Sketch Representations

15-494 Cognitive Robotics
David S. Touretzky & Ethan Tira-Thompson
Carnegie Mellon
Spring 2014
Sketches in Tekkotsu

• A sketch is a 2-D iconic (pixel) representation.
• Templated class:
  - Sketch<uchar>  \textit{unsigned char}: can hold a color index
  - Sketch<bool>  true if a property holds at image loc.
  - Sketch<uint>  \textit{unsigned int}: pixel index; distance; area
  - Sketch<usint> \textit{unsigned short int}
  - Sketch<float> single precision \textit{float}

• Sketches are smart pointers.
• Sketches live in a SketchSpace: fixed width and height.
• A built-in sketch space: camSkS.
Sketch Example

- Find the largest blue region in the image:
Sketch Example

$nodeclass DstBehavior : doStart {

    camSkS.clear();
    NEW_SKETCH(camFrame, uchar, sketchFromSeg());

    NEW_SKETCH(blue_stuff, bool, 
                visops::colormask(camFrame,"blue");

    NEW_SKETCH(b_cc, uint, visops::labelcc(blue_stuff));

    NEW_SKETCH(b_area, uint, visops::areacc(b_cc));

    int const max_area = b_area->max();

    NEW_SKETCH(b_max, bool, b_area == max_area); 
}

camFrame
visops::colormask
Components labeled starting from 1 in upper left; max label in lower right.
visops::areacc
b_area == max_area
Extended Example

- We've already found the largest blue blob.
- Now, find the orange region closest to the largest blue blob; ignore any orange noise (blobs smaller than 10 pixels).
Extended Example

NEW_SKETCH(b_dist, uint, visops::edist(b_max));

NEW_SKETCH(orange_stuff, bool,
             visops::colormask(camFrame, "orange"));
NEW_SKETCH(o_cc, uint, visops::labelcc(orange_stuff));
NEW_SKETCH(o_area, uint, visops::areacc(o_cc));
NEW_SKETCH(o_blobs, bool, o_area > 10);

NEW_SKETCH(bo_dist, uint, b_dist * o_blobs);
int const min_index = bo_dist->findMinPlus();
int const min_label = o_cc[min_index];
NEW_SKETCH(bo_win, bool, o_cc == min_label);

NEW_SKETCH(rawY, uchar, sketchFromRawY());
visops::edist(b_max)
o_area > 10

NEW_SKETCH(o_blobs, bool, o_area > 10);
bo_dist

NEW_SKETCH(bo_dist, uint, b_dist*o_blobs);
bo_win

NEW_SKETCH(bo_win, bool, o_cc == min_label);
Sketch Properties

- Every sketch has a color, and a colormap.
- Sketch<bool> is rendered in that color.
- Sketch properties are inherited from the first argument of any visual routine or sketch operator.
- Example:

  ```
  NEW_SKETCH(result, bool, blue_stuff | orange_stuff);
  ```

  The result will have color blue.

- Colormaps: segMap, grayMap, jetMap, jetMapScaled
SketchSpaces:

A Look Under the Hood
From Sketches to Shapes
Sketch + Shape Operations