

# CAPTCHA Formation with Warping and Random Number Generation

Muhammad Umer Kakli

Electronics and Telecommunication Research Institute,  
University of Science and Technology,  
Daejeon, South Korea  
Email: [umar.isb@gmail.com](mailto:umar.isb@gmail.com), [umar.isb@etri.re.kr](mailto:umar.isb@etri.re.kr)

Saeed Ullah

Korea Institute of Science and Technology Information,  
University of Science and Technology,  
Daejeon, South Korea  
Email: [saeedonline12@gmail.com](mailto:saeedonline12@gmail.com)

**Summary**— Completely Automated Public Turing test to tell Computers and Human Apart (CAPTCHA) is a test used in computing to check that whether the user is human or not. Typically, a distorted random sequence of alphabets and numbers is shown the user, and then asked to enter those alphanumeric values, and finally it is compared with the original alphanumeric values for verification. In this report, we utilized OpenCV to automatically generate a CAPTCHA sequence based on warping and random number generation.

## I. INTRODUCTION TO CAPTCHA'S

In recent years, we have witnessed tremendous advancements in mobile phone and internet technology. We can retrieve the information from anywhere in the world with just few clicks. In this era of globalization where such inventions and progressions improved our daily life quality on one hand, the risks and frauds involved in cyber world cannot be overlooked on the other hand. With every passing day numbers of cybercrimes are increasing. Researchers are trying to build more reliable and secure systems. One of the challenges in cybersecurity domain is the 'success of deep learning and artificial intelligence'. Deep learning algorithms are intelligent enough to breach the security systems. One of the basic idea to prevent from automated cyber-attacks is the use of CAPTCHA's. The alphabets and numbers in CAPTCHA image are distorted too much that it is not easy for recognition algorithms to accurately recognize the alphanumeric values. Some of the CAPTCHA images are shown in Figure 1.

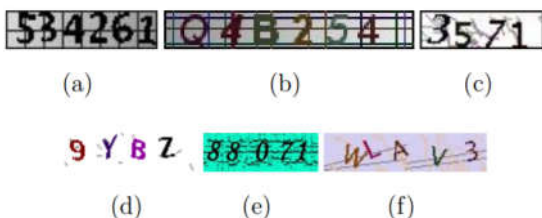


Figure 1. Some sample CAPTCHAs

In this report, we have utilized OpenCV's warping function and Random Number Generation (RNG) class to automatically generate a CAPTCHA image. Firstly, we used warping to distort the image from its original shape. The input image is warped to a randomly selected plane. This is done by using 'warpPerspective' function. After warping, we further rotate

the image with random angle up to 30 degrees to make it robust but readable. We used 'warpAffine' function to achieve the rotation task. Once both transformations are done we further applied salt and pepper noise so that it becomes strong against automatic character recognition algorithms.

## II. RESULTS AND DISCUSSION

The environment used for this program is Microsoft Visual Studio 2010 and OpenCV 3.2.

Figure 2. shows the transformations applied to one character of CAPTCHA

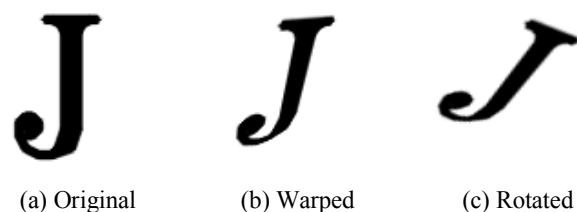


Figure 2. Transformation of one character

Length of total number of characters in CAPCHA can be vary from application of application. In our experiments we used five character CAPCHA. Different random values for warping plane and rotation angle are applied to each character. Once all five characters are concatenated salt and pepper noise is further added. Figure 3. shows the final CAPCHA image.

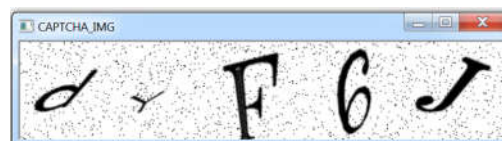


Figure 3. Final CAPCHA Image

## III. CONCLUSION

A very simple approach based on warping, rotation and salt & pepper noise is used to generate a CAPCHA Image. OpenCV also provides various functions for drawing apart from traditional image processing functions which are easy to use. By adding random colors or drawing random line over the image could increase the CAPCHA strength against cyber-attacks.