Forward Warping

\[ I_I(x, y) \rightarrow I_w(x', y') \]

for \( x, y \) in \( I_I \):

\[ x', y' = T[y] \]

\[ I_w(x', y') = I(x, y) \]

Problem: What if \( x', y' \) are floats?

Possible answer: "Splat" \( I(x, y) \) to multiple pixels in \( I(x', y') \)

Issues with:

- Scale (e.g., \( T \) is a 16x uniform scale)
- Holes remaining after splatting
Linear Interpolation

\[ y = y_1(x_2 - x) + y_2(x - x_1) \]

If \( x_1 = 0, \ x_2 = 1 \),

\[ y_1(1 - x) + y_2(x) \]
Inverse Warping

For each \((x', y')\) in \(I'_1\):

\[
\begin{align*}
    x, y &= T^{-1}(x', y') \\
    I'_1(x', y') &= \text{interpolate}(I_1, T^{-1}(y'))
\end{align*}
\]

Bilinear Interpolation - placing a tent filter at non-integer coordinates!

Interpretations:
- a tent filter at non-integer coords
- weights determined by areas of rectangles at opposite corner
- interpolate linearly on two sides, then interpolate linearly between the two

\[
I'_1(x', y') = (x_2 - x)(y_2 - y) I(x_1, y_2)
\]

+