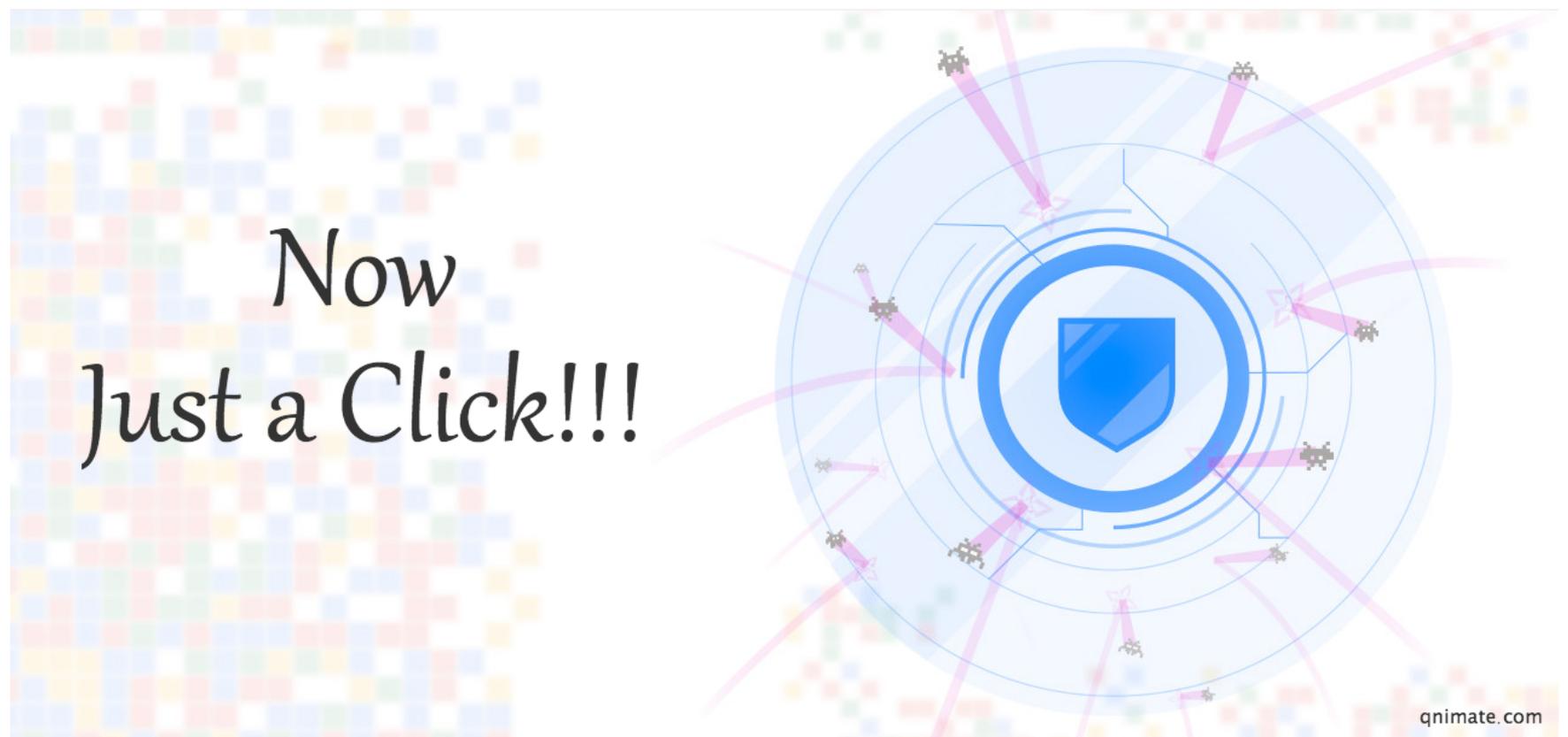


How does Google's No CAPTCHA reCAPTCHA work?

Narayan Prusty

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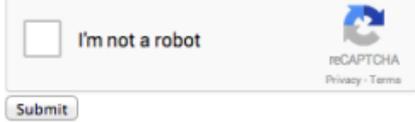


Many websites have started integrating [Google's new No Captcha reCaptcha](#). It has a better anti-bot protection and user experience.

Most don't know how it actually works. In this article I will explain various techniques used by Google to detect bots.

