

## Tricerion SMART

### Strong Mutual Authentication & Anti-Robot Technology

Tricerion SMART is the most advanced and usable solution to the problem of robot registrations to online web services – a growing menace to e-business.

### CAPTCHA – Completely Automated Public Turing test to Tell Computers and Humans Apart

The leading method of determining whether the user is a human or a machine is known as CAPTCHA. In this approach an image of a distorted word, number or alphanumeric sequence is displayed and the user is asked to retype what they see into a form (see Figure 1 for an example). The idea is that a computer cannot decrypt the distorted image while a human can. This works reasonably well in practice against the simpler robot scripts, but in theory anything a computer can create, it can analyze. Scripts now exist to decrypt many CAPTCHA images with an alarmingly high percentage of success.

Many different web sites use the same CAPTCHA algorithms to create the image to be displayed. Many scripts writers are starting to use humans to train CAPTCHA-breaking algorithms or even to replace them. A human follows a link offering a free item, such as an iPod, and the page request that the user decrypts a CAPTCHA image. What is happening can be one of two things. First, the innocent user could be helping to teach a script how to decrypt the image generated by this CAPTCHA algorithm. Second, the user could be entering the value of a CAPTCHA taken from a page on another site on which the robot is currently trying to enroll.



Users almost universally hate CAPTCHA for two reasons. First, it can be quite difficult for users to figure out what a distorted image says. Second, and more seriously, users tend to react negatively to requests to carry out actions they don't understand, and this is true for many users in the case of CAPTCHA.

CAPTCHA poses serious problems for accessibility, since for users with a visual impairment it effectively locks them out of CAPTCHA-protected registrations.



#### Castleforce IT Consultancy Ltd

Registered Office: The Summit, Thorsway, Caldby, Wirral, CH48 2JJ Tel: 0151 2031400

Sales Office: Enterprise Centre, University of Reading, L33 London Road Campus, London Road, Reading Berkshire, RG1 5AQ Tel: 0118 9071600

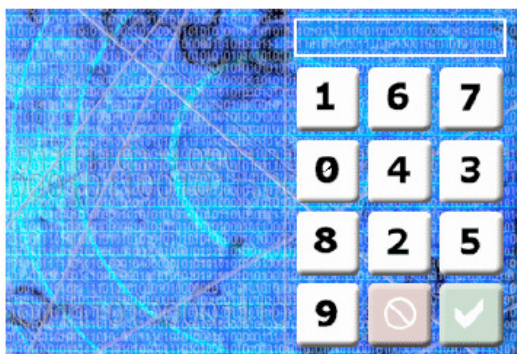
Company Registration No: 5935861 VAT No. 899948123

Email: [info@castleforce.com](mailto:info@castleforce.com) Web: [www.castleforce.com](http://www.castleforce.com)

## Advanced Registration Protection using Tricerion Keypads

The Tricerion SMART Anti-Robot system uses Tricerion's SMA platform to generate a unique, one-time code for users to enter on a virtual keypad with shuffled keys (e.g. Figure 2). To confirm that the user is human, the correct keys with the correct values must be entered. This process is highly usable, while providing excellent protection against robot entry thanks to a combination of key position shuffling and sub-visible key image distortion, which is very hard for robots to process. Further network profiling capabilities built into the SMA platform provide additional protections against the “free iPod” type of scam.

Please input on the keypad  
the following digits: 012718



**Figure 2:** SMART numeric keypad

### 1. Input instructions.

The anti-robot system generates a unique number to authenticate the user request at the transaction level.

### 2. User Input on a Randomized Keypad

The confirmation number is entered on a randomized keypad.

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## Image-Based Anti-Robot System

This approach can be taken to a higher level of robot resistance by asking users to perform a conceptual mapping task rather than just a string entry task. In this case a non alphanumeric keypad is used for input, providing an unlimited open set of available symbols.

Human users can easily understand the sequence of words “Hand, Glass, Wrench, Scissors” and be able to select corresponding images on a keypad (e.g. Figure 3). However, this task is very much harder for an automated system, which would have to know the precise images first, and all reasonable descriptions of them, and then it would have to be able to analyze the keypad and locate sub-visually distorted versions of these images, in order to be able to complete the registration process.

**Please input the buttons  
representing these concepts:  
*Hand, Glass, Wrench, Scissors***



**Figure 3:** SMART conceptual keypad

Since the database of symbols can be arbitrarily large, and symbols can be placed anywhere on the keypad, the knowledge and processing requirements for a robot become very much larger than in conventional automated registration systems. We believe automated attempts to bypass the Tricerion SMART system to be effectively prohibitive to who want to abuse online services.

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