Sketch Representations

15-494 Cognitive Robotics
David S. Touretzky &
Ethan Tira-Thompson

Carnegie Mellon
Spring 2015

Sketches in Tekkotsu

- A sketch is a 2-D iconic (pixel) representation.
- Templated class:
  - Sketch<uchar> — *unsigned char*: can hold a color index
  - Sketch<bool> — true if a property holds at image loc.
  - Sketch<uint> — *unsigned int:* pixel index; distance; area
  - Sketch<usint> — *unsigned short int*
  - Sketch<float> — single precision *float*
- Sketches are smart pointers.
- Sketches live in a SketchSpace: fixed width and height.
- A built-in sketch space: camSkS.

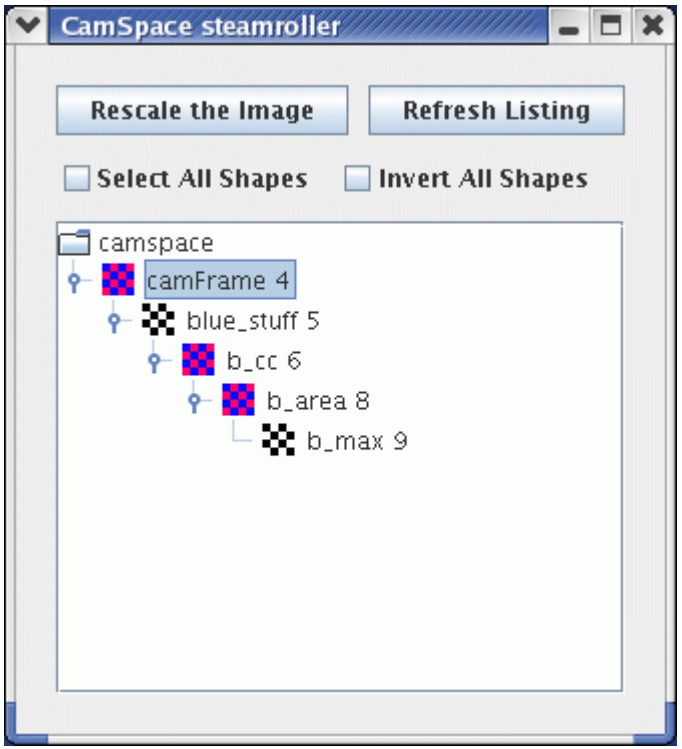
Sketch Example

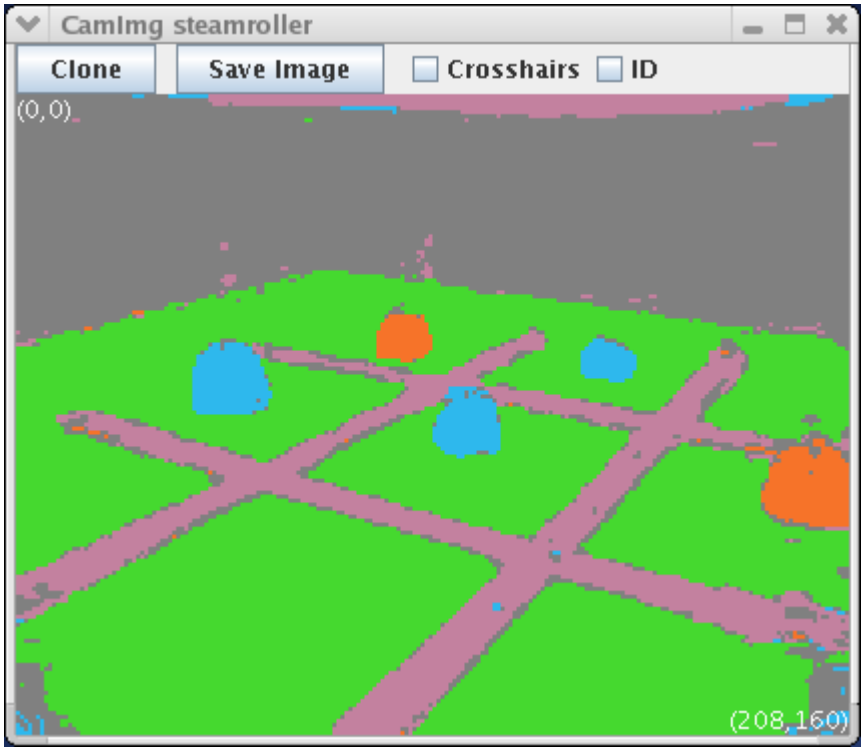
- Find the largest blue region in the image:

Sketch Example

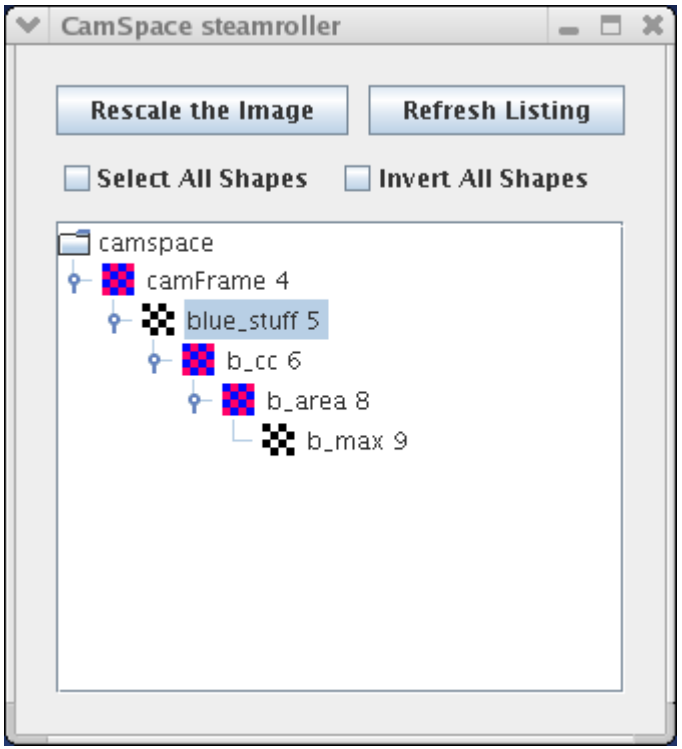
```
$nodeclass DstBehavior : doStart {

    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);

}
```

