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Development of 3D Website Along with VFX and Animation

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ABSTRACT

This paper focuses on the development of 3D web application by designing dynamic 3D model with the help of VFX and animation. 3D Modeling can create the static exposure of product but VFX and animation adds dynamic effects for real time rendering of product. Real time rendering and interactive roaming gives a detailed view of the 3D objects created. Firstly, Blender software was used to design a raw 3D model of a swiss knife and, VFX and animation were applied to add dynamics and interactive features to this model. Verge3D online application was used to define functions that HTML can perform on different parts of the model designed. Lastly, Google web designer was employed to develop an HTML page where we have placed HTML embedded 3D model retrieved from Verge3D. In addition to this, different buttons were placed and linked in the website to allow user to perform different functions defined in Verge3D.

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INTRODUCTION:

Ever since 3D modeling came into being around 50 years back in the late 1960s, the technology has evolved in a massive way. The pioneer 3D graphics company, Evans & Sutherland, was founded by David Evans and Ivan Sutherland in association with University of Utah, U.S. in 1968**[1]**. Currently, there are many industries or sectors benefiting from this technology, such as gaming, architecture, healthcare, engineering, entertainment industry, commercial advertising, Geographic Information System (GIS), academic research, website development etc.

With the rapid digitalization of business organizations, more and more websites are getting developed daily for online presence, information exchange, credibility, market expansion, consumer insights, advertising, e-commerce, 3D tour, architecture, model designing, gaming, management systems, cloud storage, e-learning, etc.**[2][3][4][5][6][7]**. Everyday slightly more than 547200 new websites are created globally**[8]**. Now the competition at the development of websites/web applications arises mostly in designing making the product more easy to use and interactive at the same time. 3D modeling is a new rave in the development of websites and web applications. 3D elements used in web design can make a website more impressive and memorable. The technology can expand the area of visibility in the application as well as the number of details we want to display to the user. 2D technologies are not capable of developing websites/web applications interactive and effective enough to meet UX for certain purposes like gaming, product display, etc. Advantages of 3D modeling over 2D methods include ability to change angle or animate images with faster rendering of the changes, automatic calculation and rendering photorealistic effects rather than mentally visualizing or estimating, and lesser chance of human error in misplacing, overdoing, or forgetting to include a visual effect**[9]**. The website/web application prepared with the help of 3D modeling along with visual effects and animation has more attractive design and more understandable facts/details.

Some of these 3D modeling softwares commonly used today are Adobe Maya, Houdini, Cinema 4D, Blender, WebGL, Verge3D, etc. 3D modeling along with VFX and animation can enhance the UI/UX of websites/web applications far more than user expectations**[10]**. The development of a 3D website/web application involves broadly two processes. The first step of development of 3D model and implementation of VFX is done by software applications like

Adobe Maya, Blender, etc. The second step involves the deployment of 3D model prepared along with VFX and animation in websites/web applications by the help of software tools like WebGL, Verge3D, etc. VFX includes shading and texturing of objects with integration of real time environment. Therefore, VFX along with 3D modeling is helpful in creating multiple visual combinations. As the model prepared through VFX and 3D modeling is static, addition of animation can make the model dynamic. Animation helps in the dynamic manipulation of image and rendering motions.

The objective of the present work is to create and design a website using visual effects and animation in addition to the 3D modeling technology.

METHODOLOGY

We have employed following software tools for achieving the objective of the present study – BLENDER[11], VERGE3D[12] and, GOOGLE WEB DESIGNER[13]. Blender software application was used for these three purposes – designing 3D model, implementing VFX and animating objects. Verge3D is a middleware between Blender 3D model and HTML. It enables users to interact with 3D model through html page. We can also define predefined functions which HTML can perform on different objects in 3D model. Verge3D integrates 3D model with pre-defined functions into a HTML embedded object, which is usable in HTML page. Google web designer is a software tool to design HTML pages. (Fig. 1)

