On the development of a web extension for text authentication on Google Chrome

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***Abstract*—Web extension is a software that can be installed on a web browser. A web-extension link is displayed as an icon on the toolbar of the browser. Based on browsing activity, the extension works automatically or by clicking the extension icon depending on the functionalities made in the extension software. In this work, we developed a web extension on Google Chrome browser to verify online texts by simply clicking on an extension button. Upon clicking the button, the underlying algorithm in the extension software retrieves the texts from the current web-page being displayed. Verification and authentication of texts are performed by comparing the retrieved texts with text database. According to the comparison, texts are highlighted in colors. We consider authentication of Arabic Hadith texts for a case study. The authentic Hadith texts are highlighted by green color; authentic texts with partial diacritics, by yellow; and unauthentic texts, by red. This technique can also be used to authenticate laws, constitutions and Government documents in any language.**

Keywords—web extension, web programming, text authentication, Hadith texts

I. INTRODUCTION

Web extension is a collection of computer programs with design scripts that expand the capabilities of a web browser in diverse ways. The web extension is written using web development languages such as CSS, JavaScript and HTML. The web extension in Google Chrome (or Mozilla Firefox) is also known as plug-in or add-on based on the browser and the version.

A web extension is made up of a collection of functional files that are combined as a package for circulation and installation. The packages are made available online for sharing with users and thus, they become ready for installation with the browser. There are many popular extensions for Google Chrome such as Ultimate Shopping Search, AddBlock, Hangouts, Google Translate and Ginger grammar checker [1].

Ultimate Shopping Search [2] helps to find the items what are looked for. This extension provides fast and effortless exploration and recommendation of some stores for shopping relevant items. Using the extension, one finds the opportunity to purchase the better items rapidly.

AdBlock [3] is a web extension available for Google Chrome, Mozilla Firefox and Opera. The primary objective of AdBlock is to remove all advertisements from our browsers e.g., Facebook-, Animated-, YouTube-, Autoplay-sound-, Pop-up-, Banner- and Background-ads.

A web-extension, Gospik [4] allows linking on Google with other people looking for the same contents. It is a public network based on online searches. Using Gospik, users can post the messages or requests about anything to anyone on Google search web page. This extension makes Google search interactive.

Bingoo [5] supplies users with powerful, but simple tool to use mapping technology and business information e.g., company areas, contact information and ratings regarding the map. It also provides extra information such as, pictures, reviews, and hours of traveling for a business place. Furthermore, this extension assists to find the information of driving, cycling, transit and walking direction to the destination from a start location.

Speechlogger [6] is a speech recognition and instant voice interpretation web extension. This app converts voice to text and translates text to a different language and then converts the translated text to sound. Similarly, it saves timestamps, helps to perceive sound, generates subtitles, and transcribes audio files.

Ginger Grammar Checker [7] is a web extension for writing better English texts efficiently. Ginger corrects the sentence structure, grammar, spelling and reference marks. The extension can rephrase texts, rapidly translate text to

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about 40 different languages, immediately provide definitions and synonyms and live corrections.

Unlike the mentioned above extensions, we want to develop a web extension to verify the authenticity of online Hadith texts. In the present era, the Internet has become an integral part of our daily lives and the global interaction systems have become attractive with user-friendly interfaces that make the message delivery and posting extremely easy. However, there is a dark side of these systems i.e., somebody can easily manipulate, amend and counterfeit the actual contents creating a havoc to groups or individuals. In the current research, our aim is to verify the authenticity of texts posted on websites. Many authentication techniques exist now-a-days to verify the authenticity of texts of different languages e.g., English [8], Chinese [9], Devanagari [10], and Arabic [11-12]. Alginahi et al. [13-14] worked on authentication and verification of Arabic texts using zero watermarking. Recent interesting related works are found as follows: Chen et al. [15] proposed a text watermarking algorithm based on semantic role labeling, Rizzo et al. [16] presented a content-preserving text watermarking approach through Unicode homoglyph substitution, Taleby et al. [17] described an innovative technique for web-text watermarking, and Kabir et al. [18] worked on developing algorithms for web-based Hadith authentication.

In this work, we developed a web extension to verify texts on a website under Google Chrome browser. In particular, sensitive Arabic texts i.e., Hadith texts are considered and authenticity is verified. The authentic texts are highlighted by green color; authentic texts with partial diacritics, by yellow; and unauthentic texts, by red.

