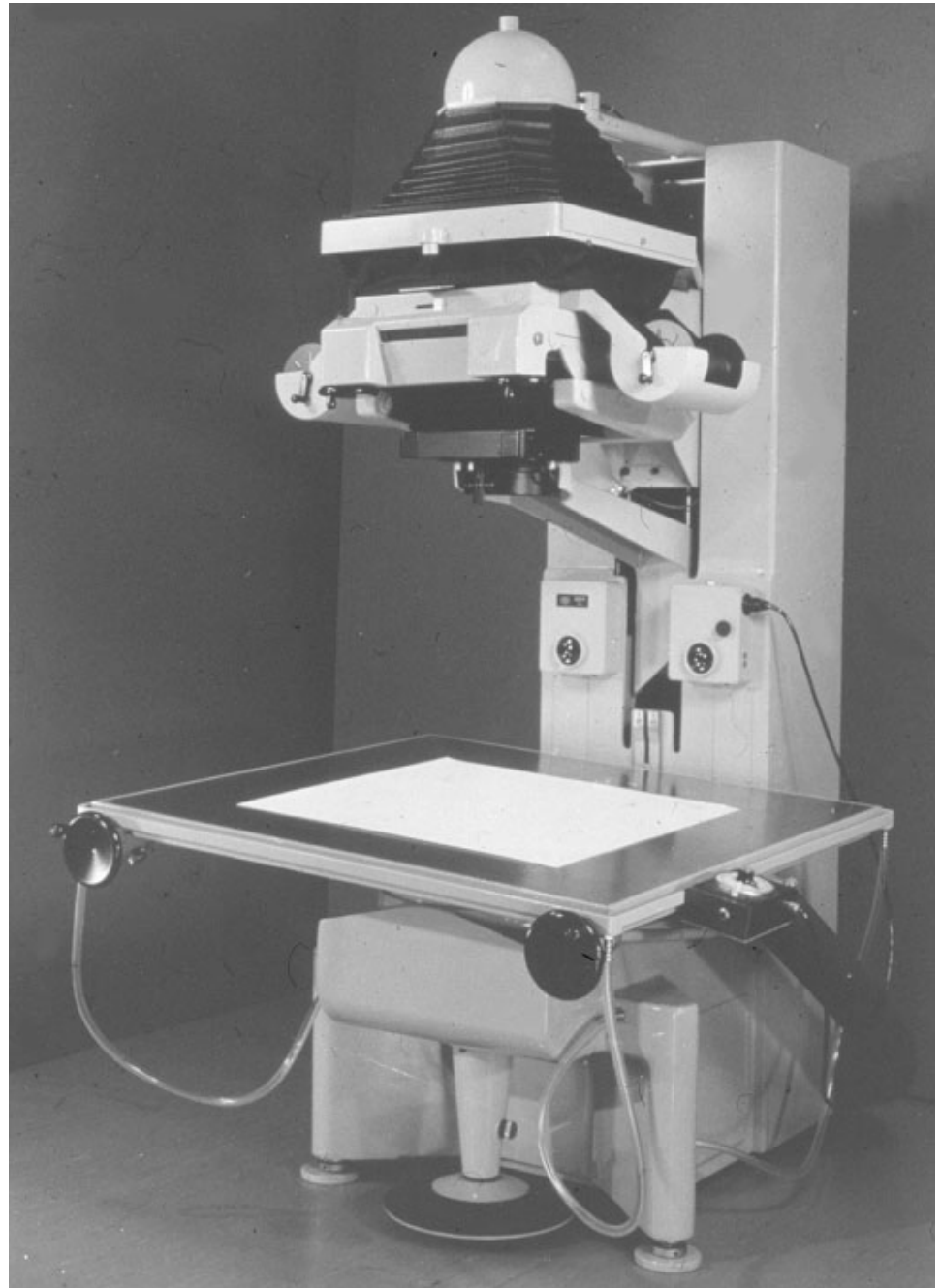


Motivation for Rectification, Interpolation & Resampling: We would like to present the building face in a view *as if* we were looking at it from in front. We want constant scale and angles represented correctly, so we can do simple measurement, design, etc.

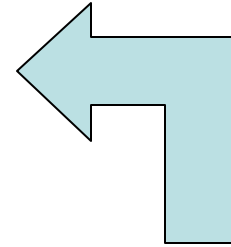


In the “old days” we would have done this job with a special instrument called a *rectifier*. It was basically a projector with a tilting easel which allowed us to rectify or take out distortions of the type we are looking at here. You would compose the view on the easel, then when ready you print it onto photographic paper or film for a permanent record. Today we do the same thing digitally which means a projective, 8-parameter transformation and *resampling or interpolation*.

