Original Article

Design and implementation e-Certificate Generator using HTML5 Canvas Context Graphic 2D

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Abstract - *The development of web-based technology has been utilized by services that provide electronic certificates for their users. Along with the increasing number of users, the creation of electronic certificates in image or document format causes an increase in storage media on the server. This research uses an application program interface technology (API) on HTML5 Canvas with a 2D graphic rendering method. The data on the e-certificate is arranged with layers of image or text objects that have size, color, and coordinate properties. The results of implementing electronic certificates with HTML5 Canvas show that the use of storage media on the server is up to 90% more efficient. And the electronic certificate display is responsive on all devices as it scales with browsers. That way, web services for electronic certificates can be more economical, secure, and dynamic.*

Keywords - *Electronic Certificate; HTML5 Canvas; Storage*

I. INTRODUCTION

The need for storage space on the server will increase as the use of the service grows. Stored data consists of source code, document, database, image, or video format. Several online course website services and online event bookings that provide electronic certificates for their users are currently using the export format of PDF or JPG by storing them in a server storage space for users to download. The more data stored will affect server performance and incur costs to increase storage space. This is not good for a service business that will continue to grow.

The digitization of multimedia with the establishment of techniques and computer systems has resulted in better efficiency in the production, memory, and broadcast of digital content, especially content from internet networks [1].

HTML5 capabilities, especially on the canvas element, can be maximized for the purposes of displaying dynamic data that can be downloaded into document or image format. That way, the authors conducted research to be implemented into a web-based electronic certificate generator system.

A. Research Problem

Based on the problems in the introduction, the E-Certificate that is not optimized can use a lot of storage space on the server, which results in decreased server performance in providing resources.

B. Object and Benefits

The purpose of this research is to solve the problem of developing a better E-Certificate that does not require large storage space.

C. Limitation of Research

The limitation of this study is that HTML5 Canvas can only be applied to the website platform

II. METHODOLOGY

In this journal, the authors took advantage of the interface program application technology (API) on the HTML5 Canvas with 2D (two-dimensional) graphic rendering methods.

The development method uses Agile with the Scrum framework. Agile software development processes are based on fast delivery, which shortens the development lifecycles of projects, Short cycles with Iterative that enable rapid corrections and verification enables a rapid development process [2].

III. STUDY LITERATURE
A. HTML5

HTML5 is a language that supports multiple devices, created to display web pages on PCs, Tablets, Smartphones, and Smart TVs [3]. Some of the features in HTML5 are Canvas - 2D / 3D Graphics, Audio & Video, Location-Based Services, Working Offline, Web Workers, Drag & Drop, and Form element.

Based on information from the W3C (World Wide Web Consortium), HTML5 is an open platform for developing a website without the need to pay a license to an organization. The W3C HTML5 specification is a distinct additional unit that complements a limited set of functionalities. This includes

new HTML markup such as *<video>*, *<audio>*, and *<canvas>* [4].

HTML5 can provide a function to display graphical objects that are quite complicated from the visitor's side where all the images are made or drawn directly on the visitor's computer, which means that if the data is local, there is no delay or internet network latency [5], plus service providers there is no need to store large, high-quality images on the server for each user so that it can save the use of storage space and bandwidth usage when the user accesses the data.

B. Document Object Model (DOM)

The document object is a structural representation of a web page. The DOM is created by taking all HTML and CSS code. DOM is loaded on the screen by the browser, and DOM can be manipulated using JavaScript [6]

C. E-Certificate

The electronic certificate is short for E-Certificate or better known as a digital certificate. The certificate comes in a file with a specific document format (can be PDF or image file) or a scanned file. The purpose of this certificate is to replace the existence of conventional certificates that must be printed on certain paper media [7].

D. Storage System

A storage system is system storage that created storage and has a file that will easily found when we required it at any time.

The storage system is the procedures and measures which should be done to store the file, and we can find that file quickly.

The storage system is defined as management systems and the rediscovery of archives based on guidelines that have been chosen to increase effectiveness and for the use of time, place, power, and cost. System the arrangement archive good and regular reflect the success of handling of activities in the past which will be great their influence on the development in the future [8][9].

IV. HTML5 CANVAS BASIC CONCEPT

The DOM is an application program interface (API) for HTML and is also used in XML. The DOM defines the logical structure of a document and how it is accessed and manipulated. With the DOM, program makers and create documents, navigation structures and then add, change or delete elements and content from the document [10].

The canvas itself can be accessed via the DOM in a browser via the Canvas 2D context, but the graphic elements created on the canvas cannot be accessed by the DOM; this happens because the way the Canvas works does not have an object itself, the canvas only contains instructions on which part of the image. Must appear [4].