The rest of the paper is organized as follows. Section II presents the fundamentals of web-extension design. Section III describes the methodology of building the web extension for authentication of online texts. A case study on Arabic Hadith authentication is provided in section IV and the test result is presented in section V. Section VI concludes the paper.

II. WEB-EXTENSION DESIGN FUNDAMENTALS

A web extension consists of HTML, CSS and JavaScript files which add some functionalities of the web browser. A web extension in Chrome environment requires a manifest file in json format namely manifest.json. The manifest is just a metadata file which contains the basics of an extension e.g., its name, description and version number. The extension also needs an icon (typically 19x19px PNG image) to be shown on the web browser as a button for the extension. Furthermore, an HTML file popup.html incorporates a JavaScript file popup.js that is used for the browser action [1].

A typical manifest file manifest.json can be given in Script 1. In script 1, browser_action includes an image icon.png that will act as an icon to the extension button on browser toolbar. The image must be located in the same folder of manifest.json. Furthermore, a popup file is included in browser action to link with the extension programs. Finally, permissions provide permission to access the URL of the current tab.

The next step is to link popup.html defined in browser_action with the JavaScript program popup.js that comprises the extension functionalities. Popup.html is also used to design the user interface for the extension functionalities. A typical popup.html can be given in Script 2. The script popup.js sets the logic for the extension that will execute when the extension button is clicked. The last step is to develop the extension to write the program that would execute when a user clicks the extension button.

Script 1: manifest.json

```
{
"manifest_version": 2,
"name":"Web extension for Hadith authentication",
"description": "This extension will verify whether the displayed Hadith texts are authentic or not",
"version": "1.0",
"browser_action": {
"default_icon": "icon.png",
"default_popup": "popup.html"
},
"permissions": [
"activeTab"
]
}
```

Script 2: popup.html

```
<!doctype html>
<html>
<head>
<title> Web extension for Hadith authentication </title>
<script src="popup.js"></script>
</head>
<body>
<h1> Hadith-authentication program</h1>
<button id="AuthenticateHadith"> Authenticate Hadith in this webpage</button>
</body>
</html>
```

Script 3: popup.js

```
chrome.browserAction.onClicked.addListener(
function(tab) {
chrome.tabs.executeScript(tab.id,{code:"var html = document.getElementsByTagName('html')[0];"
  + "text =html.innerText;"+ "text;"},
   function (result) {
     tabText  = result;
     console.log(tabText);
   });
   alert(fileText);
 var rawFile = new XMLHttpRequest();
rawFile.open("GET",
chrome.extension.getURL('mytext.txt'), true);
rawFile.onreadystatechange = function (){
   if(rawFile.readyState == 4){
        if(rawFile.status == 200 ||
              rawFile.status == 0){
         fileText = rawFile.responseText;
         console.log(fileText);
        }
 }
 }
 rawFile.send(null);
 alert(tabText);
});
```

A typical code in popup.js is given in Script 3. This script will read the text content of a webpage and read a text file

mytext.txt located in the same folder of popup.js and show both the contents. In line 2 of Script 3, the function executeScript will run the code defined inside the function in that text content of the current webpage is read and stored in tabText. Then, the alert function will show the text content on the display window. Next, the file mytext.txt will be opened and its text content will be read and stored in fileText. Finally, the content will be displayed.

Hence, five files: icon.png, manifest.json, popup.html, popup.js and mytext.txt will be in the working directory which can be loaded into Chrome. First, we visit chrome://extensions in our Google Chrome browser. Then the developer mode checkbox is selected in the top-right corner of the browser. A file-selection dialog is popped up by clicking load unpacked extension where the directory of the extension files is selected. After this step, the extension will ready to work.

III. Methodology

The prime intention of this work is to develop a procedure for online (Arabic) text authentication by a web extension using a fast algorithm. Algorithm 1 presents the authentication procedure that works with two phases: A and B.

Algorithm 1: **Text Authentication Procedure**

Input: Website containing possible text from the source.
Output: Marked text with color indicating authenticity.
Phase A: Identify the Arabic texts

1. Read all the texts of the current tab of a browser (visiting website).
2. Check whether the text is in language L or not. If the text is not in L, then stop the program. Otherwise, continue to the next step.