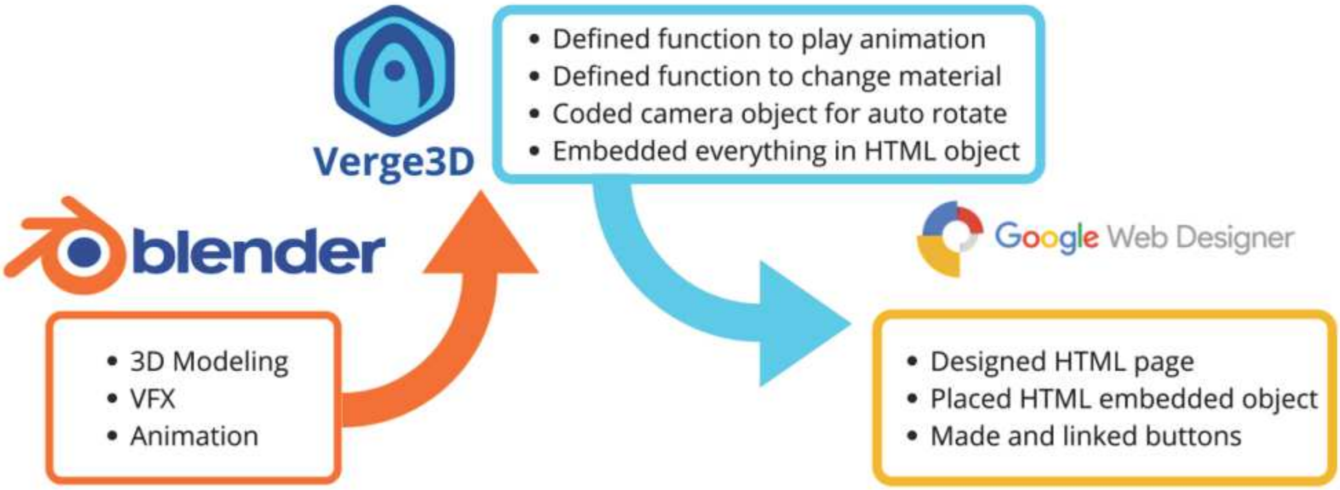

Verge3D
• Defined function to play animation
• Defined function to change material
• Coded camera object for auto rotate
• Embedded everything in HTML object
blender
• 3D Modeling
• VFX
• Animation
Google Web Designer
• Designed HTML page
• Placed HTML embedded object
• Made and linked buttons

Fig. 1

RESULTS AND DISCUSSIONS

Blender:

Firstly the Blender software tool was used for designing a raw 3D model of the Swiss knife with blades and tools (Fig. 2). Secondly, we implemented VFX to design following materials for applying on the model – chrome for blades, aluminum for frame and brass for pivot. For the body of the swiss knife model we have designed three different materials – wood (Fig. 3), carbon black (Fig. 4) and blue metal (Fig. 5), which we can change in the website/web application. We have placed the swiss knife at the centre of the ionosphere to provide space for the movement of camera. We have also applied VFX for interactive environment (Fig. 6). Lastly, we have animated the opening/unpacking motion of all blades/tools of the swiss knife model at once. We have animated the motion by key-framing the positions, rotations and scales of the blades/tools (Fig. 7).