Is it a check box?

Google asks users to click the check box to verify that they are not bot. Even a bot can click a check box so how does it protect? Well it's not actually a check box; it's a div inside an iframe.



```
<!DOCTYPE html>
<html>
<head>...</head>
<body>
  <form method="post" action="trial.php">
    <div class="g-recaptcha" data-sitekey="6Lf1wP4SAAAAABry5K59KW0vg_SPItGyRy6CLrZe">
      <div>
        <div style="width: 304px; height: 78px;">
          <iframe frameborder="0" hspace="0" marginheight="0" marginwidth="0" scrolling="no" style="border: none; width: 304px; height: 78px; border: 1px solid #c1c1c1; margin: 0px; padding: 0px; resize: none; display: none;" src="https://www.google.com/recaptcha/api2/anchor?k=6Lf1wP4SAAAAABry5K59KW17702478828&parent=http%3A%2F%2Fflabs.qimate.com&fname=6rcptoken=42010604">...</iframe>
          <div style="width: 250px; height: 80px; border: 1px solid #c1c1c1; margin: 0px; padding: 0px; resize: none; display: none;">
            <input type="checkbox" value="true" style="width: 100%; height: 100%; border: none; margin: 0; padding: 0;">
            <input type="text" value="true" style="width: 100%; height: 100%; border: none; margin: 0; padding: 0;">
          </div>
        </div>
      </div>
    </div>
  </form>
</body>
</html>
```

It actually creates a virtual checkbox inside the iframe, and the user clicks the virtual check box. Google also inserts an invisible text area inside the form. Google populates the text area with a unique value indicating whether the user is a bot or not. We will see how it finds bot or not later on in this article.

Text inside the text area is a unique value, true and false indicating human or bot, is stored in Google servers. We need to retrieve the boolean using this unique value once form is submitted. And then act accordingly.

Why can't bots emulate mouse click?

Most bots don't run JavaScript therefore they won't see the reCaptcha and therefore no text area is embedded. We can detect this server side and find its bot or not by checking if text area is present or not while submitting the form.

There are some bots who run JavaScript code. But they will not click on the virtual checkbox because it's not a checkbox for them; it's just a graphics.

If you design a bot specific for a website, then obviously that bot can emulate a mouse click. Emulating a mouse click is not enough to bypass this security.

There are a lots of other things that Google considers.

Factors on which Google depends to detect bots?