Phase B: Check whether the text letters are from a source database

3. Verify whether the texts match with text database. If they do not match more than 95%, then stop the program. Otherwise, proceed to the subsequent step.
4. If the texts match with text database is not 100%, this may be imitation of the source texts with mistakes, and therefore, the texts will be highlighted with red and stop the program. Otherwise, texts will be colored as green implying that the texts match exactly with text database

In phase A, web-texts from the current Tab of the browser are read as Unicode values [19] and checked for the availability of any Arabic text. If no Arabic text is found, the program stops.

Phase B begins if Arabic language is discovered. In this phase, the texts are checked with text-database with the same idea presented by Kabir et al. in [20]. If there is no match, the program stops which indicates that the texts on the website are not from the text source. If the texts match 100%, the texts are authentic and are highlighted as green indicating that the texts are from authentic source. Otherwise, if the texts match 95%, then the texts will be highlighted with red. Next, the algorithm is coded into JavaScript functions and integrated with the extension program popup.js as described in the previous section.

IV. Case Study

We carried out a case study with online Hadith texts to verify our web extension. The Hadith database must be built from authentic sources. Additional considerations are required in phase B of Algorithm 1 to verify Arabic text authentication. Arabic texts contain diacritics [21] which provide more readability of the associated texts. However, without diacritics, the texts are also valid. Therefore, the second phase is amended as follows.

The texts are first checked with text-database without considering diacritics to avoid the complexity. If there is no match or less than 95%, the program stops which indicates that the Arabic texts on the website are not from Hadith or seriously mistaken of the hadith.

Next, if 100% match does not occur, texts will be highlighted with red, indicating that some letters are wrong, and consequently, the program is terminated. Otherwise, the fundamental letters of the texts are correct and the program further verifies whether the Hadith texts contain full/partial diacritics. If the texts contain misplaced/wrong diacritics, texts are highlighted with red. If the texts possess partial diacritics, the texts are highlighted as yellow indicating that the texts contain an authentic Hadith with partial/no diacritics. Otherwise, texts will be highlighted with green, implying a perfect match of letters with diacritics.

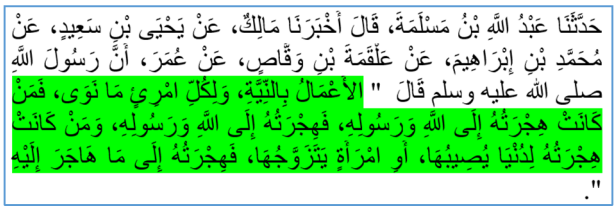
حَدَّثَنَا عَبْدُ اللَّهِ بْنُ مَسْلَمَةَ، قَالَ أَخْبَرَنَا مَالِكٌ، عَنْ يَحْيَى بْنِ سَعِيدٍ، عَنْ مُحَمَّدِ بْنِ إِبْرَاهِيمَ، عَنْ عَلْقَمَةَ بْنِ وَقَّاصٍ، عَنْ عُمَرَ، أَنَّ رَسُولَ اللَّهِ صلى الله عليه وسلم قَالَ " الأَعْمَالُ بِالنِّيَّةِ، وَلِكُلِّ امْرِئٍ مَا نَوَى، فَمَنْ كَانَتْ هِجْرَتُهُ إِلَى اللَّهِ وَرَسُولِهِ، فَهِجْرَتُهُ إِلَى اللَّهِ وَرَسُولِهِ، وَمَنْ كَانَتْ هِجْرَتُهُ لِدُنْيَا يُصِيبُهَا، أَوِ امْرَأَةٍ يَتَزَوَّجُهَا، فَهِجْرَتُهُ إِلَى مَا هَاجَرَ إِلَيْهِ ".

Fig. 1. Sahih Bukhari, Book 2, Hadith 54.

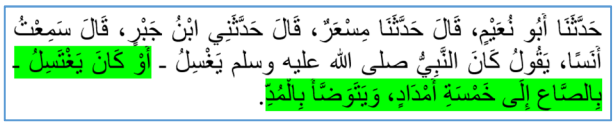
حَدَّثَنَا أَبُو نُعَيْمٍ، قَالَ حَدَّثَنَا مِسْعَرٌ، قَالَ حَدَّثَنِي ابْنُ جَبْرٍ، قَالَ سَمِعْتُ أَنَسًا، يَقُولُ كَانَ النَّبِيُّ صلى الله عليه وسلم يَغْسِلُ - أَوْ كَانَ يَغْتَسِلُ - بِالصَّاعِ إِلَى خَمْسَةِ أَمْدَادٍ، وَيَتَوَضَّأُ بِالْمُدِّ.

