Project 2 (one more time - without no match)

• The dynamic programming algorithm needs the following definitions:
  \( I_L \) is the left row; \( I_R \) the right row, with \( n \) pixels per row.
  \[
  SAD(x, x') = \sum_{x' - r}^{x' + r} \sum_{j = -r}^{j = r} |I_L(x) - I_R(x')|
  \]
  If we let \( k \) be the radius of the search interval we will use around the input estimate of disparity, \( D_{in} \), then we can define the match score matrix, \( M \), as a \((2k+1) \times (n-2r)\) matrix with rows indexed from -\( k \) to \( k \):
  \[
  M(\text{offset}, \text{column})
  \]
  • maxint if \( D_{in}(\text{column}) + \text{offset} < 0 \)
  • \( SAD(\text{column}, D_{in}(\text{column}) + \text{offset}) \) otherwise
  • Define Conjugate(\text{offset}, \text{column}) = column + D_{in}(\text{column}) + \text{offset}

Last time around

• A disparity map, \( D \), is a mapping from \((r, n-r)\) - pixel positions - to \((0, \text{maxdis}+1)\) - disparities. \( D \) must satisfy
  - \( j < j' \) implies \( j + D(j) \leq j' + D(j') \)
• The Cost of a disparity map is defined as
  \[
  Cost(D) = \sum_{x \leq y} M(D(x) - D_{in}(x), y)
  \]
• Goal is to find the disparity map, \( D^* \), that has minimal cost
Home stretch

• Define \( \text{Best}(\text{offset}, \text{col}) \) to be the cost of the minimal cost disparity map for the first \( \text{col} \) columns of \( I_L \) constrained to assign disparity \( \text{D}_{\text{in}}(\text{col}) + \text{offset} \) to \( \text{col} \).

• The cost of the best disparity map will then be:

\[
\min_{-k \leq \text{offset} \leq k} \text{Best}(\text{offset}, n - r)
\]

The finish

• Now we need a recursive definition of \( \text{Best} \), and we are done.

\[
\begin{align*}
\text{Best}(\text{offset}, r) &= M(\text{offset}, r) \\
\text{Best}(\text{offset}, \text{col}) &= M(\text{offset}, \text{col}) + \\
\min_{\text{offset} \leq \text{offset} \leq \text{offset}_\text{conjugate}(\text{offset}, \text{col} - 1)} \{\text{Best}(\text{offset}', \text{col} - 1)\}
\end{align*}
\]
The Delivery

- Automatic grading of the dynamic programming algorithm:
  - Given: Match matrix
  - Output: Best disparity map and its score
  - Due: May 17
  - Value: 35%

- Report
  - Describe implementation
  - Compare output disparity map to ground truth
  - Extra credit - implement no-match algorithm
  - Due: May 21 - no late submissions
  - Value: 65% + 25%