**Scraptcha**

**System**

* Idea: do I have to store image in DB, or just signature (#?) from ImageMagick? Image
* Want button to switch image quality? No
* Take image of object (trash) with a Logitech C310 HD Webcam
  + Raspberry Pi Compatible, no external power needed
* Perform image processing on rPi to make comparison
  + How? Similarity algorithm? See examples, including Google Image Search
  + Look into SVMs
* Compare image to images in DB on manager, see if have a match
  + Use ImageMagick, compare() function with -metric option to generate difference
    - -compose Src to remove original image in result
    - Display in UI?
  + If have a match >75%? then assume algorithm correct
    - If user has correct bin, turn on green LED over bin
    - If user has incorrect bin, turn on red LED over bin
    - Use LED bar to display green/red alert
    - All cases, display object name, correct bin on LCD
  + No match, send image to manager to UI, give captcha
    - Ask user to identify object as: trash, recycling or compost
    - Store answer into DB to improve recognition algorithm
* Use stored data later as human-verified captchas
  + See online examples of decoding ancient texts with captchas

**Notes**

* OpenCV (Open Computer Vision)
  + Use it!
  + Has an objDetect class that does Cascade Classification, Latent SVM (see below)
  + Can train it with known objects and over time it will improve
* SVM (Support Vector Machine)
  + Analyze data and can detect patterns; classification and regression analysis
  + Uses training algorithm to build model to classify
  + [Good SVM Intro from OpenCV](http://docs.opencv.org/doc/tutorials/ml/introduction_to_svm/introduction_to_svm.html)
  + Train it and then use it to predict
  + Two types in OpenCV: Cascade Classification and Latent SVM
  + Cascade Classification
    - Need few 100 sample views of particular object along with negatives, all same size
    - After trained, apply to same size area of input image to detect, outputs '1' if match
    - Scan with window of given size over image looking for match
  + Latent SVM
    - Filter applied to all positions and scales of image

**Schedule**

* See Gantt Chart

**Parts List**

* See Master BOM

**References**

* <http://en.wikipedia.org/wiki/CAPTCHA>
* <http://publiclaboratory.org/tool/spectrometer>
* Cameras
  + <http://www.raspberrypi.org/archives/tag/camera-board>
  + <http://www.cl.cam.ac.uk/projects/raspberrypi/tutorials/robot/image_processing/>
  + [http://elinux.org/RPi\_VerifiedPeripherals#USB\_Webcams](http://elinux.org/RPi_VerifiedPeripherals" \l "USB_Webcams)
* Image Processing
  + <http://www.raspberrypi.org/phpBB3/viewtopic.php?t=26797&p=241431>
  + <http://www.cl.cam.ac.uk/freshers/raspberrypi/tutorials/image-processing/> \*\*
  + <http://www.imagemagick.org/script/compare.php> \*\*
  + <http://www.imagemagick.org/script/identify.php> \*\*
  + <http://www.imagemagick.org/Usage/compare/> \*\*
* OpenCV + SVM
  + <http://docs.opencv.org/modules/objdetect/doc/latent_svm.html>
  + <http://docs.opencv.org/modules/objdetect/doc/cascade_classification.html>
  + <http://eduardofv.com/read_post/185-Installing-OpenCV-on-the-Raspberry-Pi>
  + <http://mitchtech.net/raspberry-pi-opencv/>
  + <http://forum.stellarisiti.com/topic/99-raspberrypi-a-webcam-and-opencv/>
  + <http://www.fanjita.org/serendipity/archives/57-Capturing-webcam-video-with-OpenCV-on-Raspberry-Pi-Arch-Linux.html>
  + <http://orictosh.blogspot.com/2012/09/raspberry-pi-opencv-bmmf-getting-it.html>
  + <http://opencv.willowgarage.com/wiki/CompileOpenCVUsingLinux>
  + <http://opencv.willowgarage.com/wiki/CameraCapture>
  + [http://opencv.willowgarage.com/wiki/CameraCapture?highlight=%28cvCaptureFromCAM%29](http://opencv.willowgarage.com/wiki/CameraCapture?highlight=(cvCaptureFromCAM))
  + Install on Pi: apt-cache search opencv
  + Locating and summing colors
    - <http://docs.opencv.org/modules/core/doc/operations_on_arrays.html>
    - <http://vaamarnath.wordpress.com/2010/09/08/opencv-extracting-rgb-from-a-color-image>
    - <http://myopencv.wordpress.com/2009/06/13/detecting-colors-using-rgb-color-space/>
    - <http://opencv-users.1802565.n2.nabble.com/color-detection-td3141075.html>
    - <http://opencv-users.1802565.n2.nabble.com/How-to-execute-the-cvSplit-function-td5106812.html>
    - Bounding Box: <http://stackoverflow.com/questions/10315551/opencv-2-3-c-how-to-isolate-object-inside-image>
    - Background detection: <http://mateuszstankiewicz.eu/?p=189>
* Google Image Search
  + <http://googlecode.blogspot.com/2012/02/image-results-now-available-from-custom.html>
  + [http://productforums.google.com/forum/#!topic/websearch/1NK97rlK5cU](http://productforums.google.com/forum/" \l "!topic/websearch/1NK97rlK5cU)
  + <http://vivithemage.co.uk/blog/?p=295>
  + [**http://skyzerblogger.blogspot.com/2013/01/google-reverse-image-search-scraping.html**](http://skyzerblogger.blogspot.com/2013/01/google-reverse-image-search-scraping.html)

**Purchase Options**

* Camera
  + <https://www.sparkfun.com/products/10061>
  + <http://www.amazon.com/Logitech-960-000585-HD-Webcam-C310/dp/B003LVZO8S>
* LCD
  + <http://www.adafruit.com/products/1109> (Out of Stock, combo of LEDs and LCD!)
  + <http://www.adafruit.com/products/292> (LCD backpack, use only blue/white)
    - <http://www.adafruit.com/products/181>
  + <http://www.adafruit.com/products/358>
* LED
  + <http://www.adafruit.com/products/459>
    - Need 3 PNPs, <http://www.adafruit.com/products/450>

<http://www.ee.washington.edu/class/478/peckol/final_projects/2008/win/MMSorter/index.htm>