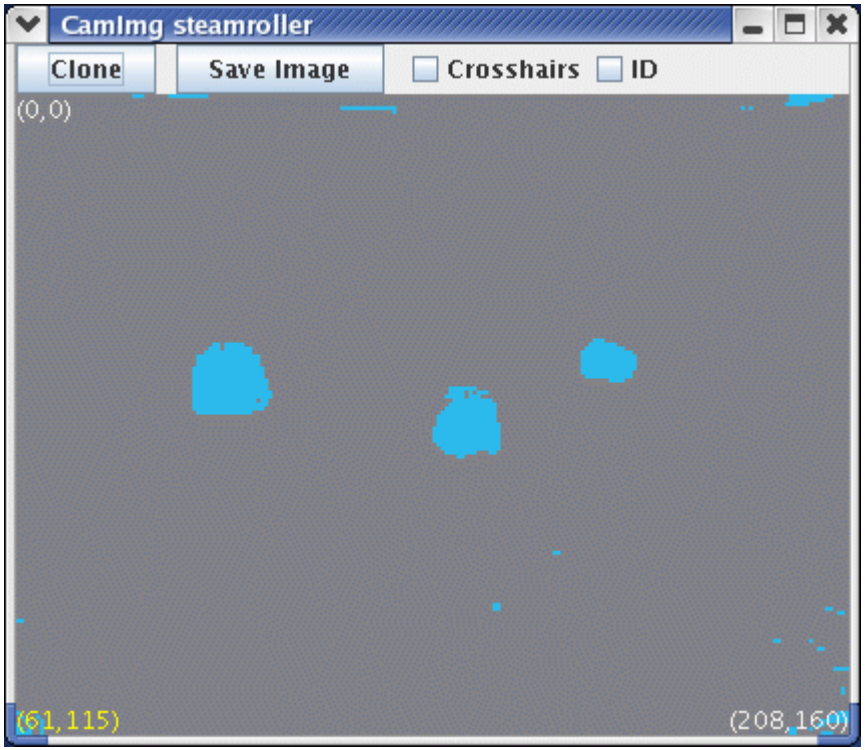
camFrame


CamSpace steamroller
Rescale the Image
Refresh Listing
Select All Shapes
Invert All Shapes
camspace
camFrame 4
blue_stuff 5
b_cc 6
b_area 8
b_max 9

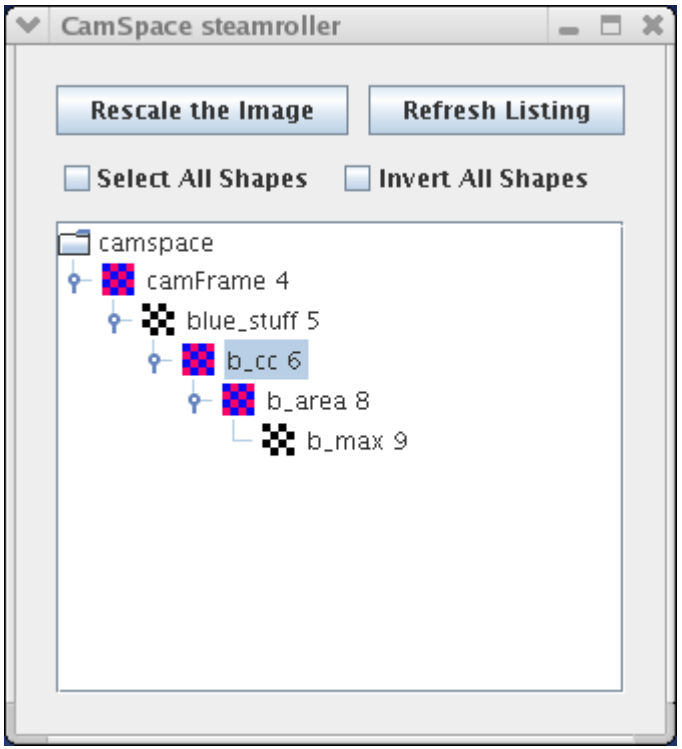

CamImg steamroller
Clone
Save Image
Crosshairs
ID
(0,0)
(208,160)