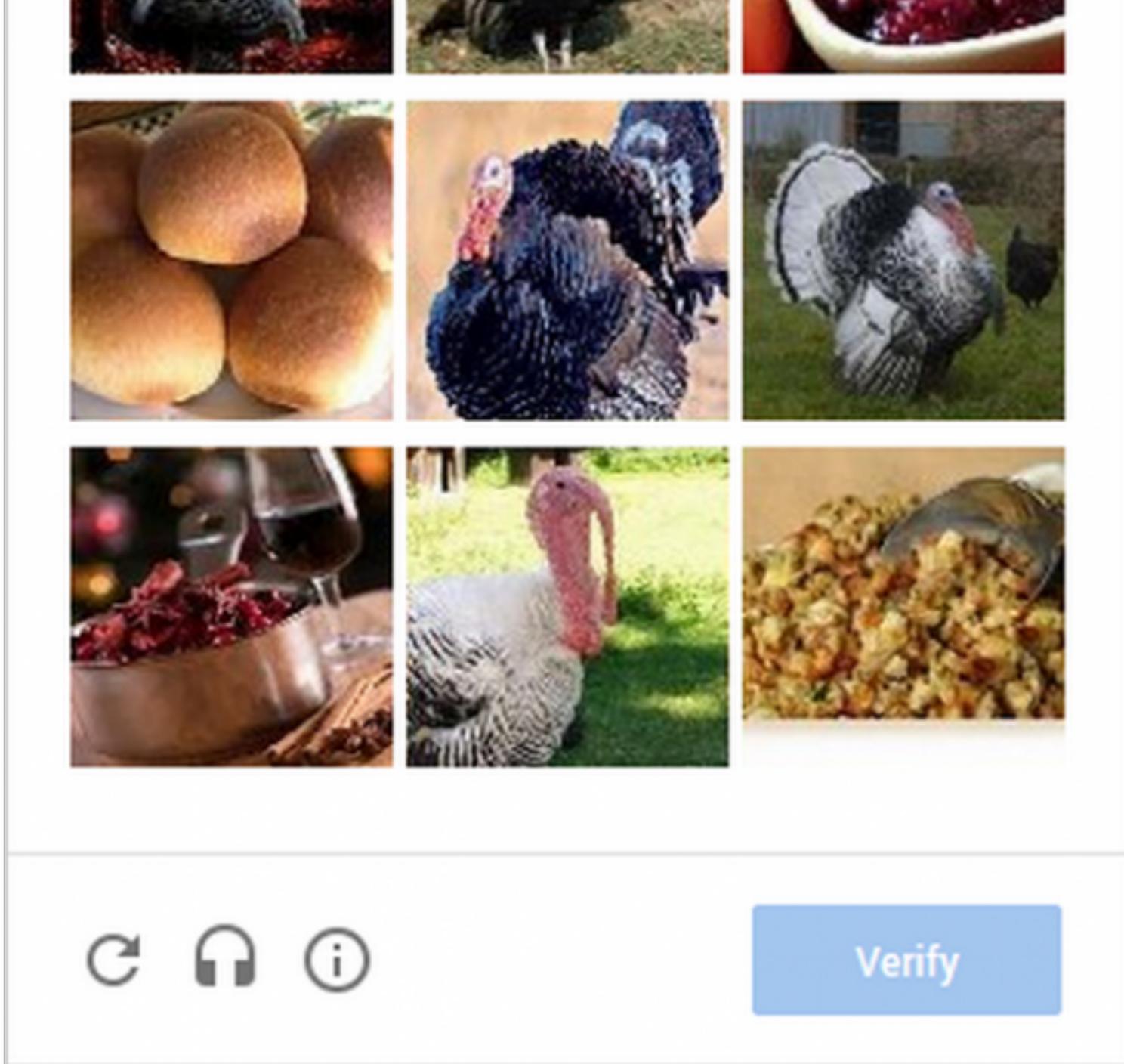
Clicking on the virtual checkbox is not the only factor. Google also relies on the pattern of movements of a mouse that differentiates humans and bots. It looks for overall user engagement with the captcha. It also uses user-time-on-page algorithms, bots' IP addresses database, HTTP referer, number of requests etc. We still don't know all the methods used by Google to detect bots.

Google's new reCaptcha also uses algorithms of Google Analytics and Google AdSense to detect bots. Google Analytics' detection methods prevent bots from increasing page views, and Google AdSense algorithms prevent fraud clicks on ads.

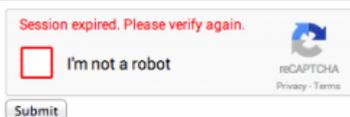
What if it's unsure?

Sometimes Google is unsure whether it's a bot or human submitting the form. In that case, it asks the user to validate the old style captcha in desktop and image style for mobile phones.

On Desktop



Once it displays this extra validation step, it also starts a form expiration timer. This is done to prevent bots from solving CAPTCHAs.



```
Elements Network Sources Timeline Profiles Resources Audits Console
<!DOCTYPE html>
<html>
  <head>...</head>
  <body>
    <form method="post" action="trial.php">
      <div class="g-recaptcha" data-sitekey="6Lf1wP4SAAAAABry5K59Kw0vg_SPItGyRy6CLrZe">
        <div>
          <div style="width: 304px; height: 78px;">
            <iframe frameborder="0" hspace="0" marginheight="0" marginwidth="0" scrolling="no" style="border: none; width: 304px; height: 78px; border: 1px solid #ccc; margin: 0px; padding: 0px; resize: none; display: none;" src="https://www.google.com/recaptcha/api2/anchor?k=6Lf1wP4SAAAAABry5K59Kw...></iframe>
          </div>
          <div style="width: 250px; height: 80px; border: 1px solid #ccc; margin: 0px; padding: 0px; resize: none; display: none;"></div>
        </div>
        <input type="submit">
      </form>
      <div style="display: block; visibility: hidden; position: absolute; width: 106px; left: -10000px; top: -10000px;">
        <table cellpadding="0" cellspacing="0" dir="ltr" style="width: 106px; border: none;" class="gc-bubbleDefault pls-container"></table>
      </div>
    </body>
  </html>
```