Reagent Label Text Detection Based on the Stroke Width Transform

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Motivation

Smart Phones in the Lab

Smart phones are becoming ubiquitous in both personal and professional settings, but not in lab.

Safety and Practicality

Laboratory personnel often need to look up safety and or ordering information for reagents. We propose to develop an Android app to coordinate MSDS lookup by parsing text from user photos of chemical labels in real time.

Related Work

Stroke Width Transform

Text in natural scenes is difficult to detect due to variability in shapes, textures, and colors. Existing text detection algorithms use a stroke width transform, which exploits the stroke width uniformity of written characters to detect them.

ROBUST TEXT DETECTION IN NATURAL IMAGES WITHEDGE-ENHANCED MAXIMALLY STABLE EXTREMAL REGIONS (Chen et al, 2011)

Implementation

Implementation

We wrote an Android application to take a photo and launch a Google search. We chose to offload the computation onto a server using MATLAB and Tesseract.

Algorithm

Original Image

MSER Detection: Maximally stable extremal regions is a blob detection method to find regions of interest in an image.

Canny-edge Pruning: canny edges are essentially used to segment character candidates.

Geometric Filtering: filtering of character candidates based on non-extremal area and aspect ratio is used to discard non characters.

Text-line formation: groups of letters are identified by dilating character candidates to find locally contained letter candidates..

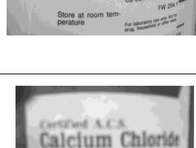
Stroke Width Transform: We use a Euclidian distance transform to find the distance of every pixel in a character candidate to the edge, keeping CC with uniform width.

Tesseract: Finally, we use the open source OCR software Tesseract to decipher the group of characters which is most uniform, after application to the original image..

Google & MSDS: Using the Tesseract text, we send a query to a Google search, with "MSDS" and "filetype:pdf" appended. All chemical manufactueres are required by law to make MSDS available to users.

Results

The performance of our algorithm depended on the underlying quality of the original image.

Image	Text Mask	OCR Output
		**Mask**: Calcium Chloride4-20 ManAnhydrous **Applied**: Calcium flhlande420M%hAnhydraus
		Mask: N381918-1KG am-c1599L-Arginine, 98.54-%, FCC **Applied**: 1* f33"E9"" &°¥KG amfi$%L-Arginine, 935+-%, FCC
		Mask: 500 g _ 3_3a4-12Ammonium Chloride,Crysta lPOLYSTORMORWAR® (ACS)N}-{'C| FW 53.49LOT C22604 **Applied**: 509 9 3384 12Ammonium Chloride,Crystal wnvsroamoamAR® mas)NH..;CI FW 53 49L01' (222604
		Mask: 3iin **Applied**: CITRIC ACIDETrisodaum Sait fimry m mm 5269 mmpcerature ;..:-at "¥,L'§°gfl""fl,,s
		Mask: (nothing) **Applied**: (nothing)

Future Work

Inventory Management

Our app could be extended to interface with Stanford's ChemTracker to bring relevant inventory information and maintenance tools to the scientist.

Conclusion

Text Recognition: Gleaning text from images is a nontrivial task. The stroke width transform was enough to capture text projected on a developable surface when the line of text was in the zero plane of the camera, but deviation from perfect images quickly reduced our algorithm performance. The algorithm is very successful in finding flat text, regardless of nonuniform lighting and color.

Deployment: Despite the steep learning curve, Android app development was feasible in our short time frame. It is a suitable device for promoting smartphone use in the laboratory.