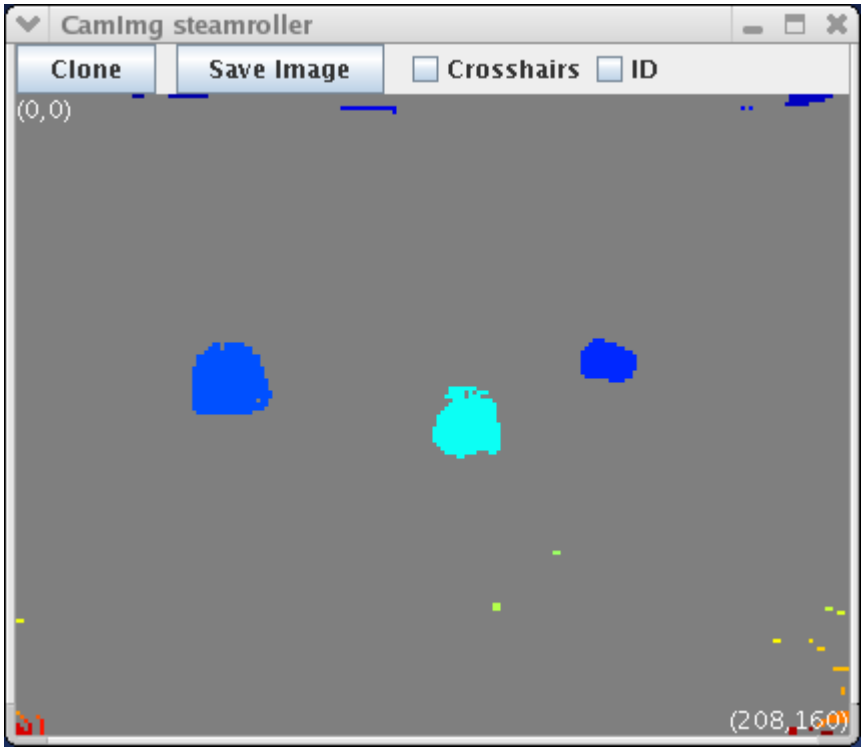
visops::colormask





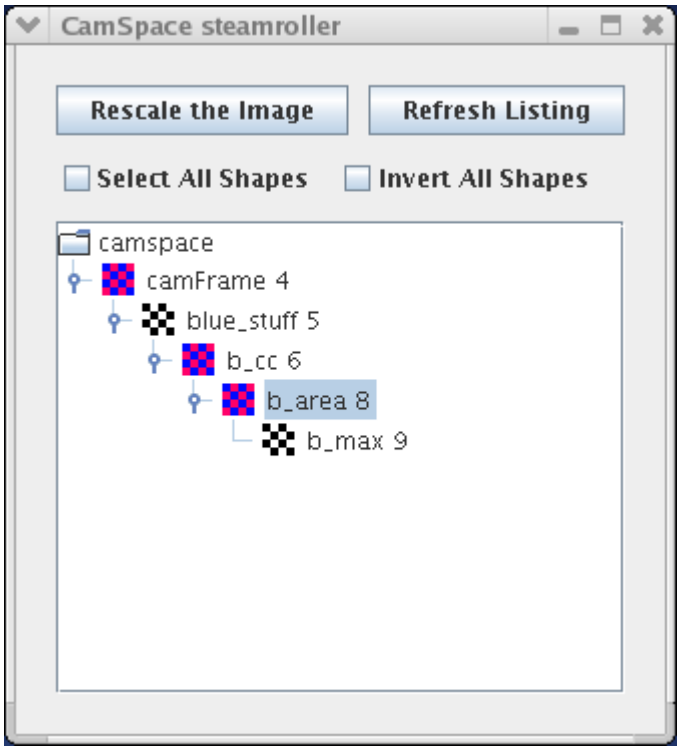
visops::labelcc

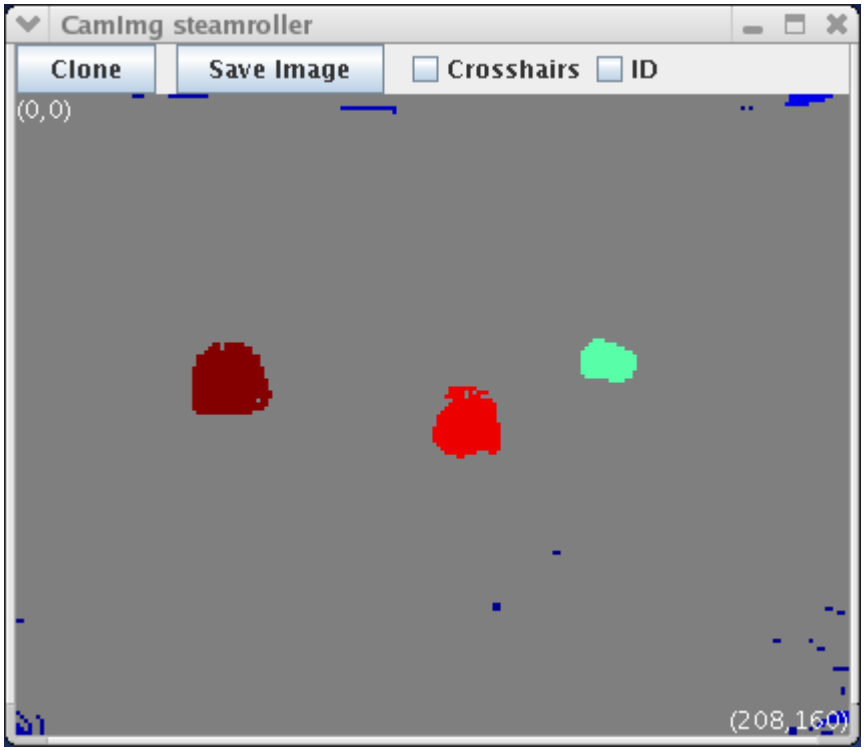




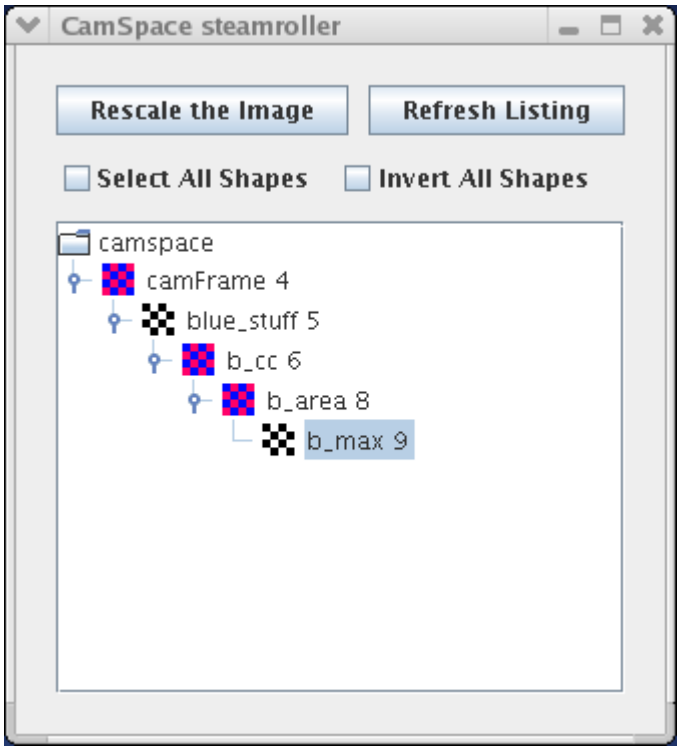
Components labeled starting from 1
in upper left; max label in lower right.