Basically, Canvas is a part of HTML5, which is especially used for the next generation of web technology, even arguably the future. Because in HTML5, Canvas is an

HTML tag that we can use in an HTML file that functions to draw an object with JavaScript. Because the HTML5 Canvas is a bitmap, every pixel drawn on the canvas can overwrite the pixel below it [11].

V. BUSINESS PROCESS

An e-Certificate can occur because of a process carried out by both the event organizer and the participants. The event organizer determines the location of an object based on the coordinates, while participants can see the results of the E-Certificate arrangement which appears on the HTML5 Canvas frame, here is the flow of the E-Certificate creation:
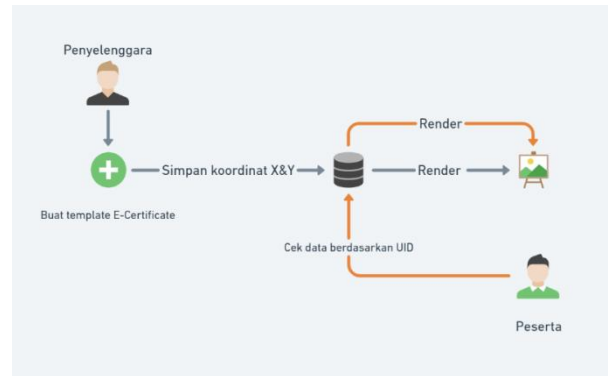

Fig. 1 E-Certificate Creation Flow

In this flow, there is a process of "rendering," In computer graphics, rendering can be defined as the process of converting a model into an image by means of computer programs. [12] Where at this stage, the data taken from the database is processed to be displayed on the user interface page.

VI. ANALYSIS

A. Layering Object

The use of the canvas element can be used to preview the electronic certificate on the user's browser without having to change it in an image format. Canvas will manipulate the elements inside it into a 2D graphic. The data objects to be displayed from the electronic certificate must be arranged into layers as shown below:
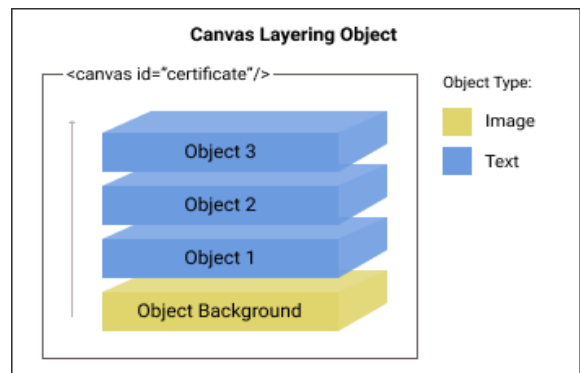

Fig. 2 Canvas Layering Object

To display a dynamic electronic certificate requires two types of objects, namely image objects and text objects with different parameters.

Table 1. Canvas Parameter Object

Object type	Parameter
Image	Source Image
	x-axis coordinate
	y-axis coordinate
	Width
	Height
Text	Text Value
	x-axis coordinate
	y-axis coordinate
	Text Color
	Text Align
	Font Size
	Font Face
	Font Style

B. Object Axis Coordinate

On web pages, the canvas is square and contains coordinates which are usually called the "Cartesian Coordinate System." Where the word cartesian itself comes from the French mathematician and philosopher Rene Descartes (1596-1650), the coordinate system shows points using a pair of letters indicating the distance from the X and Y axes [13].
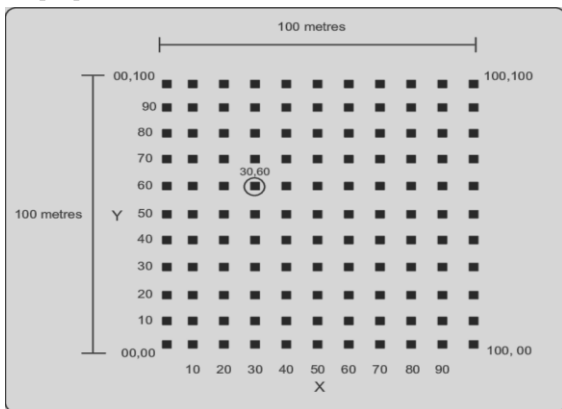

Fig. 3 Canvas Coordinate System

Based on the canvas illustration above, the cartesian coordinate system is quite easy to use because to place it, and it is enough to use a value of 1-100 both from the X and Y coordinates calculated from the center or 0 axes. If you want to place an object, its position can be determined using the coordinate value, namely ([Coordinate value X], [Coordinate value Y]). The horizontal position is represented by the value of the X-axis, while the vertical position is represented by the value of the Y-axis.