Fig. 2. Sahih Bukhari, Book 4, Hadith 201.

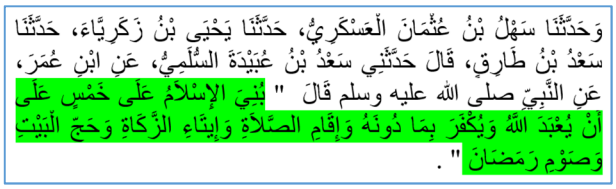
وَحَدَّثَنَا سَهْلُ بْنُ عُثْمَانَ الْعَسْكَرِيُّ، حَدَّثَنَا يَحْيَى بْنُ زَكَرِيَّاءَ، حَدَّثَنَا سَعْدُ بْنُ طَارِقٍ، قَالَ حَدَّثَنِي سَعْدُ بْنُ عُبَيْدَةَ السُّلَمِيُّ، عَنِ ابْنِ عُمَرَ، عَنِ النَّبِيِّ صلى الله عليه وسلم قَالَ " بُنِيَ الإِسْلاَمُ عَلَى خَمْسٍ عَلَى أَنْ يُعْبَدَ اللَّهُ وَيُكْفَرَ بِمَا دُونَهُ وَإِقَامِ الصَّلاَةِ وَإِيتَاءِ الزَّكَاةِ وَحَجِّ الْبَيْتِ وَصَوْمِ رَمَضَانَ " .

Fig. 3. Sahih Muslim, Book 2, Hadith 121.

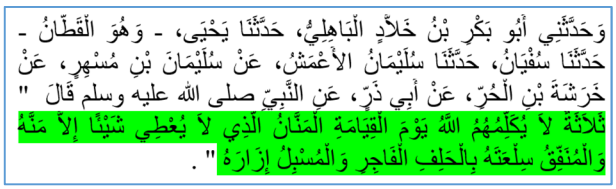
وَحَدَّثَنِي أَبُو بَكْرِ بْنُ خَلاَّدٍ الْبَاهِلِيُّ، حَدَّثَنَا يَحْيَى، - وَهُوَ الْقَطَّانُ - حَدَّثَنَا سُفْيَانُ، حَدَّثَنَا سُلَيْمَانُ الأَعْمَشُ، عَنْ سُلَيْمَانَ بْنِ مُسْهِرٍ، عَنْ خَرَشَةَ بْنِ الْحُرِّ، عَنْ أَبِي ذَرٍّ، عَنِ النَّبِيِّ صلى الله عليه وسلم قَالَ " ثَلاَثَةٌ لاَ يُكَلِّمُهُمُ اللَّهُ يَوْمَ الْقِيَامَةِ الْمَنَّانُ الَّذِي لاَ يُعْطِي شَيْئًا إِلاَّ مَنَّهُ وَالْمُنْفِقُ سِلْعَتَهُ بِالْحَلِفِ الْفَاجِرِ وَالْمُسْبِلُ إِزَارَهُ " .

Fig. 4. Sahih Muslim, Book 2, Hadith 307.

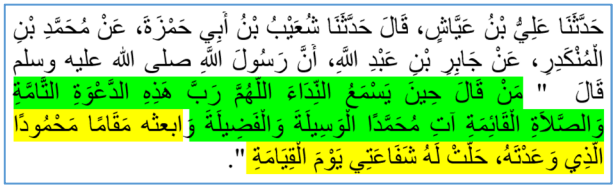
حَدَّثَنَا عَلِيُّ بْنُ عَيَّاشٍ، قَالَ حَدَّثَنَا شُعَيْبُ بْنُ أَبِي حَمْزَةَ، عَنْ مُحَمَّدِ بْنِ الْمُنْكَدِرِ، عَنْ جَابِرِ بْنِ عَبْدِ اللَّهِ، أَنَّ رَسُولَ اللَّهِ صلى الله عليه وسلم قَالَ " مَنْ قَالَ حِينَ يَسْمَعُ النِّدَاءَ اللَّهُمَّ رَبَّ هَذِهِ الدَّعْوَةِ التَّامَّةِ وَالصَّلاَةِ الْقَائِمَةِ آتِ مُحَمَّدًا الْوَسِيلَةَ وَالْفَضِيلَةَ وَابْعَثْهُ مَقَامًا مَحْمُودًا الَّذِي وَعَدْتَهُ، حَلَّتْ لَهُ شَفَاعَتِي يَوْمَ الْقِيَامَةِ ".

