Color Barcodes for Mobile Applications

April 23, 2012

Group members

- Henryk Blasinski - h.blasinski@stanford.edu
- Sam Fok - samfok@stanford.edu

Project description

Two dimensional barcodes, such as the QR code or Aztec code have been known for several years and have slowly been gaining popularity in a range of applications where machine readable interfaces are required [1, 2]. For example Aztec codes encode car details in registration documents in Poland, or constitute a machine readable part of flight boarding passes. While barcode standards allow for variable message length encoding, longer messages require a significant increase in the physical size of the barcode. For this reason, in most applications, the encoded character string is not longer than 30 characters.

In large majority of cases two dimensional barcodes are captured with digital cameras embedded in mobile phones or other portable imaging devices. These devices inherently capture color information and therefore only software changes are necessary to also enable the use of color for information encoding allowing for an information density increase. Recently, a few color barcode designs have been proposed, [3, 4] are just examples of different schemes. With the exception of the Microsoft Tag [5], all of these solutions are still under development.

A recent paper by [6] proposes an interesting methodology to extend any 2D barcode to color. Their method consists in embedding independent barcodes in print colorant channels (cyan, magenta, yellow) and printing them in an overlay. The decoding algorithm consists in estimating whether a particular colorant is present in a given pixel and reconstructing each of original barcodes in each of the layers. While the authors clearly describe their decoding algorithm and demonstrate a proof of concept, they do not address the applicability of their scheme to mobile applications where computational complexity and resources are critical. For example they are using large resolution RGB images, while a typical phone preview stream provides low resolution, luminance - subsampled chrominance image formats. In this project we are planning to implement the color barcode scheme as described in [6] in an Android phone and quantify this algorithm in terms of computational cost, decoding accuracy, bit error rates, decoding time etc.

References

[1] H. Kato, K. Tan, and D. Chai, *Barcodes for Mobile Devices*. New York, NY, USA: Cambridge University Press, 2010.

[2] H. Kato and K. Tan, "Pervasive 2D barcodes for camera phone applications," *IEEE Pervasive Computing*, vol. 6, pp. 76–85, Oct.–Dec. 2007.

[3] A. Grillo, A. Lentini, M. Querini, and G. F. Italiano, "High capacity colored two dimensional codes," in *Proc. of the 2010 Intl. Multiconference on Comp. Sci. and Info. Tech. (IMCSIT)*, pp. 709–716, Oct. 2010.

[4] K. Tan, D. Chai, H. Kato, and S. Ong, "A color 2D-barcode for mobile applications: Design tips," *IEEE Pervasive Computing*, vol. PP, no. 99, p. 1, 2011.

[5] D. Parikh and G. Jancke, "Localization and segmentation of a 2D high capacity color barcode," in *IEEE Workshop on Applications of Computer Vision (WACV)*, (Copper Mountain, CO, USA), pp. 1–6, Jan. 2008.

[6] O. Bulan, H. Blasinski, and G. Sharma, "Color QR codes: Increased capacity via per-channel data encoding and interference cancellation," in *Proc. IS&T/SID Nineteenth Color and Imaging Conference: Color Science and Engineering Systems, Technologies, and Applications*, (San Jose, CA), 7-11 Nov. 2011.