QR code is a two-dimensional barcode. A standard QR code can contain some information, but it is quite difficult to embed a different element into the design, because it will look like a separate element. This article describes the algorithm that allows you to style a QR code.

QR code benefits

The advantages of QR codes are:

1. Information density. I.e. the information is arranged very compactly.

2. Orientation independency. Each QR code contains 3 markers at corners that allow a reader to find the orientation.

3. Error correction. The information stored in a QR code is slightly duplicated (from 5 to 30%). So even if a QR code was damaged all the original information can be restored.

4. Any type of stored information. The list of available formats is limited only by those that are supported by a reader.

How to make a styled QR code?

A regular QR code looks like this:
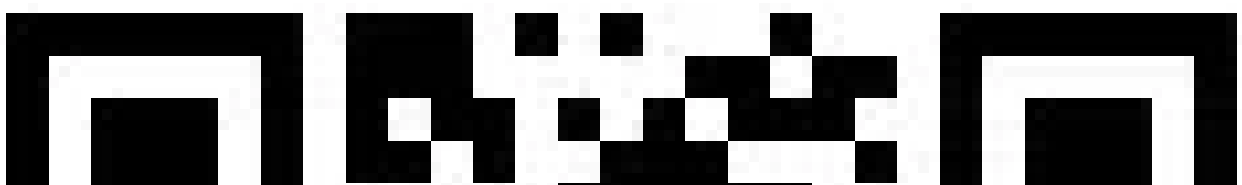
But this QR code can be styled, i.e. we can apply a background colour or image, foreground colour or picture, a custom style for corner markers, implement a style for each small QR code block, embed an image/logo into the QR code. All these operations are possible due to an error correction algorithm. So while the QR code style is not greater than the error correction limit – the QR code will be readable by any reader. The more error correction data we store in the QR code the more transformations we can apply to the QR code. But it is quite hard to predict the limit when the QR code becomes unreadable – this can be tested only by a reader. For example, we can create a QR code that looks like this:
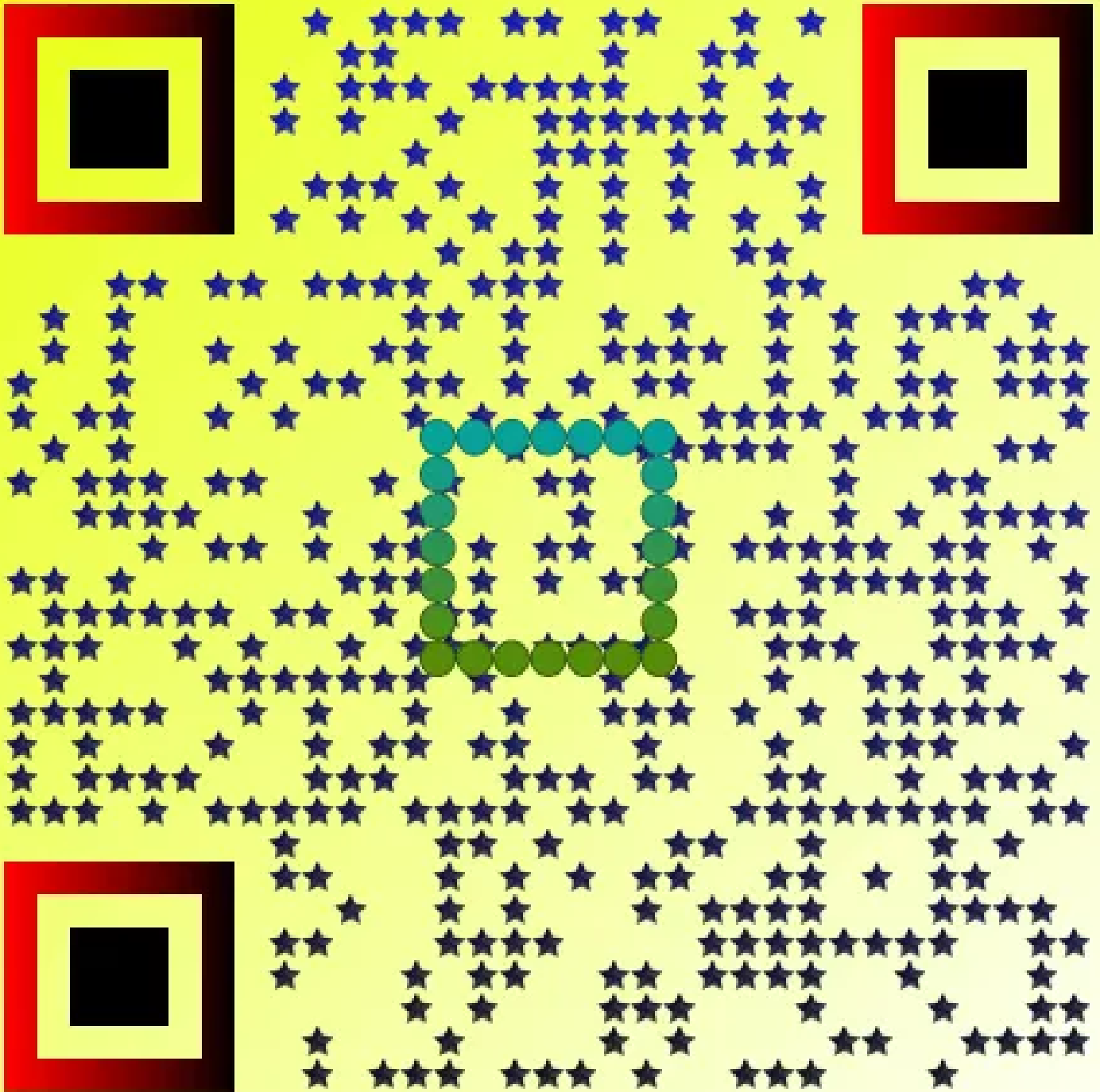
QR code stylisation algorithm