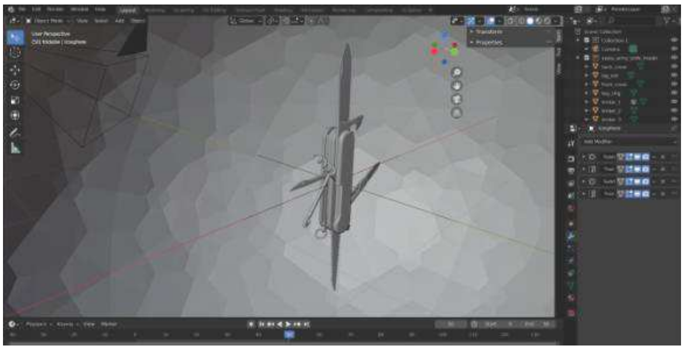


Fig. 2

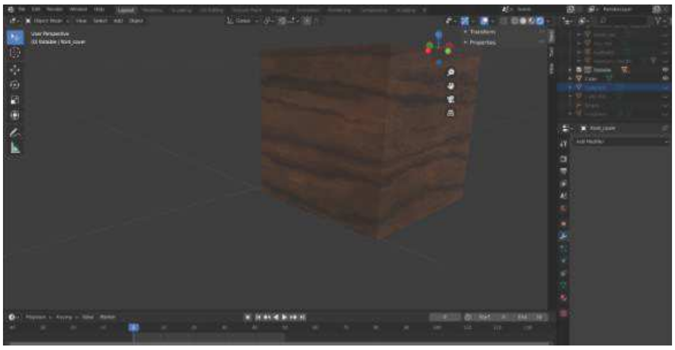


Fig. 3

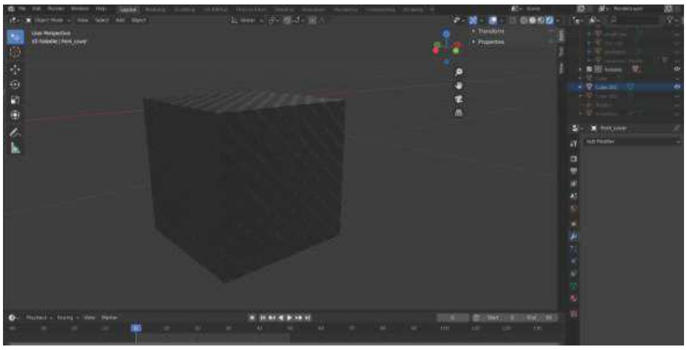


Fig. 4

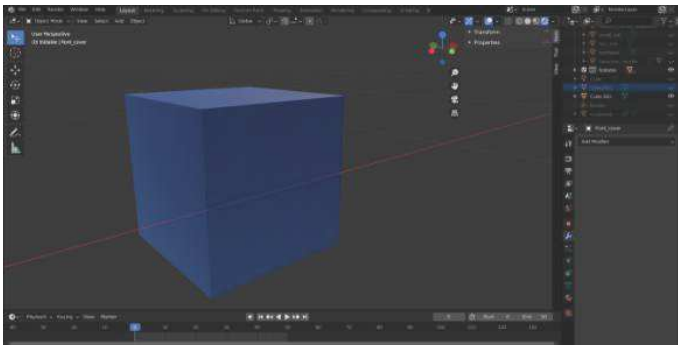


Fig. 5

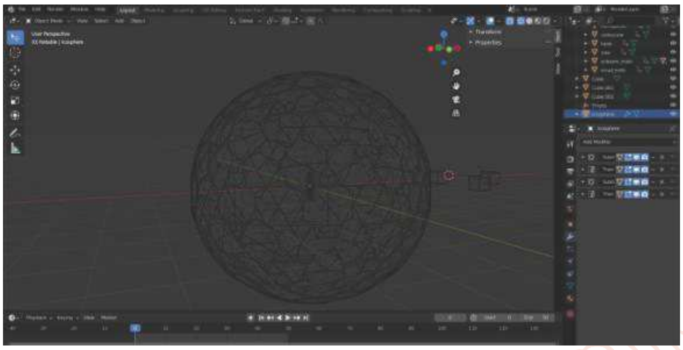


Fig. 6

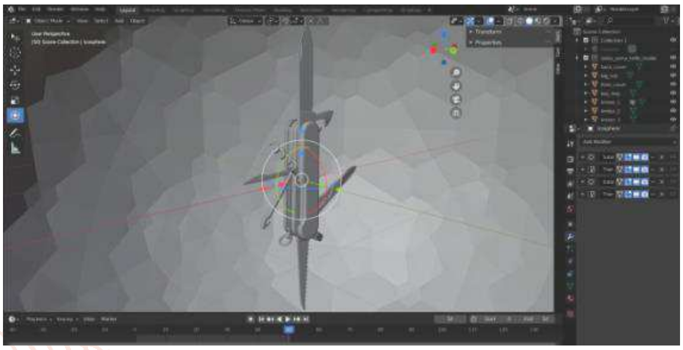


Fig. 7

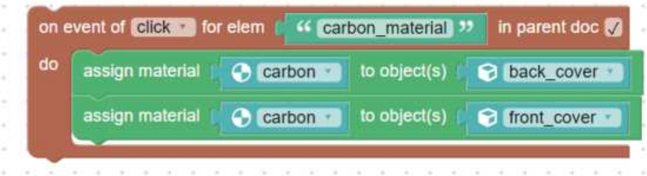
Verge3D:

We have defined functions which HTML can perform on different objects in 3D model. We have integrated 3D model along with defined functions into a HTML embedded object, which is usable in HTML page. We have coded the camera object for auto-rotate around the 3D model, if there is no activity by the user for a certain period of time. We have defined functions for:

- ➢ Play opening/unpacking animation of all Blades/tools at once
- ➢ Play opening/unpacking animation in reverse, i.e. closing/packing animation of all Blades/tools at once
- ➢ Play opening/unpacking animation for individual blade/tool when respective blade/tool is clicked by user
- ➢ For changing material of body of swiss knife 3D model to other predesigned materials.

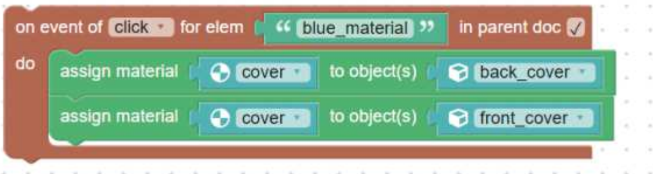
We have defined functions to change material of objects “back_cover” and “front_cover”. We have three different materials “carbon”, “cover” (default blue) and “wood”. We are also linking these functions to HTML elements “carbon_material”(Fig. 8), “blue_material”(Fig. 9) and “wood_material”(Fig. 10), i.e., these functions will get invoked on event of click for respective element. We have set a timer of 2 seconds after initial loading of HTML page. When the timer will get over, it will set the camera object on auto-rotate (Fig. 11). We have also set a click listener on all objects which will get invoked if user clicks anywhere on the screen. The click listener will set the camera auto-rotate off for an interval of 5 seconds, after that it will set the camera auto-rotate on again (Fig. 12). As initially when the HTML page will load, the Swiss Knife Model will be in folded state, therefore, we have defined a variable “fold” with initial state true. The fold variable will hold the folding state of the Swiss Knife Model (Fig. 13). We have also defined variables for each individual Blade/Tool to hold their respective fold state, as we have given a functionality to unfold individual blade/tool by clicking on them. We have set all these variables initially to false (Fig. 14).

On event of click for HTML element “unfold_knife_button”, we have set “play animation” function for all objects (i.e., all blades/tools) from frame 0 to 50. We are also checking the fold state of all blades/tools via “fold” variable before playing the animation. We are also setting “fold” variable to false after playing animation as all the blades/tools are unfolded now. We have also set clicked listener for very individual blade/tool, which will play the animation for that individual blade/tool only. Clicked listener will also check and maintain values of “fold” variable as well as respective fold state variable of individual blade/tool. On event of click for HTML element “fold_knife_button”, we have set “play animation” function either for all objects (i.e., all blades/tools) or for individual blade/tool (if any is in unfold sate) from frame 0 to 50 in reverse order. We are also checking the fold state of all blades/tools via “fold” variable as well as respective fold state variable of individual blade/tool (if any is in unfold state), before playing the animation. We are also maintaining the values of variables accordingly. (Fig. 15)



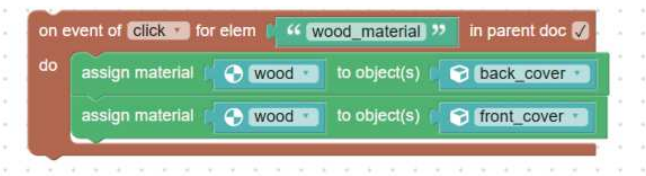
```
on event of click for elem “carbon_material” in parent doc ☑
do  assign material carbon to object(s) back_cover
    assign material carbon to object(s) front_cover
```

Fig. 8



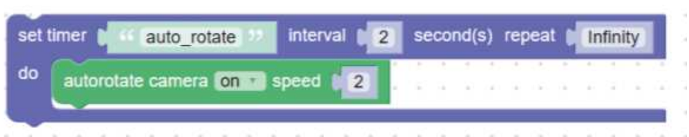
```
on event of click for elem “blue_material” in parent doc ☑
do  assign material cover to object(s) back_cover
    assign material cover to object(s) front_cover
```