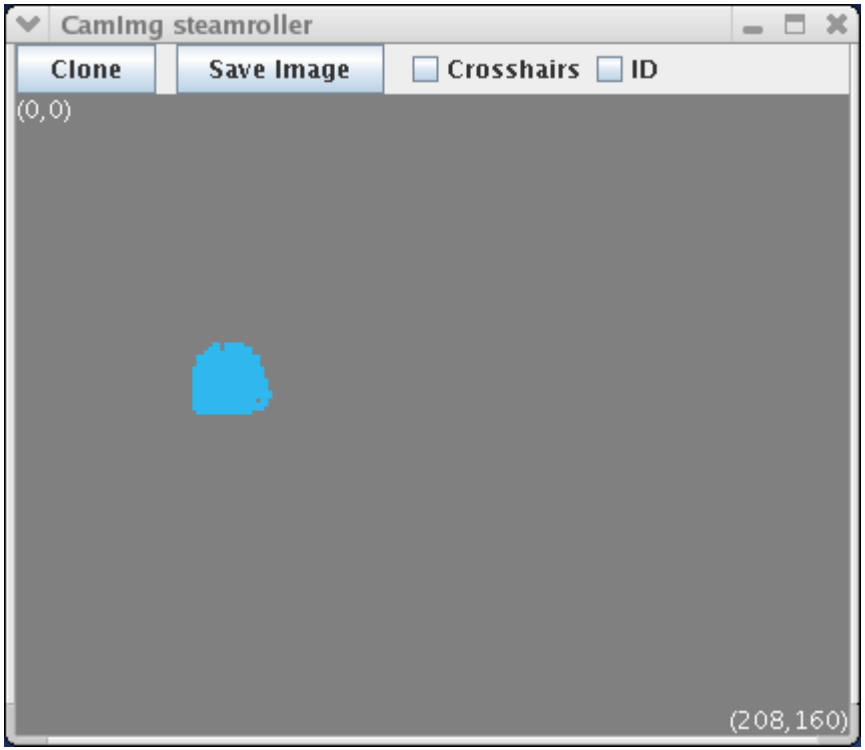
visops::areacc





b_area == max_area





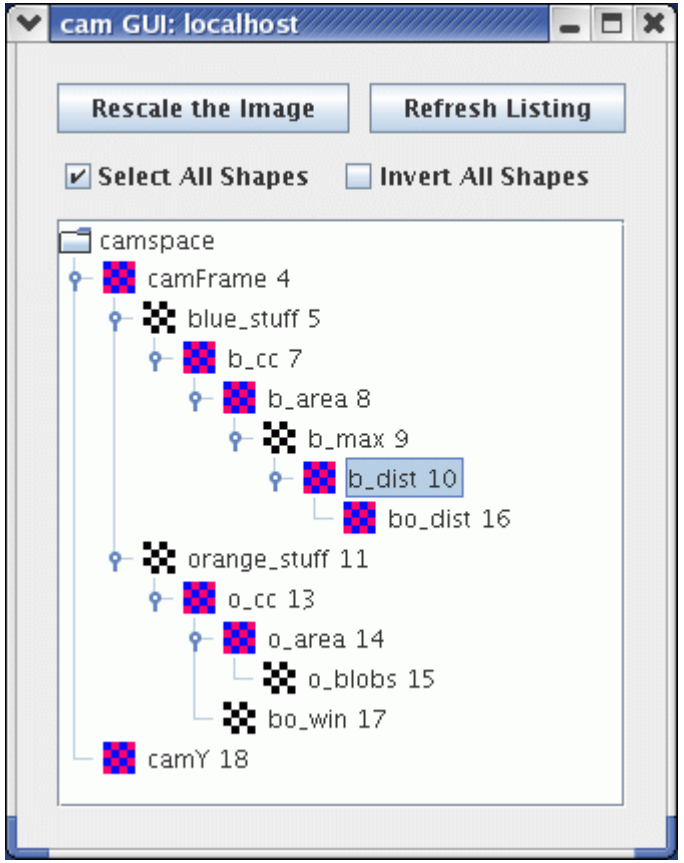
Extended Example

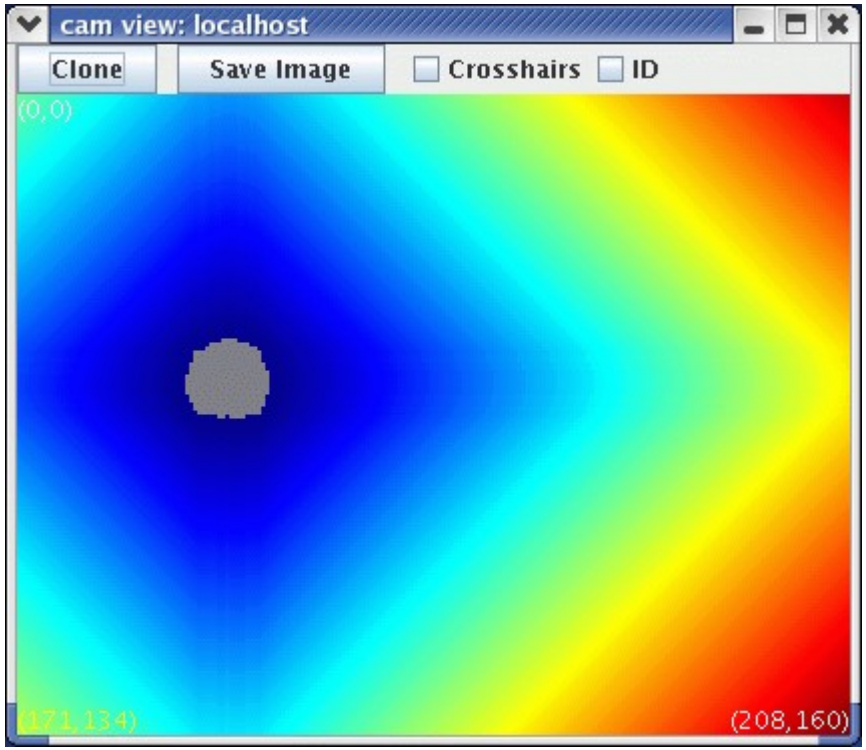
- We've already found the largest blue blob.
- Now, find the orange region closest to the largest blue blob; ignore any orange noise (blobs smaller than 10 pixels).

