

Image Based Data Transmission between Smart Phones and Computers

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Description

Barcodes have been used extensively in our daily life. As an extension of barcode, the emergence of 2D barcode [1] which can hold more data than conventional barcodes enabled us using a scan to obtain URLs or more interesting information than a simple string of numbers. In this project, I want to take the 2D barcode one step further so that more data can be transmitted at one time.

Let's now think about cameras and screens on our smart phones. Other than the 2 spatial dimensions, there are two more dimensions we can easily capture by a smart phone camera and easily represent by a smart phone screen: color and time. If we represent data in the 4 dimensions mentioned above on a smart phone screen, and ask another smart phone to receive the data using the camera, data transmission can happen at a reasonable high speed:

Smart phones will have no difficulty in displaying and capturing a 240x180 array of squares. If we encode each square of the array in possible 4 colors, the single frame will contain more than 10kBytes of data. If processing power allows, the speed of data transmission can reach up to 100kBytes per second, which is considerable.

Moreover, the reconciliation between the two devices is quite intuitive here. No connection will be established and data safety is well under control of device owners.

Technical Details

The prototype will be implemented on my own Android phone and probably my computers. The technology used here should be similar to that in QR code readers. The receiver program has to first recognize the region where the code is displayed and align to the code. Then the code region has to be de-skewed [2]. (Preferably this part will be implemented in the GPU.) The last step will be decoding and some error correction coding [3] will be used in the design of the code.

References

[1] QR Code: http://en.wikipedia.org/wiki/QR_code

[2] Skew correction: <http://www.sciencedirect.com/science/article/pii/S1049965283710412>

[3] Parity check: http://en.wikipedia.org/wiki/Parity_bit