Fig. 9



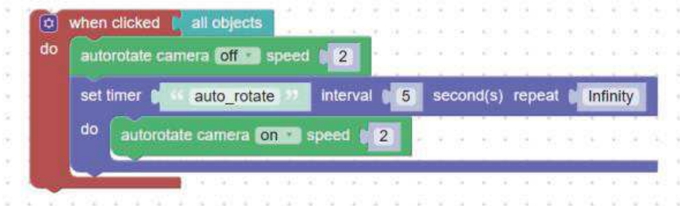
```
on event of click for elem "wood_material" in parent doc ☑
do  assign material wood to object(s) back_cover
    assign material wood to object(s) front_cover
```

Fig. 10



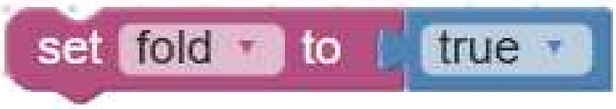
```
set timer "auto_rotate" interval 2 second(s) repeat Infinity
do  autorotate camera on speed 2
```

Fig. 11



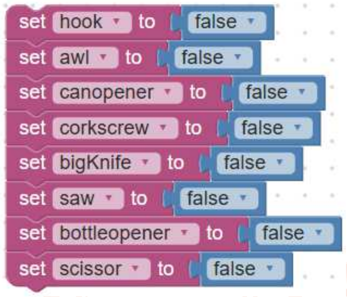
```
when clicked all objects
do  autorotate camera off speed 2
    set timer "auto_rotate" interval 5 second(s) repeat Infinity
    do  autorotate camera on speed 2
```