Fig. 5. Sahih Bukhari, Book 10, Hadith 614.

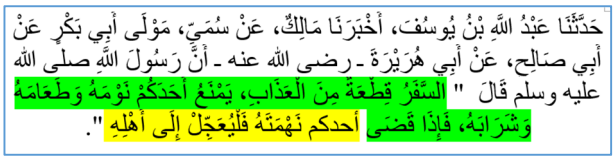
حَدَّثَنَا عَبْدُ اللَّهِ بْنُ يُوسُفَ، أَخْبَرَنَا مَالِكٌ، عَنْ سُمَيٍّ، مَوْلَى أَبِي بَكْرٍ عَنْ أَبِي صَالِحٍ، عَنْ أَبِي هُرَيْرَةَ ـ رضى الله عنه ـ أَنَّ رَسُولَ اللَّهِ صلى الله عليه وسلم قَالَ " السَّفَرُ قِطْعَةٌ مِنَ الْعَذَابِ، يَمْنَعُ أَحَدَكُمْ نَوْمَهُ وَطَعَامَهُ وَشَرَابَهُ، فَإِذَا قَضَى أحدكم نَهْمَتَهُ فَلْيُعَجِّلْ إِلَى أَهْلِهِ ".

Fig. 6. Sahih Bukhari, Book 56, Hadith 3001.


حَدَّثَنَا هَارُونُ بْنُ سَعِيدٍ الأَيْلِيُّ، حَدَّثَنَا ابْنُ وَهْبٍ، قَالَ وَأَخْبَرَنِي مَخْرَمَةُ بْنُ بُكَيْرٍ، عَنْ أَبِيهِ، عَنْ حُمْرَانَ، مَوْلَى عُثْمَانَ قَالَ تَوَضَّأَ عُثْمَانُ بْنُ عَفَّانَ يَوْمًا وُضُوءًا حَسَنًا ثُمَّ قَالَ رَأَيْتُ رَسُولَ اللَّهِ صلى الله عليه وسلم تَوَضَّأَ فَأَحْسَنَ الْوُضُوءَ ثُمَّ قَالَ " مَنْ تَوَضَّأَ هَكَذَا ثُمَّ خَرَجَ إِلَى الْمَسْجِدِ لاَ يَنْهَزُهُ إِلاَّ الصَّلاَةُ غفر لَهُ مَا خَلاَ مِنْ ذَنْبِهِ " .

Fig. 7. Sahih Muslim, Book 3, Hadith 232.


حَدَّثَنَا أَبُو بَكْرِ بْنُ أَبِي شَيْبَةَ، حَدَّثَنَا يَحْيَى بْنُ سَعِيدٍ الْقَطَّانُ، عَنْ مُحَمَّدِ بْنِ عَجْلاَنَ، حَدَّثَنِي بُكَيْرُ بْنُ عَبْدِ اللَّهِ بْنِ الأَشَجِّ، عَنْ بُسْرِ بْنِ سَعِيدٍ، عَنْ زَيْنَبَ، امْرَأَةِ عَبْدِ اللَّهِ قَالَتْ قَالَ لَنَا رَسُولُ اللَّهِ صلى الله عليه وسلم " إِذَا شَهِدَتْ إِحْدَاكُنَّ الْمَسْجِدَ فَلاَ تَمَسَّ طِيبًا " .

Fig. 8. Sahih Muslim, Book 5, Hadith 443.


