Region Visualization

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Image segmentation and region identification is an important part of most computer vision applications. Several VisionX tools are available to simplify the visualization process

The visualization issue is illustrated in the binary image above; the outcome of a segmentation is a binary image. Displaying just that image, in general, provides limited useful information

See slide 3 for best methods

Region Visualization: Images

Task: to visualize and compare two different segmentations

Original Image: car.vx

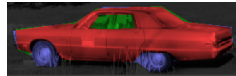Segmentation A: carA.vx

Segmentation B: carB.vx

VisionX-V4   *vrdiff*
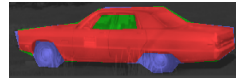

Region Visualization: Best methods region

Task: to visualize A single segmentation

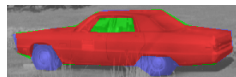In general the best method is to add to the grey level image

%**vrdiff** carA.vx carB.vx –cs of= | **vccvt** –i | **vcmod** ig=car.vx of=carVCx.vx

Dynamic intensity mapping may be better for images with high dynamic range

%**vrdiff** carA.vx carB.vx –cs of= | **vccvt** –i | **vcmod** –d ig=car.vx of=carVCy.vx

A simple color index image may be generated by vrdiff

%**vrdiff** carA.vx CarB.vx ig=car.vx –ci of=carVCr.vx

VisionX-V4   *vrdiff, vcmix, vmpix*

Region Visualization: Region comparison

Task: to quantitatively compare two different segmentations

%**vrdiff** carA.vx CarB.vx -sh
apcnt=13145;
bpcnt=14165;
overlap=12061;
anotb=1084;
bnota=2104;
union=15249;
diff=3188;
tp=12061; tn=12011;
fp=1084; fn=2104;
fpc=0.7749;
sim=0.79093;
sens=0.851464;
spec=0.917220;
dsc=0.883266;

carA.vx

carB.vx

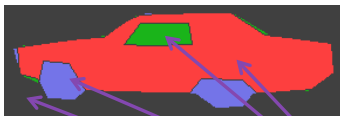Vrdiff: provides both a quantitative analysis of the two binary images and various visualizations.

For of the analysis shown on the left see the crdiff man page. Be sure that the metric you use is the correct one for the application

VisionX-V4   *vrdiff*

Region Visualization: Region comparison

vrdiff region matching color scheme

%**vrdiff** carA.x carB.vx -cs of=carVC1.vx

A and B
A and not B
B and not A
not A and not B

Matched regions are shown in red

VisionX-V4   *vrdiff*

Region Visualization: single region

Task: to visualize A single segmentation

In general the best method is to add to the grey level image

%**vrdiff** carA.vx CarA.vx ig=car.vx –ci of=carVCr.vx

In some case an outline may be better.

%**vmpix** car.vx carA.vx | **vcmix** car.vx of=carV2.vx

On overlay is possible but other methods are better.

%**vcmix** car.vx carA.vx of=carV1.vx

VisionX-V4   *vrdiff, vcmix, vmpix*

Region Visualization: single region (no color)

Task: to visualize A single segmentation

If color is not available then an outline may be best*.

```
%vmpix if=carA.vx of=tmp
%vcmix ig=tmp car.vx of=carVg2.vx -g
```

In some case, especially in the case of many small regions an overlay may be better.

```
%vmpix  car.vx  carA.vx | vcmix car.vx of=carV2.vx
```

* Vcmix cannot accept a pipe to its if= input.

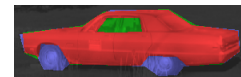---

Region Visualization: single region (color image)

Task: to visualize A single segmentation

If the original image is already in color then covert to gray first in order to show regions

```
%vchan -c if=carc.vx of=car.vx
%vrdiff carA.vx carB.vx –cs of= | vccvt –i | vcmod ig=car.vx of=carVCx.vx
```

And for a single region just repeat the name

```
%vrdiff carA.vx carA.vx –cs of= | vccvt –i | vcmod ig=car.vx of=carVCx.vx
```
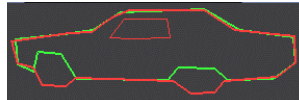
Presenting the original image next to the segment visualziation is oftena good idea.

Other Region Visualizations: color boundaries

Task: to visualize and compare two different segmentations

```
%vmpix if=carA.vx i2=carB.vx | vcmap lf=colornod4 of=carVC3.vx
```

```
%vmpix if=carA.vx i2=carB.vx | vcmix if=car.vx of=carVC4.vx
```

Other Region Visualizations: grey options

Task: to visualize and compare two different segmentations

```
%vpix carA.vx tf=0 | vrdiff if=carA.vx ig=car.vx -ci of=carVCg.vx
```

```
%vpix carA.vx tf=0 | vrdiff bf=carA.vx ig=car.vx -ci of=carVCg.vx
```

Other Region Visualizations: other colors

Task: to visualize and compare two different segmentations

```
%vcmix car.vx carA.vx  of=carVg1.vx -g
```

```
%vmpix if=carA.vx of=tmp
%vcmix ig=tmp car.vx of=carVg2.vx -g
```

Region Visualization: Summary

- vrdiff is the key to good visualizations; see slide 3 for the best methods
- vcmod may be used with vrdiff to provide high quality true color visualizations. vcmod also can manage non-byte images and images with large dynamic ranges
- Many alternative methods for region visualizations are possible and may be appropriate in special situations

- vrdiff may also provide a quantitative comparative analysis of regions