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());
```

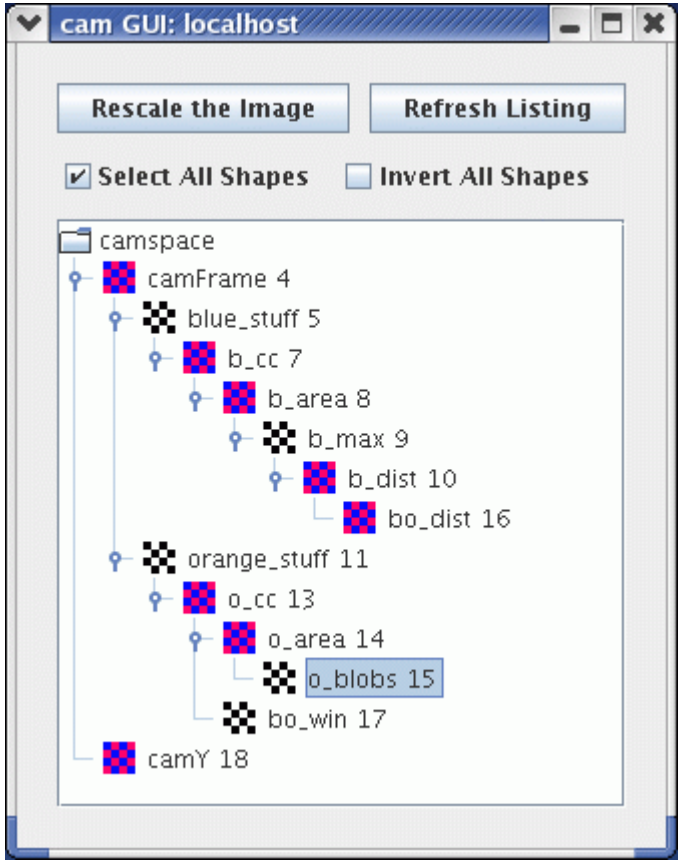
visops::edist(b_max)

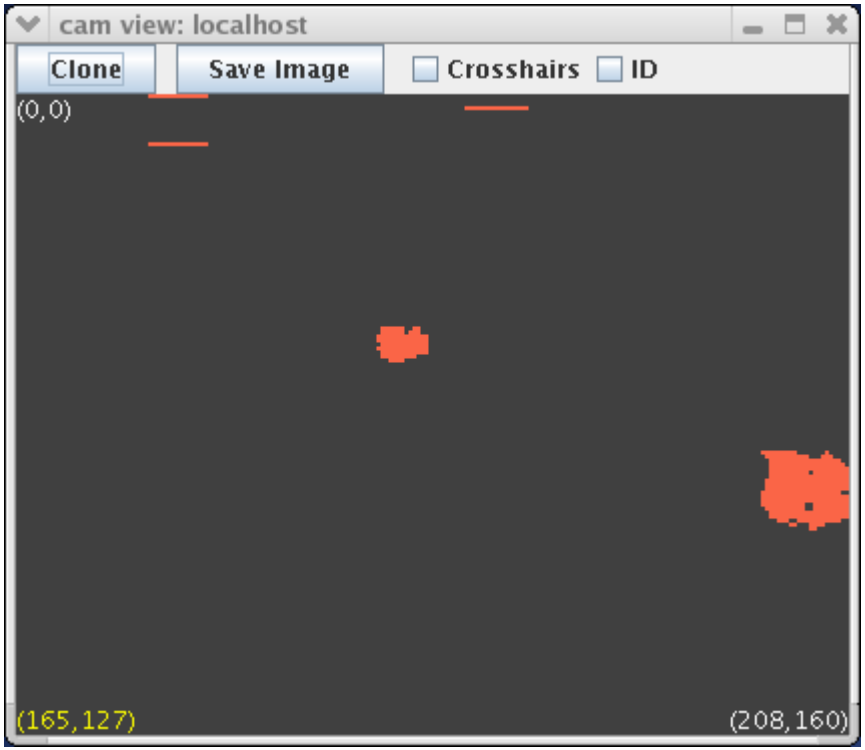




o_area > 10

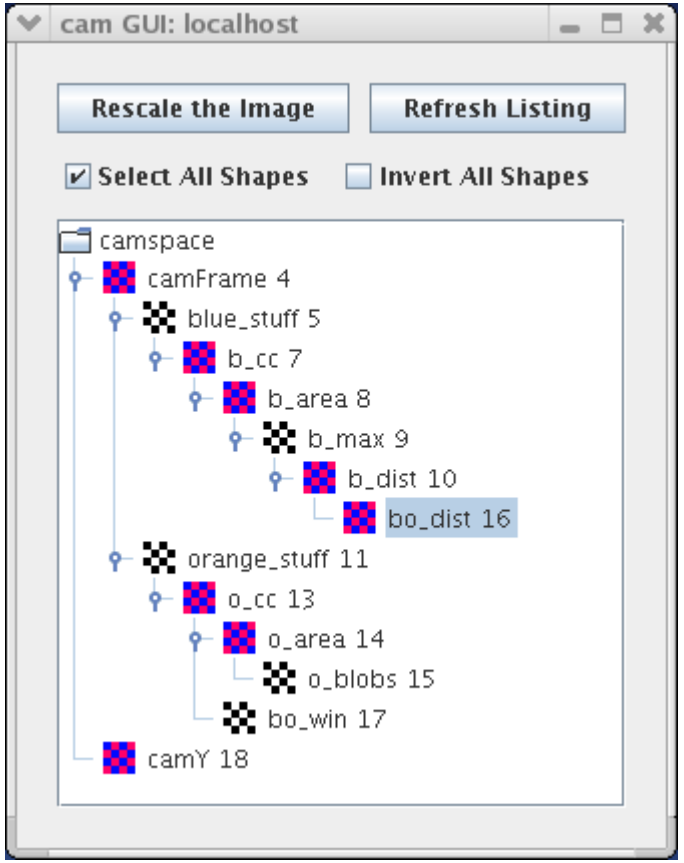
```