C. Flowchart Integration

The following are the steps for integrating data into Canvas and displayed in a browser that can be downloaded in pdf and jpg document formats.
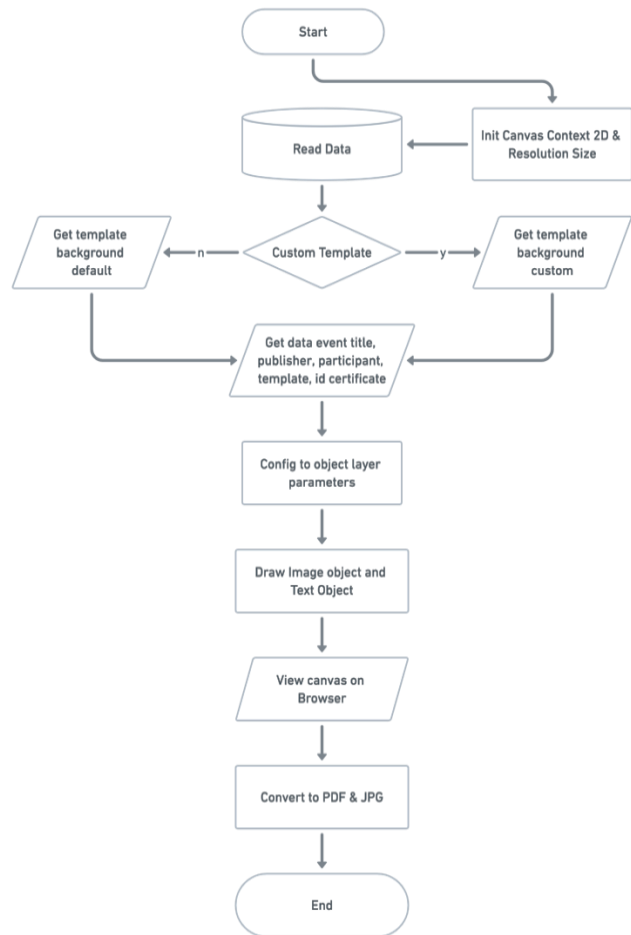

Fig. 4 E-Certificate Creation Flow

VII. IMPLEMENTATION

Certificates created on a canvas can mostly be downloaded in image or document format because the nature of the canvas is a bitmap. The resulting output is an image. When creating a certificate for event visitors as an award, the organizer must adjust the position of an object based on the axis value. Here is an example:

Fig. 5 E-Certificate (50,40)

From the example certificate above the axis value of the word "Septian Andra" is (50.40) so that the placement of the object is in the middle of the canvas and tends to be upward because the Y-axis value is 40. If the Y-axis value is reduced to 10, then the object's position will be as below:
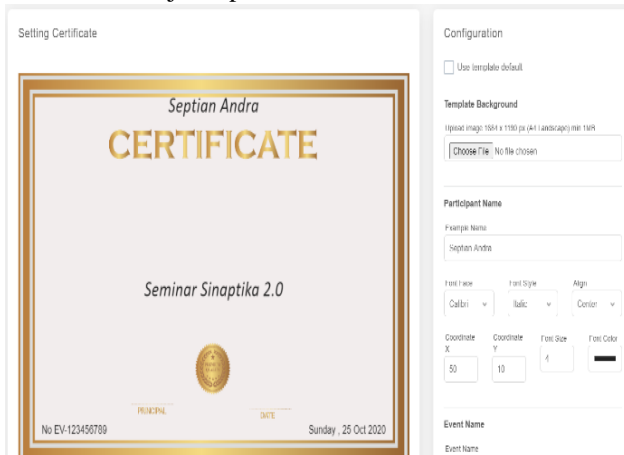

Fig. 6 E-Certificate (50,10)

The object moves to follow the coordinates based on the set value, the smaller the Y value, the higher the object is. Likewise, with the X value, the smaller the X value, the object will be to the left.

VIII. HTML5 CANVAS SECURITY

The definition of computer security or IT security is the protection of information systems from theft or damage to the hardware, the software, and to the information on them, as well as from disruption or misdirection of the services they provide. [14] changes to data on a computer system, including one of the actions that can threaten the security and reliability of a system.

On a system created using HTML5 Canvas, one cannot change data directly on the canvas frame, in other words, the information on the canvas cannot be changed through the inspect element because the HTML5 canvas is a graphic that was previously rendered from the database.

IX. CONCLUSION

Based on the results of the research that has been done, the conclusions that the authors get are as follows:

- The use of HTML5 Canvas technology to create electronic certificates can reduce the use of storage space on the server, and this can save costs for using the server.
- Parameters on objects that can be manipulated can correspond to data stored in the database, and this allows service providers to create custom electronic certificates.
- The electronic certificate display in the browser adapts to various device sizes.
- The use of the HTML5 Canvas 2D graphic rendering method can also be developed in services that use electronic tickets.
- Testing the authenticity of certificates can be developed with digital image processing applications that use the artificial neural network method further [15].

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