Songs, Pictures and Python

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Chaitanya
& the WWW

14 December, 2010

The Talk

Why?

- More participants for Tutorials (& Sprints)
- A feeling for the **power** that Python gives
- Get students enthused about Python

What?

- Weekend hacks[a], etc.
- Trivial & straight forward – No “research”
- Mostly images
- Some web crawling and word counting

[a] *hackers build things, crackers break them* – ESR

We *like* to sing what we see!

Motivation

- “We sing what we see” – Chaitanya
- Check it out!
- Lyrics of top 500 songs
  - 5 decades * 100 songs
  - People connect to them

How?

- Get the lyrics
- Count the words

How & What?

Getting the lyrics

- Search for a website
- Look at html – very dirty!
- Simple hard-coded regex

Word count

- Very common
- Already had some code from our tutorials!

"Results"?

blue	105	red	54	green	30
black	63	purple	33	yellow	11
brown	56	white	32	pink	7

How & What?

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Our eyes suck at blue!

Discussion

- A post on Hacker News.
- Known facts
  - Luminance vs. Chrominance
  - Sensitivity – $G > R > B$
    - Bayer filter (Sensor ratios)
    - CIE 1931 $V(\lambda)$, CIE 1978 $V(\lambda)$ (Spectral sensitivity)
    - They try to illustrate this!
- Initial plan was to replicate
- Flaws in their arguments

Argument-1

`data/traci.png`	`data/tracislide.png`

Argument-1 . . .

Code

```
def show_channels(I):
    for i in range(3):
        J = zeros_like(I)
        J[:, :, i] = I[:, :, i]
        figure(i)
        imshow(J)
```

Discussion

- Blue channel is rather dark
  - intensity of Blue in the image could be less
- Bayer filter

Argument-1 . . .

Code

```
def show_grey_channels(I):
    K = average(I, axis=2)
    for i in range(3):
        J = zeros_like(I)
        J[:, :, i] = K
        figure(i+10)
        imshow(J)
```

Discussion

- Get a gray scale image
- Look at it using R, G, B filters.
  - Blue and Red still don't look all that sharp
  - intensities change, though

Argument-2

Argument-2 . . .

Code

```
def subsample(I):
    for i in range(3):
        J = I.copy()
        J[:, :, i] = zoom(I[::4, ::4, i], 4)
        figure(i)
        imshow(J)

def zoom(x, factor=2):
    rows, cols = x.shape
    row_stride, col_stride = x.strides
    view = np.lib.stride_tricks.as_strided(x,
                    (rows, factor, cols, factor),
                    (row_stride, 0, col_stride, 0))
    return view.reshape((rows*factor, cols*factor))
```

Argument-2 . . .

Code

```
def swap_subsample(I, k=1):
    for i in range(3):
        J = zeros_like(I)
        for j in range(3):
            J[:, :, j] = I[:, :, (j+k)%3]
        J[:, :, i] = zoom(I[::4, ::4, (i+k)%3], 4)
        figure(i+10)
        imshow(J)
```

Discussion

- We are definitely good with Green!
- Blue?

Further

Explore

- Reducing bit depth rather than pixel width
- Central vision vs. Peripheral vision
- Evolutionary aspects
- Tetrachromancy

ASCII art

Very elementary algo

- Convert image to gray-scale
- Assign intensity to pixel blocks
  - $block\_len : block\_height :: char\_len : char\_height$
- Map intensity to visual density of characters
- Replace block with corresponding character

Works well for *machine generated images*

Further

Explore

- pre-process images?
  - for non *machine generated images*
- shape matching?
- colourful html

Others

- aalib and bb-demo
- libcaca

Face Detection

Motivation

- Exploring Open CV
- Tutorials have an example on slicing face of Lena

`facedetect.py`

- Uses a **Haar** Classifier.
- Apparently, available as a sample in OpenCV
- Demo with image, camera

I love Python

Why?

- Lets me focus on the Problem
- Interactive
- Readable

Travis Oliphant – Lead Dev of `numpy`

In 1998, . . . I came across Python and its numerical extension (Numeric) while I was looking for ways to analyze large data sets . . . using a high-level language. I quickly fell in love with Python programming which is a remarkable statement to make about a programming language. If I had not seen others with the same view, I might have seriously doubted my sanity.

References

- Human Vision - http://nfggames.com/games/ntsc/visual.shtm
- Hacker News - http://news.ycombinator.net/item?id=1891753
- Numpy mailing list - Stefan van der Walt (striding trick)
- Active State - Convert text to image using PIL
- OpenCV Documentation
- Wikipedia

Thank You!

Created using Emacs Org-mode