NEW_SKETCH(o_blobs, bool, o_area > 10);
```

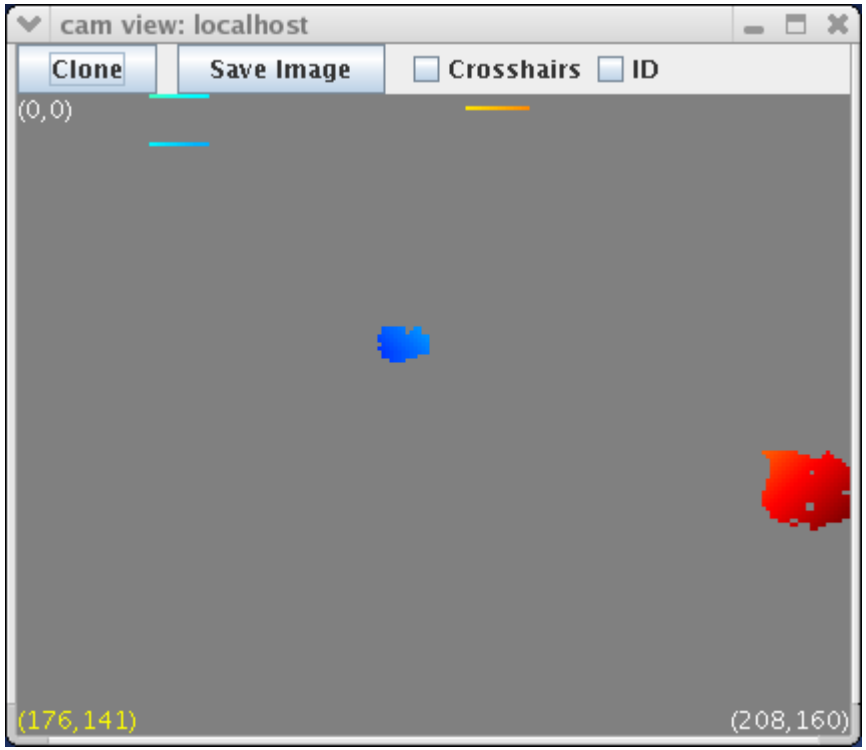




bo_dist

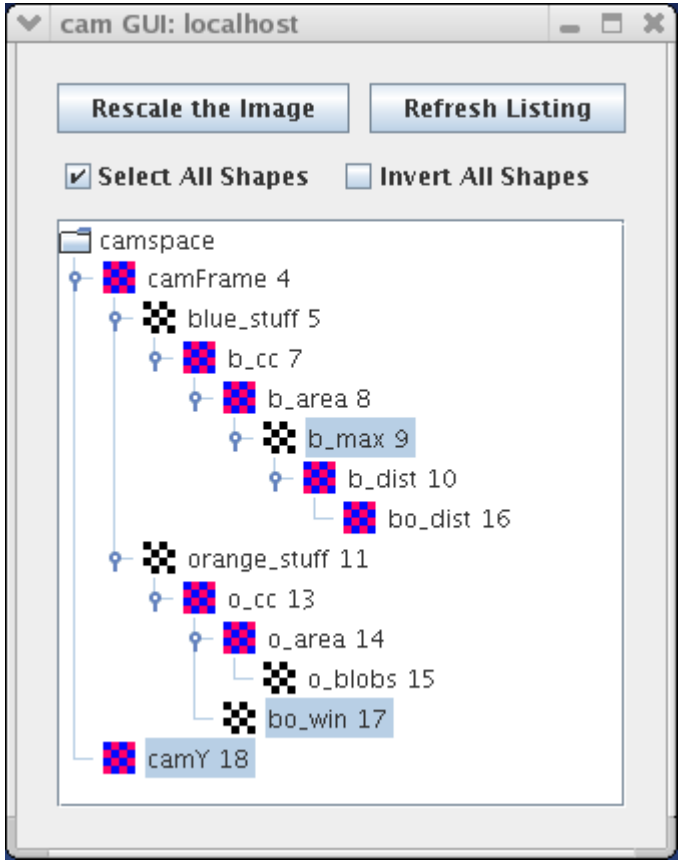
```
NEW_SKETCH(bo_dist, uint, b_dist*o_blobs);
```

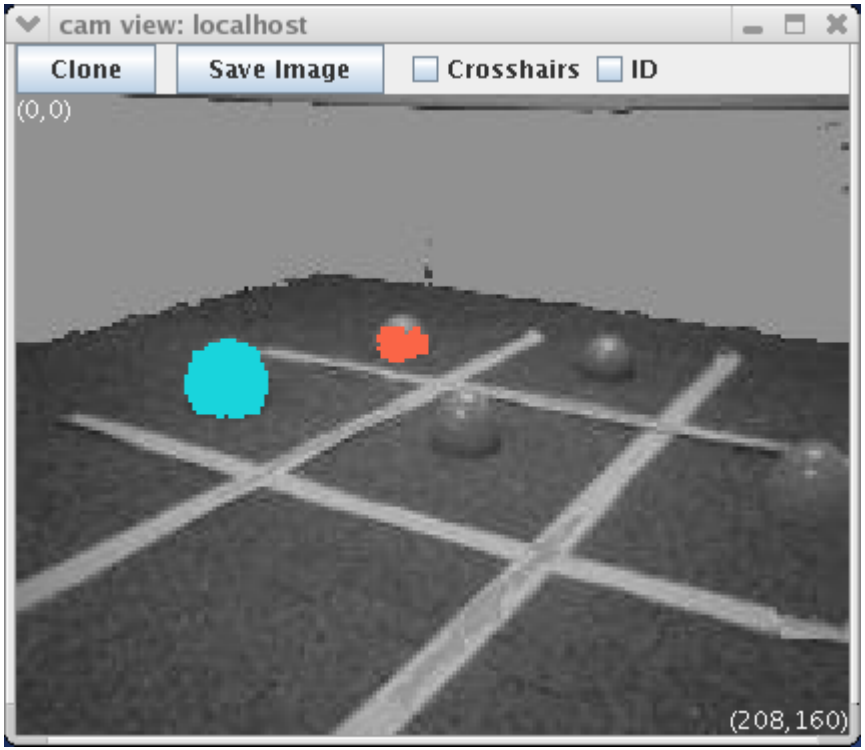




bo_win