Fig. 12



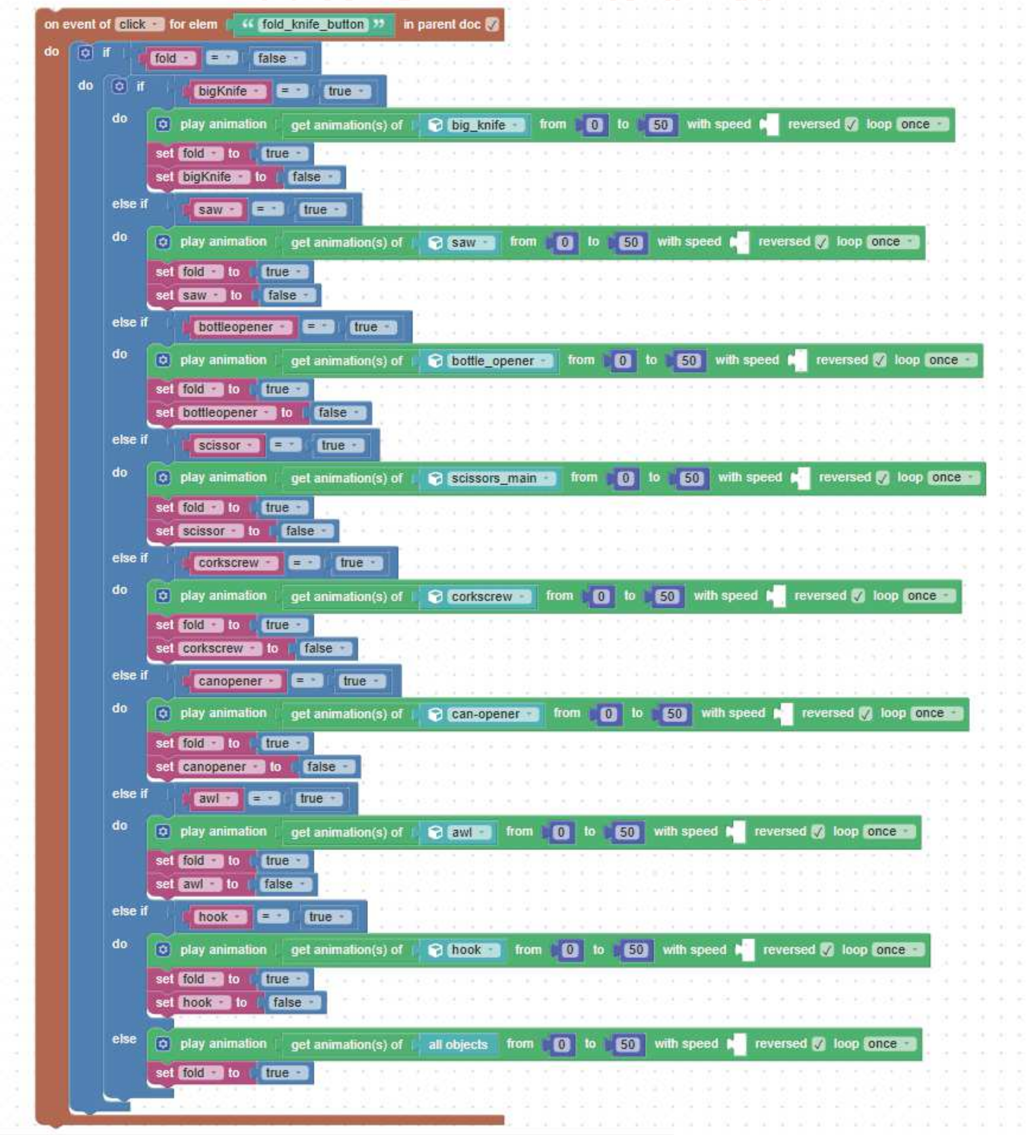
```
set fold to true
```

Fig. 13



```
set hook to false
set awl to false
set canopener to false
set corkscrew to false
set bigKnife to false
set saw to false
set bottleopener to false
set scissor to false
```

Fig. 14



```
on event of click for elem "fold_knife_button" in parent doc ☑
do  if  fold = false
    do  if  bigKnife = true
        do  play animation get animation(s) of big_knife from 0 to 50 with speed reversed ☑ loop once
            set fold to true
            set bigKnife to false
        else if  saw = true
        do  play animation get animation(s) of saw from 0 to 50 with speed reversed ☑ loop once
            set fold to true
            set saw to false
        else if  bottleopener = true
        do  play animation get animation(s) of bottle_opener from 0 to 50 with speed reversed ☑ loop once
            set fold to true
            set bottleopener to false
        else if  scissor = true
        do  play animation get animation(s) of scissors_main from 0 to 50 with speed reversed ☑ loop once
            set fold to true
            set scissor to false
        else if  corkscrew = true
        do  play animation get animation(s) of corkscrew from 0 to 50 with speed reversed ☑ loop once
            set fold to true
            set corkscrew to false
        else if  canopener = true
        do  play animation get animation(s) of can-opener from 0 to 50 with speed reversed ☑ loop once
            set fold to true
            set canopener to false
        else if  awl = true
        do  play animation get animation(s) of awl from 0 to 50 with speed reversed ☑ loop once
            set fold to true
            set awl to false
        else if  hook = true
        do  play animation get animation(s) of hook from 0 to 50 with speed reversed ☑ loop once
            set fold to true
            set hook to false
        else
            play animation get animation(s) of all objects from 0 to 50 with speed reversed ☑ loop once
            set fold to true
```

Fig. 15

Google web designer:
We have a single HTML page where we have placed HTML embedded object that we have got from Verge3D. We have also placed and linked different buttons via which single user can perform different functions that we have already defined in Verge3D. We have placed the HTML embedded element we have got from Verge3D occupying complete screen. We have defined two <div> on both sides (left and right) of the screen containing three buttons each. Below is the code of the HTML page which we have designed in Google web designer.

CONCLUSION

The present work involves creation of 3D website/web application by the development of dynamic 3D modeling, VFX and animation. The efficiency and scalability of the project prepared is to provide more interactive and dynamic visual experience. The product prepared through 3D modeling along with VFX and animation gives an informative view for better understanding the procedure. 3D Modeling can create the static exposure of product but VFX and animation adds dynamic effects for real time rendering of product. Real time rendering and interactive roaming gives a detailed view of the 3D objects created. Visual interaction of the product developed highlights the key features of each element present in it and also helps to understand the 360^{o} understanding of the environmental elements. VFX adds an extra-ordinary feature of texturing and shading along with motion of objects via animation, the model prepared via 3D modeling along with VFX and animation is far better than the model prepared using 3D modeling alone. The online softwares employed for the product development were Blender, Verge3D and Google web designer.

ACKNOWLEDGEMENTS

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