Recently, there has been great development of the technology in smart pocket devices like smart phones and tablets, and these devices have become very popular. Since most of these devices have a camera, one way to share data between users can be the sharing of a readable picture, in other words, a code. There is 1D code, like a Universal Product Code (UPC) to share data.

However, the storage capacity of 1D code is very low, and it cannot store content like a website link. In order to have a great increase in storage capacity, the most effective way is to increase the dimensions of the code. In this project, we tried to increase one more dimension to a QR code by using color as the 3rd dimension in Matlab.

Algorithm to insert color
One of the important parts of the color QR code algorithm is to design the way to insert color. Unlike normal QR code, we have designed a different way to insert the color. We have a different design because it is easier to be implemented.

Selection of color
Another important part of the color QR code algorithm is to select colors. Since we aimed the new algorithm can also decode the normal QR code, the way we choose the colors becomes essential. In order to match the property we aimed, the colors chosen are the following, which have only two grayscale representing a 'black' and 'white'. We used 8 colors for each of the modules, which in digital representing 3 bits.

Advantage
For normal QR code, some decoder may not decode the QR code with version 31 or higher because it contains too much dark and white modules and camera cannot distinguish them. The size of version 31 QR code is 141x141 modules, and it contains 2323x8 = 18584 bits. However, Color QR code only use version 14 to store 18584 bits. This is because the storage capacity is increased by 3 times compared with normal QR code.

Disadvantage
Although the storage capacity is dramatically increased, the reliability of the new color QR code is low. Here are the result of the test of the color QR code:
1. Outdoor experiment:
   Average error probability = 1.585E-03
2. Indoor experiment
   Average error probability = 7.402E-03
3. Indoor experiment without turn on the light
   Average error probability = 0.803