```
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:

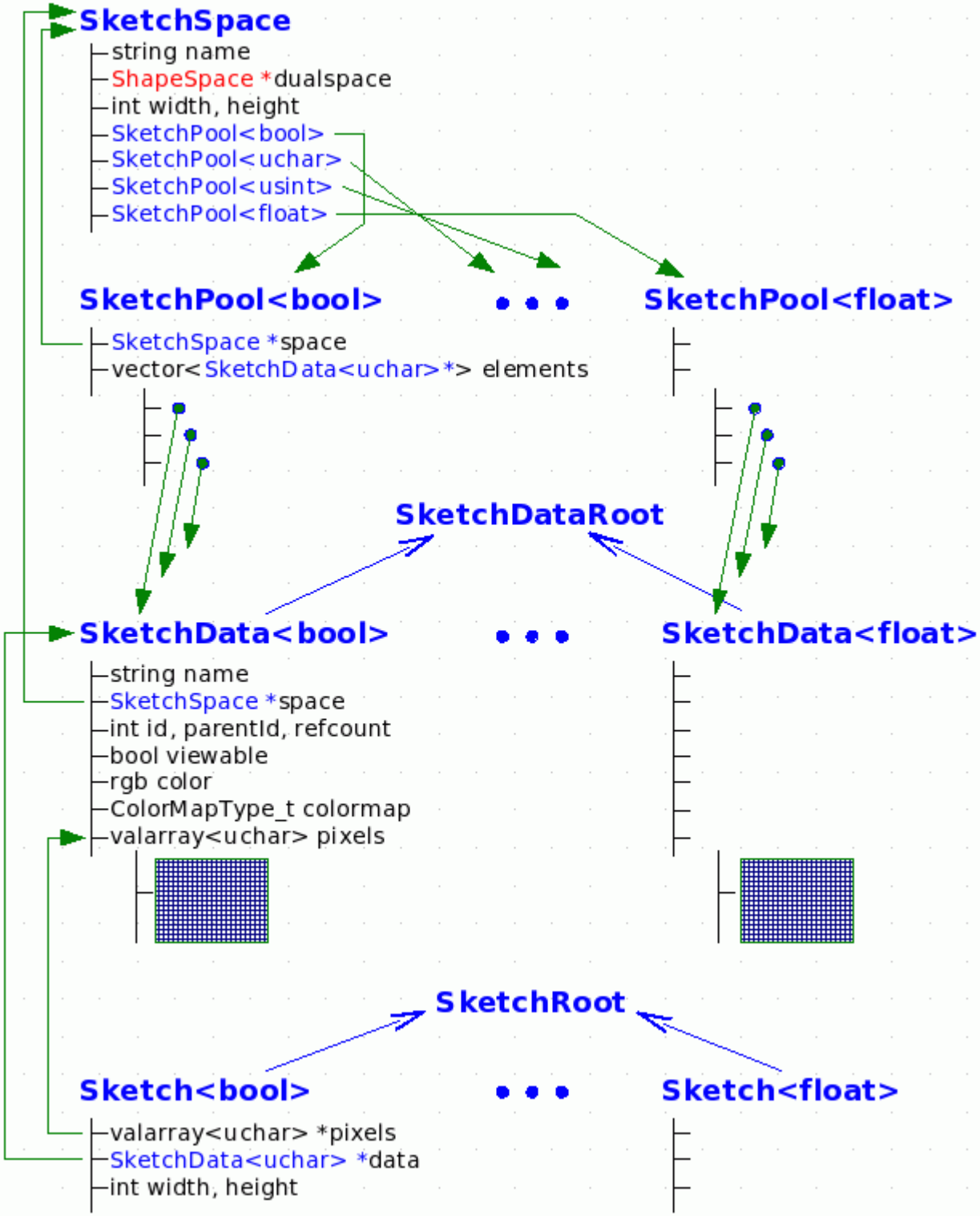
```
NEW_SKETCH(result, bool, blue_stuff  | orange_stuff);
```

