

## 2D barcodes

### ① Reed-Solomon codes

The two 2D barcode standards we're going to discuss are both more interesting than 1D bar codes from the perspective of coding theory because they both include error correction.

In particular they both use Reed-Solomon codes.

Briefly. When we made BCH codes

If you

Reed-Solomon code

This extra property gives Reed-Solomon codes extra mathematical structure.

eg

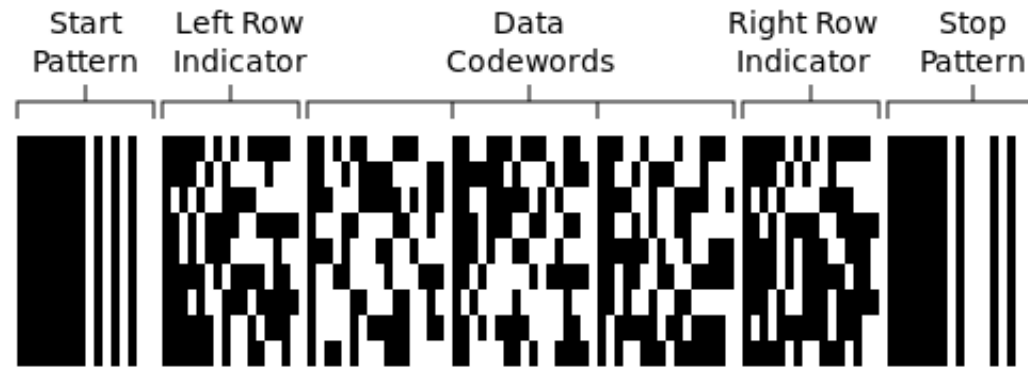
To find out more on Reed-Solomon codes see ch 7 of the textbook. (Also our project will discuss them)

② PDF 417

The 2D bar code on your BC driver's license is  
PDF 417

PDF 417 is

The 417 in the name refers to



We want to read this with a linear scanner but we may scan a bit diagonally so

This way if the scanner gets skewed you'll know that this happened and how much

There are 929 codewords and how these are mapped to message characters varies depending on the application.

For the error correction

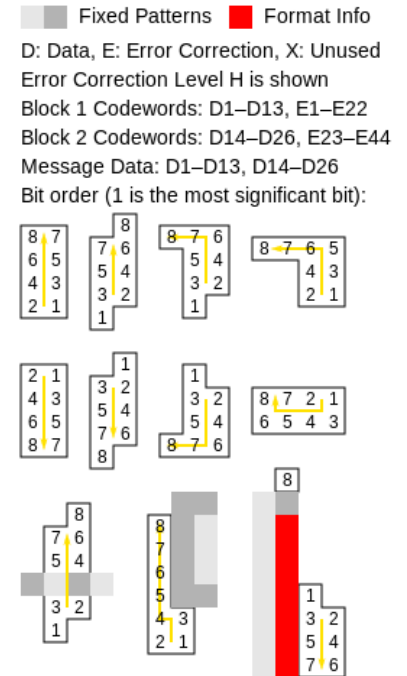
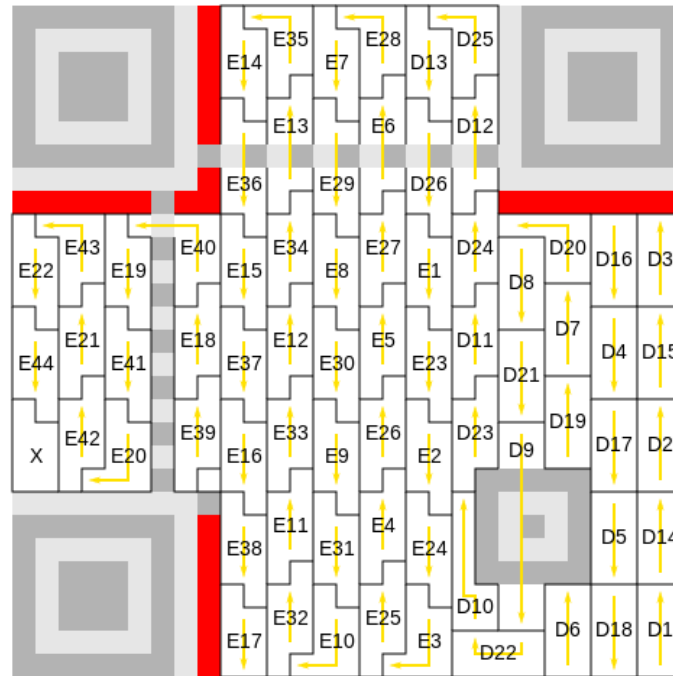
PDF 512 shows up on driver's licenses because it is an acceptable format for the US Real ID program

# ③ QR codes

QR codes are

The codewords are 8-bit blocks which twist around through the image.

As before we now switch to



The code could have read problems if the stuff in the middle had large black or white patches which look too much like the position or alignment blocks.

This is solved with

The format info sections encode

So how much of a QR code CAN be missing?



## Sources

<http://en.wikipedia.org/wiki/PDF417>

[http://en.wikipedia.org/wiki/QR\\_Code](http://en.wikipedia.org/wiki/QR_Code)

<http://keremerkan.net/qr-code-and-2d-code-generator/>