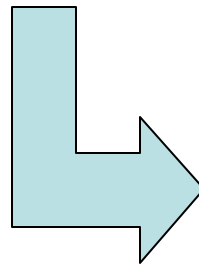




To accomplish this we define a grid in the target shape, transform back to the image, and resample at the transformed location.



We want to transform the keystone or trapezoid shape into the rectangular shape



We take a “square” grid of desired pixel locations (say every 1 meter) and transform that grid into the image. But, we get pixel values that have fractions! Then at every fractional transformed grid location we interpolate or resample a gray value or color. Placing this interpolated value in the original square grid yields the rectified image. Question: how to interpolate? Usual choices: nearest neighbor, bilinear, bicubic.

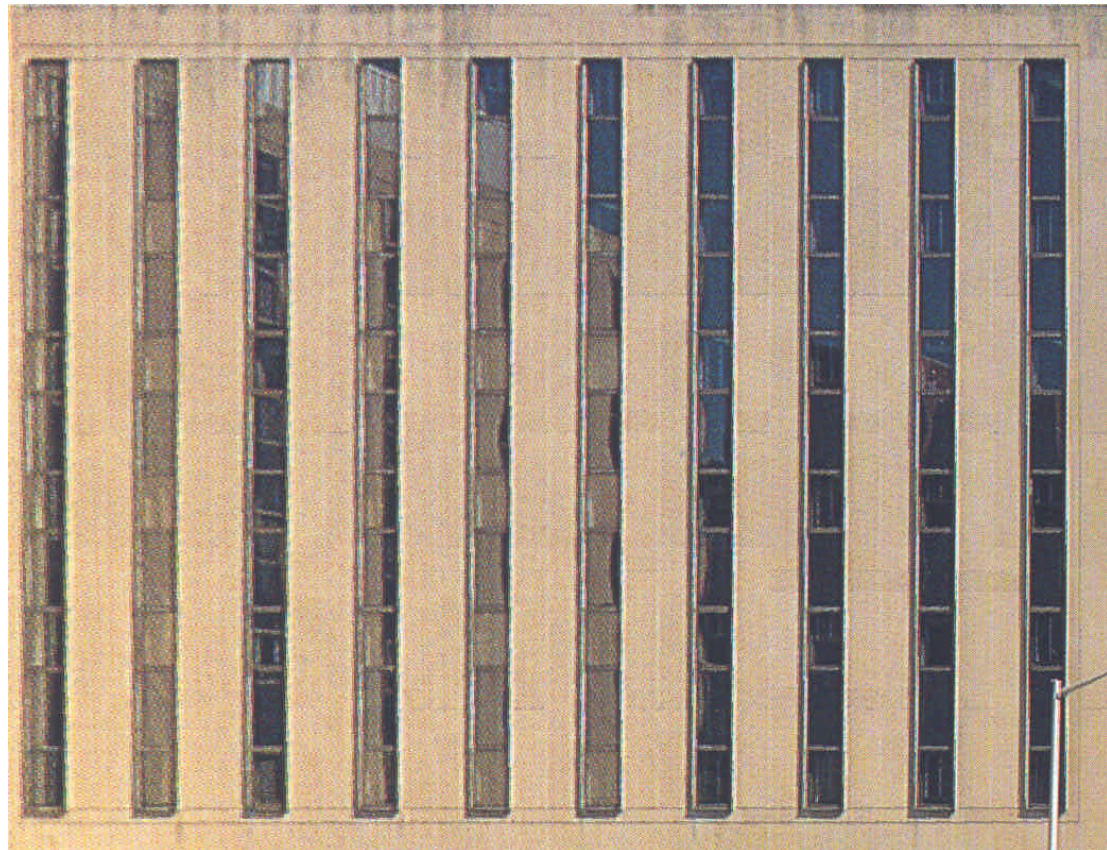




There is not any magic here, so where the scale is smaller in the original image there is not so much information

Result

Be careful, if you are *upsampling* (more pixels) then you may interpolate directly. If you are *downsampling* (fewer pixels) then you should low-pass filter first, before interpolation to avoid aliasing. Up/down may change by location in the image.



Typical Usage

- Nearest Neighbor: fast but poor visual impression when upsampling
- Bilinear: often chosen as a good compromise
- Bicubic: better visual impression when upsampling, but takes more time.