The result will have color blue.

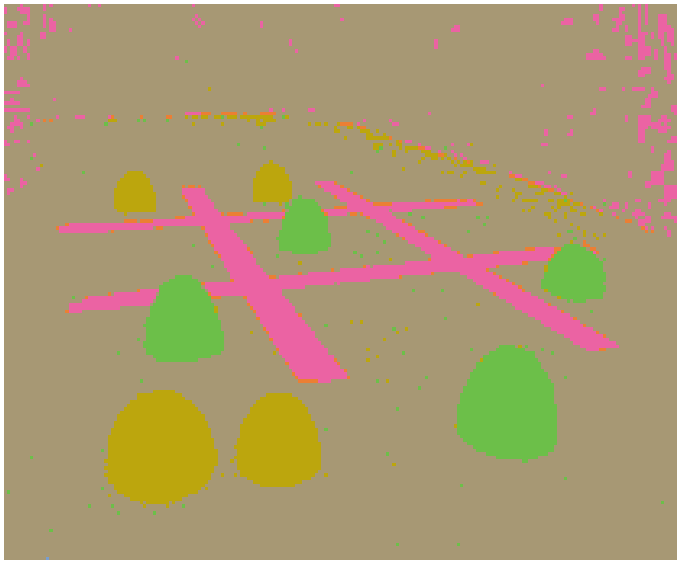
- Colormaps: segMap, grayMap, jetMap, jetMapScaled

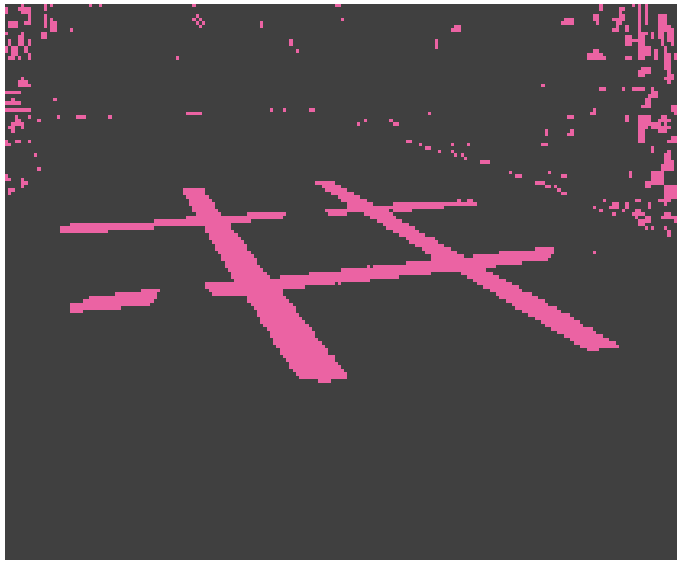
SketchSpaces:

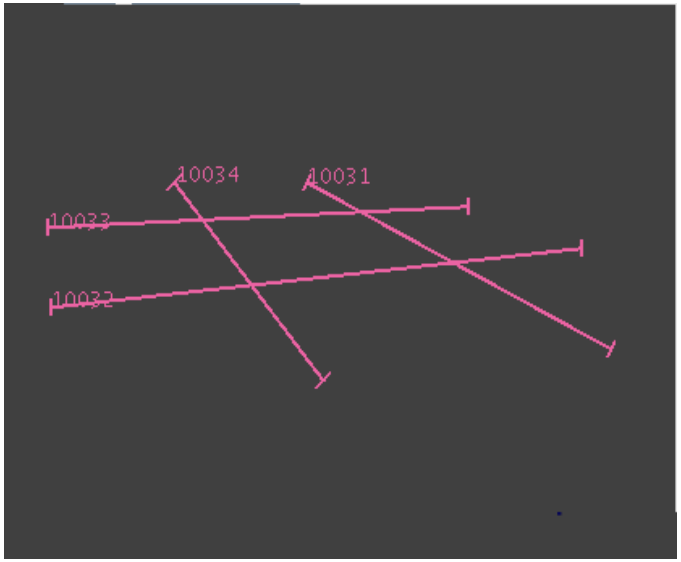
A Look Under the Hood



From Sketches to Shapes







Sketch + Shape Operations