Let's describe the algorithm that allows applying stylisation to a QR code generated in a standard way. To develop a styled QR code generator we took a standard QR code generator that creates regular QR codes as shown above. Next we split the QR code into 4 layers:

1. Background

2. QR code content image

3. QR code content mask

4. Foreground which includes corner markers and overlay images.

The QR code generator creates all four layers separately and then combines them to make a complete QR code. At first, we create a foreground image:
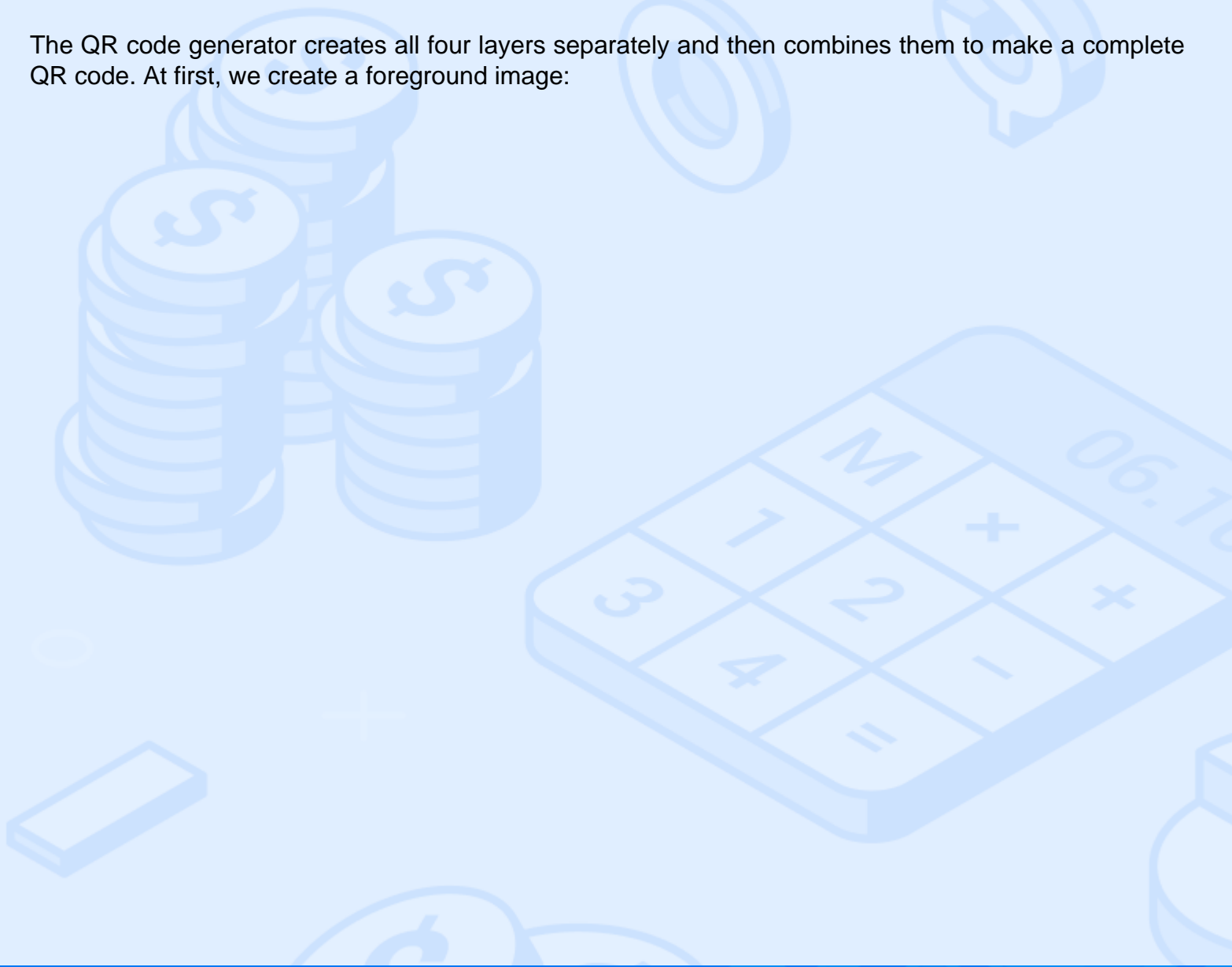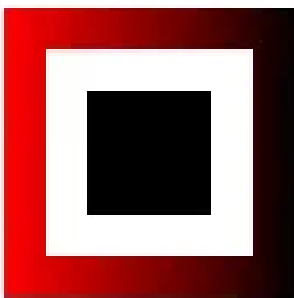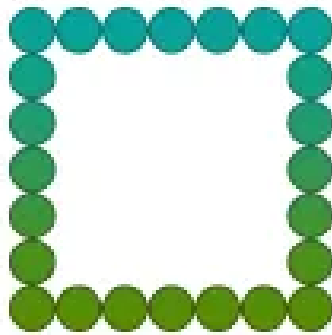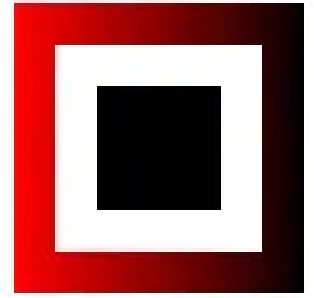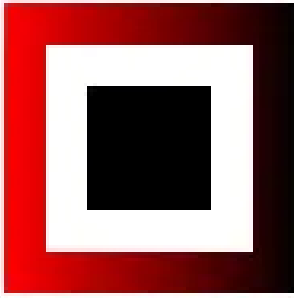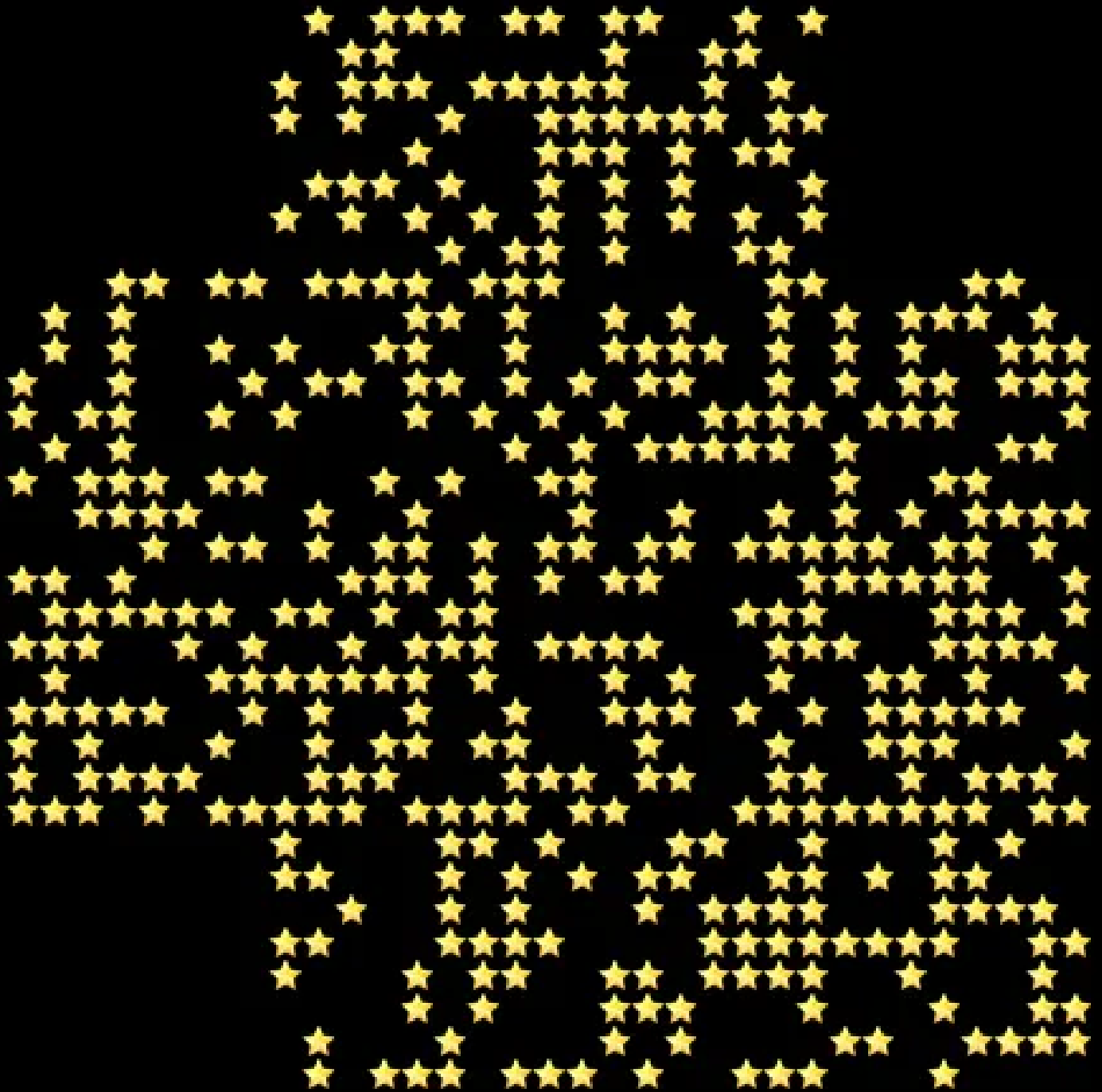
After that we create a QR code content image:

info@magora.co.uk
sales@magora.co.uk

A QR code mask image is just a generated QR code without corner markers where each block is replaced by a mask image, e.g.:
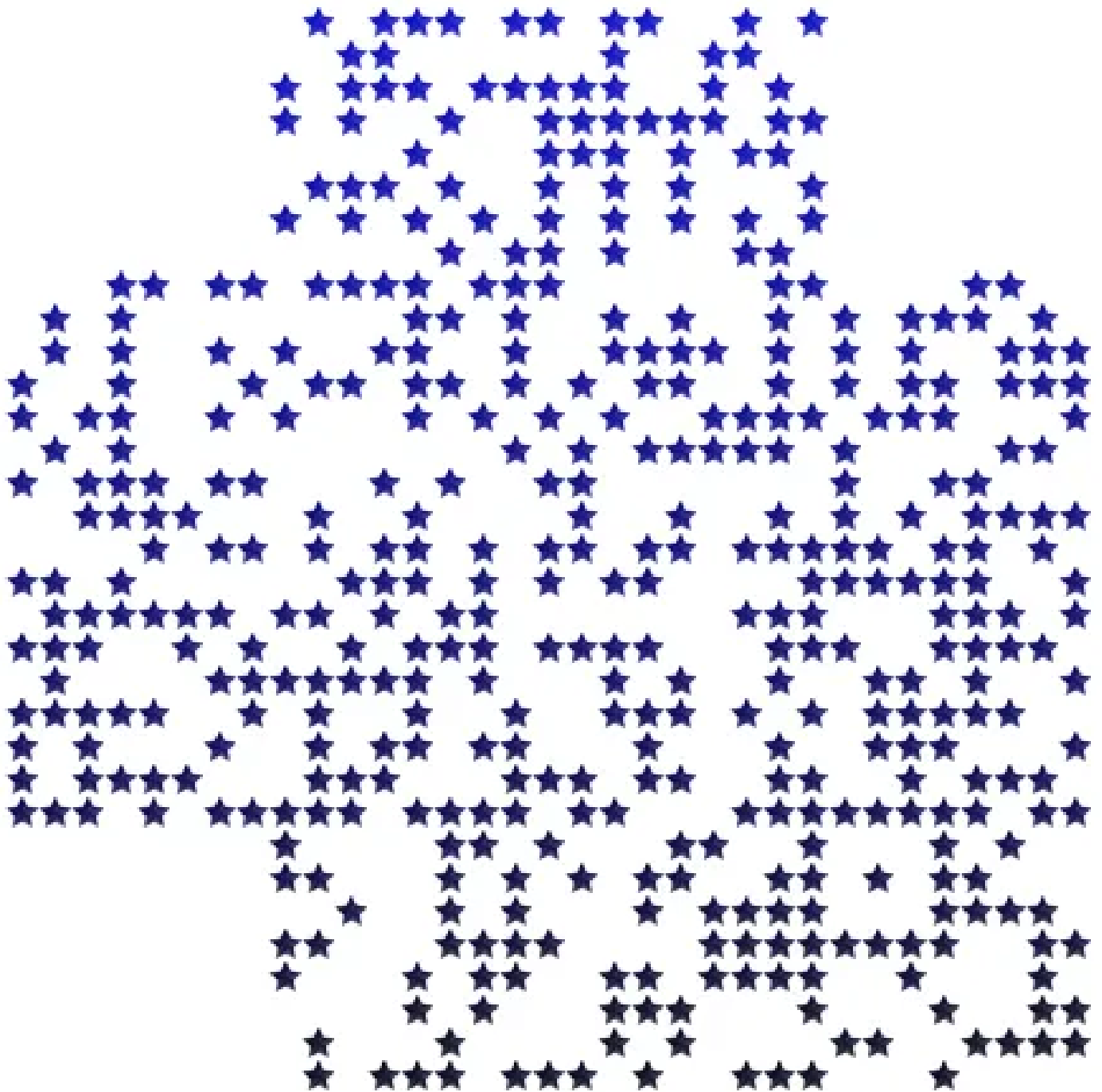
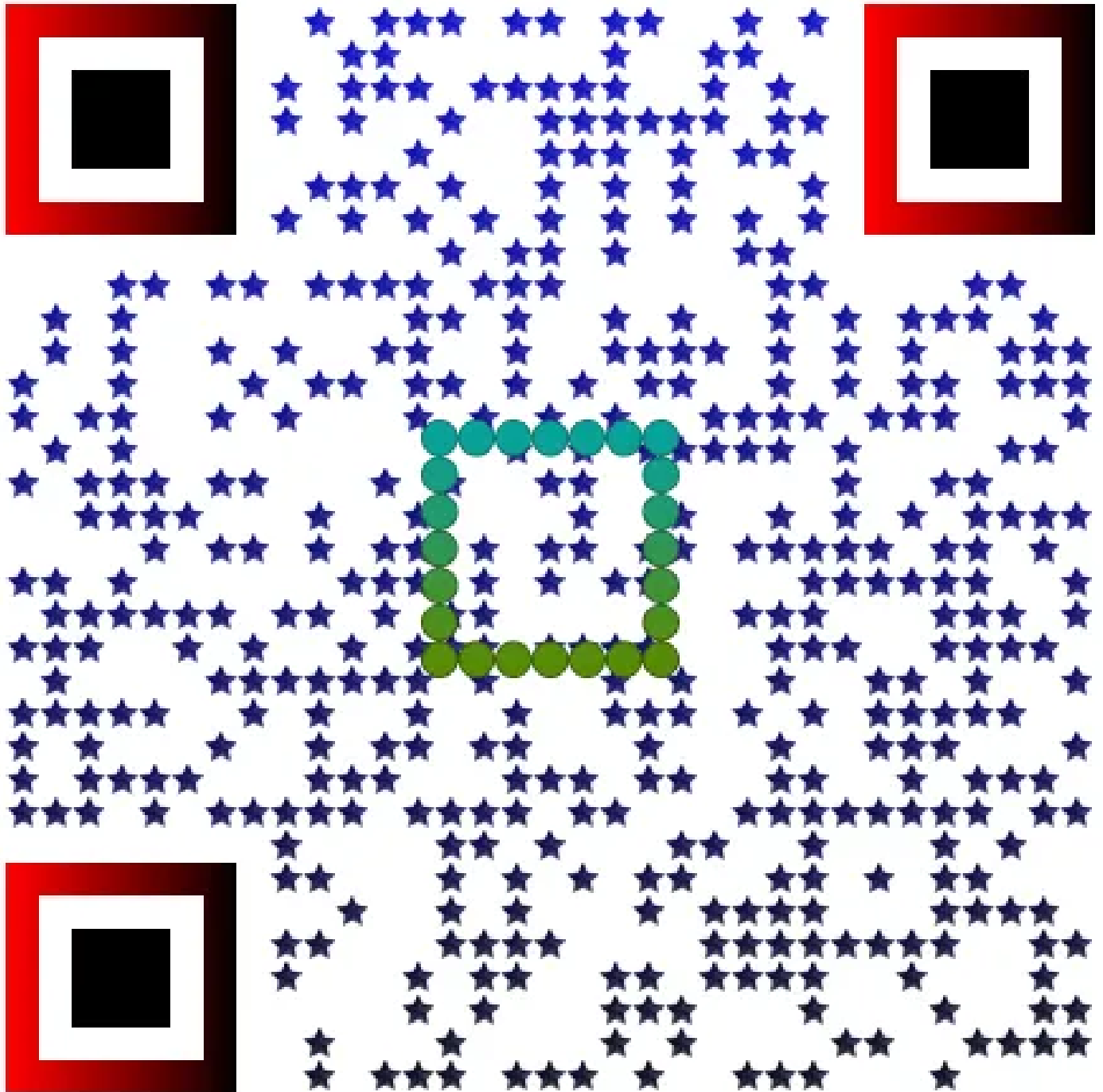So as a result, we receive the following mask:

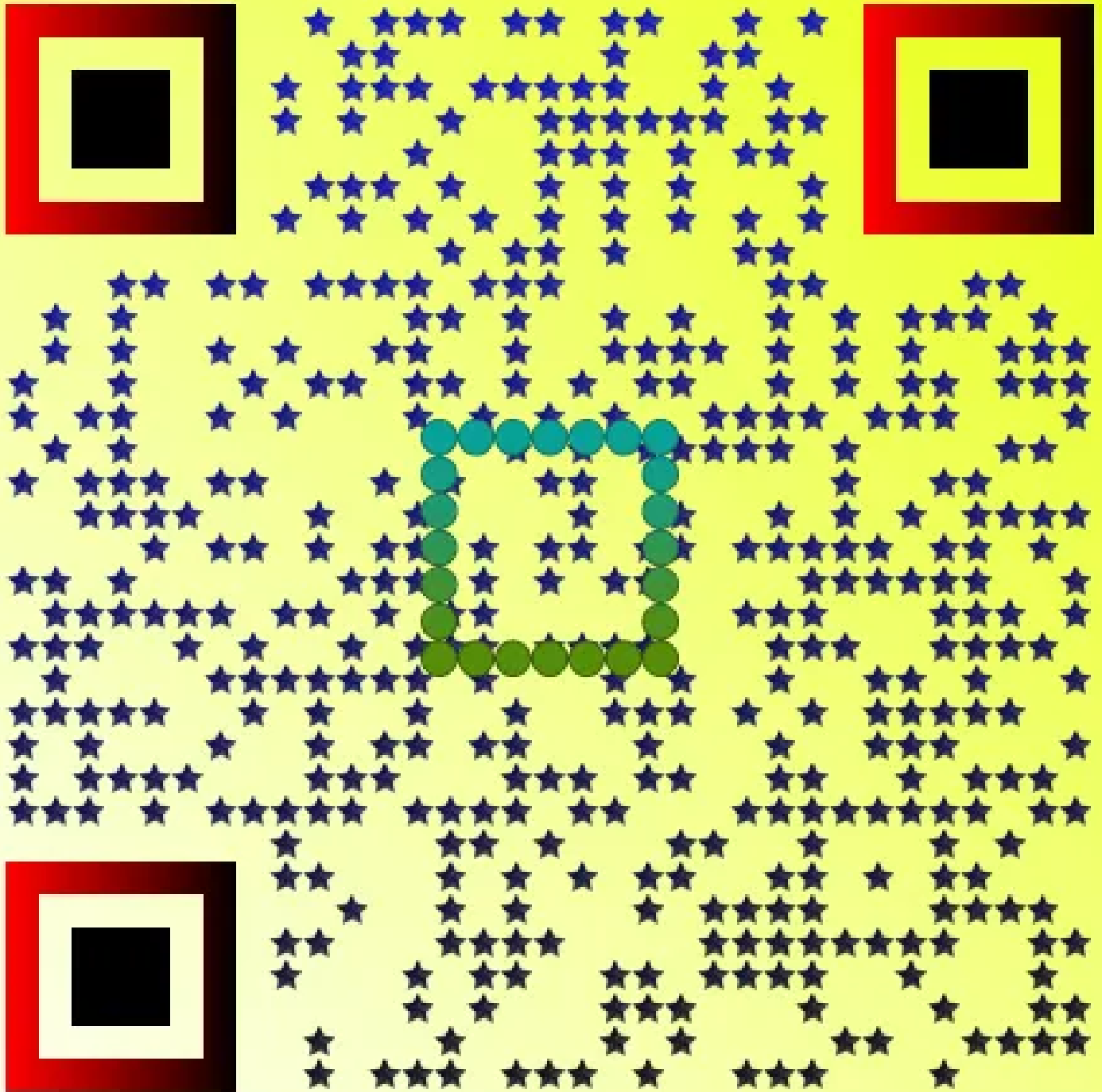After that we combine the mask and the QR code content image we receive the following image:

The combination of the previous image and the foreground elements gives an almost complete QR code:

Only one step remains: to add a background image. We just draw a background in a separate image:

And combine the last two images:

Now we have a completely styled QR code. As you can see this algorithm allows you to apply many different styles and customisations using simple operations with separate layers and to receive a completely styled QR code after combining these layers. By using this algorithm it is possible to create

QR codes that can be easily integrated into any design. Also a QR code can contain a company's logo. To develop this generator we used an open source QR code generator and an AForge library to the modify images and create the gradients and masks. If you need to code something special - our app programming team is ready to help.