حَدَّثَنِي حَرْمَلَةُ بْنُ يَحْيَى، أَخْبَرَنَا ابْنُ وَهْبٍ، أَخْبَرَنِي يُونُسُ، عَنِ ابْنِ شِهَابٍ، عَنْ أَبِي سَلَمَةَ بْنِ عَبْدِ الرَّحْمَنِ بْنِ عَوْفٍ، عَنْ أَبِي هُرَيْرَةَ، عَنْ رَسُولِ اللَّهِ صلى الله عليه وسلم أَنَّهُ قَالَ " تَنْزِلُ غَدًا إِنْ شَاءَ اللَّهُ بِخَيْفِ بَنِي كِنَانَةَ حَيْثُ تَقَاسَمُوا عَلَى الْكُفْرِ " .

Fig. 9. Sahih Muslim, Book 16, Hadith 3234.


حَدَّثَنَا أَبُو الْيَمَانِ، أَخْبَرَنَا شُعَيْبٌ، عَنِ الزُّهْرِيِّ، أَخْبَرَنِي مُحَمَّدُ بْنُ جُبَيْرِ بْنِ مُطْعِمٍ، عَنْ أَبِيهِ ـ رضى الله عنه ـ قَالَ سَمِعْتُ رَسُولَ اللَّهِ صلى الله عليه وسلم يَقُولُ " إِنَّ لِي أَسْمَاءً، أَنَا مُحَمَّدٌ، وَأَنَا أَحْمَدُ، وَأَنَا الْمَاحِي الَّذِي يَمْحُو اللَّهُ بِيَ الْكُفْرَ، وَأَنَا الْحَاشِرُ الَّذِي يُحْشَرُ النَّاسُ عَلَى قَدَمِي، وَأَنَا الْعَاقِبُ ".

Fig. 10. Sahih Bukhari, Book 65, Hadith 4945.

TABLE I. SIMILARITY OF TEST HADITHS IN FIGS. 1-10 WITH HADITH DATABASE

Hadith source	Similarity percentage with diacritics (%)	Similarity percentage only with partial diacritics (%)	Percentage of unmatched part (%)
(Fig-1)	100	-	0
(Fig-2)	100	-	0
(Fig-3)	100	-	0
(Fig-4)	100	-	0
(Fig-5)	63.48	36.52	0
(Fig-6)	68.06	31.94	0
(Fig-7)	73.08	26.92	0
(Fig-8)	78.58	-	21.42
(Fig-9)	67.45	-	32.55
(Fig-10)	65.12	-	34.88

V. TEST RESULTS

We carried out a number of tests with online Hadith to validate our web extension. Few results are presented by Figs. 1-10 and Table 1 as a demonstration of the functionalities of the web-extension. A partial Hadith database was built from Sahih Bukhari and Sahih Muslim to conduct the tests.

The web extension was installed on Google Chrome. The websites were visited where these Hadiths appear, then the web-extension button is clicked to verify the authenticity of the Hadiths. Upon clicking the button, the Hadith texts were highlighted with colors. Then, we wrote some Hadith on a website (set on a localhost) with missing diacritics, partial and full diacritics. Next, the tests were conducted, and the results are shown in the Figs. 1-10 and Table 1.

In Figs. 1-4, four Hadiths are highlighted with green color which denotes them as authentic alone with full diacritics. Hadiths in Figs. 5-7 of which some part is authentic with full diacritics (highlighted in green) and the rest is authentic with partial diacritics (highlighted in yellow).

Figs. 8-10 show the Hadiths - first parts of which are authentic with full diacritics marked by green, but the latter parts of which contain some mistakes as colored with red. To simplify the program, the unauthentic part begins from the first letter/diacritic which does not match with the Hadith. The remaining part of the texts is not checked and is highlighted with red.

Table 1 provides the summary of test results for the Hadiths in Figs. 1-10. Column one of the table presents the figure number, while column two records the similarity percentage with full diacritics. The similarity percentage for the cases of partial-diacritics match is listed in column three and the percentage of unmatched part is given in the last column. Notice that the unmatched part in a text starts from the first letter/diacritic unmatched with the hadith.

VI. CONCLUSION

In this work we developed a web-extension which can be used to authenticate online Arabic texts from a source. The developed extension is tested on Arabic Hadith from Sahih Bukhari and Sahih Muslim to check the correctness and performance of the extension. Our web extension can be used by researchers, religious organizations and lawyers to enhance the security of information [22, 23]. Moreover, this extension will create awareness on the authenticity of a laws, constitutions, government documents or religious texts among general people.

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