

1 **3D Jersey Design with Three JS and Generative AI**

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16 **1 ABSTRACT**

17 **The 3D Jersey Design Project offers a new creative design tool based on React JS, Three JS, Node JS and**  
18 **Valtio technologies. The tool allows users to create unique sports jerseys with 3D visualisation. The research**  
19 **is the technology the platform uses and how it affects users engagement and creativity. Utilizing generative**  
20 **artificial intelligence, the project proposes custom-made design options, elevating users creativity and**  
21 **engagement. The platform leads to democratization of design process and allows any user from diverse level**  
22 **of experience to participate. The objective of this document is to discuss the effects of these technologies on**  
23 **the creative industries and personal expression, taking into consideration user feedback and the engagements**  
24 **metrics.**

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28 **2 INTRODUCTION**

29 As the environment of digital technology keeps on changing with the time, the adoption of interactive tools and artificial  
30 intelligence plays a pivotal role in the area of custom apparel design. The 3D Jersey Design Project reaps the benefits of  
31 this technological progress through a platform which enables the users to design their personalized sports jerseys in a  
32 three-dimensional space. This project uses a combination of React JS, Three JS, Node JS and Valtio to develop a beautiful  
33 design interface that is similar to the ease of sketching on the paper but with the sophistication of the real-time display  
34 of the 3D design. The conventional way of designing jersey has been restrictive to the designers with high graphic  
35 design skills and textile knowledge, thus limiting access to only the pros or those who may have specialized training.  
36 As a result of the advancement of intuitive and easy to use platforms like the 3D Jersey Design Project, the process  
37 becomes democratic; thus, people who do not have any formal design training can participate effectively in the creation

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of their personalized apparel. This affordability covers involvement with broader creative expression and design. One of the most notable parts of this project is the utilization of generative artificial intelligence, which supplies users with creative prompts and options. This AI-driven feature aims to make the creative process more fruitful and innovative by providing authentic and bespoke design items that users can apply to their jerseys. The AI system acclimates to the user interactions, growing into offering more purposeful and pertinent tips, consequently augmenting the user experience and promoting innovation and creativity. This paper will describe the technical details of the 3d Jersey design platform, detailing both the moving parts that add up to the overall video and the user experience of the platform. Besides, the paper will trace the importance of generative AI in enhancing creativity and what are the transformative aspects of it when it comes to the way the user interacts with digital designing tools. Through data analysis of the user feedback and engagement metrics, the research is going to untangle the phenomenon of the online platform appearance, in which design of the sports apparel is becoming the means of expression and interaction within the wider community. Considering all, it would be manifest enough that advanced digital technologies and AI could be effectively employed in creative business areas, if in addition to the above mentioned goals, they will look to bridging the gap and thus creating construction platforms that are more accessible and educating for the public less educated on design sciences. This project represents a big step in the revolution of how media art has the power to touch the soul and it can contribute to bonding communities on the web.

### 3 LITERATURE REVIEW

#### 3.1 An Approach for Systems Identification using Artificial Intelligence

The paper evaluates a piece of writing that talks about how genetical algorithms (GAs) are being applied to medicine and business with stunning success. This is where the difference between how GA turns around the subject is shown. Apart from the pros, this paper also introduces some of the challenges seen with GAs, among others being difficulties when dealing with big data and processes that might quit early. In spite of above mentioned obstacles, the report displays how GAs can move further, for example, in digital marketing and design, stressing the potency of information and increasing the effectiveness. The paper argues that including more information about GAs' firm and feeble facets and making similarities to other AI techniques, the readers will be able to understand easily and to see the possibility for further development and use.

#### 3.2 A 3D Process Design Kit Generator based on Customizable 3D Layout Design Environment

This paper focuses on connecting computer chips in three dimensions. For the process of design kit it introduced a toolkit that helps designers to create these connections quickly and efficiently. This is a very user-friendly toolkit and designers can customize and design easily. For implementation of the design, it involves creating a toolkit with all the necessary parts and customize it for specific needs. In the end, the paper suggests adding more tools and following industry standards to make the process even better.

#### 3.3 Strategies for Web Application Development Methodologies

In this paper methodology involves an extensive review and evaluation of several web applications-specific improvement approaches and methodologies. Object-Oriented, UML-based, Agile and others are included. The fundamentals, methods and effectiveness of each methodology for developing web applications are evaluated. However, If we talk about the result of this paper, the analysis's output suggests various web applications and various kinds of development for web

applications approaches that are accessible. Every strategy has unique advantages and factors including CORBA-based methods to Agile methods like Extreme Programming and AWDWF. Moreover, UML-based methods offer organized platforms for developing and managing web applications. According to the analysis, it is clear that Agile approaches, such as AWDWF and Extreme Programming, prioritize quick prototyping, rapid development, and interaction with customers. These methods work particularly well in dynamic web scenarios where requirements shift frequently.

### 3.4 Towards Next Generation 3D Teleconferencing System

In this paper, use of special cameras to capture 3D videos in real-time, making them look clear and removing any unwanted noise or distractions was discussed. The videos are then compressed using a standard method for easier transmission. When it's time to watch the videos, different technologies are tested to make them look like screens that show 3D images without needing special glasses. Overall, this paper is a good start for making long-distance communication feel more lifelike. In the future, they want to make it even better by adding features like tracking where your eyes are looking and making it work faster.

### 3.5 Codes Reviewed

*3.5.1 Three JS implementations from github.* We looked at several github repositories for our project implementation. First we used React Js for our frontend. We watched youtube tutorials for this part. Implementation of three js was discovered from a github repository.

*3.5.2 Generative AI from github.* For the instant reply from AI for suggestions on jersey or any other query we used gemini pro chatbot from the github repository.

## 4 DATASET ANALYSIS

For 3D representation of the jersey we used a glb jersey image. Due to the limitations of glb files we only can work with one glb file. We would like to extend our areas by collecting more glb files of pants/shirts or even punjabi. Enhancing versatility for users to customize their designs according to their preferences. For logo and full texture incorporation, we currently accept png/jpg files with plans to extend compatibility to include pdf/word files. Besides adjustments to shadows and lighting parameters, a dataset was created by us. Such as temporal settings, frame rates, and spatial attributes, yield notable visual enhancements. We developed a dynamic and user-friendly interface for our frontend using React JS. To provide depth and visual appeal, we then used Three JS which is a package well-known for its capacity to enable 3D animations on the web. One of our best-known models was a jersey called "shirt baked.glb" which we embellished with textures, patterns, and logos in popular image formats like PNG and JPG. We used Tailwind CSS for styling to make sure everything looked perfect, which helped us stay efficient and consistent throughout the design process. We focused especially on the shadows in order to create a more realistic 3D environment. For a realistic effect we tinkered with transparency levels and altered settings like temporal shadows which update at a smooth 60 frames per second. In order to create the ideal environment, we also carefully placed four light sources and adjusted their ambient lighting and brightness. These minor elements came together to provide a frontend that not only looks fantastic but also gives consumers a compelling, immersive experience. As the project is 3D and for the rotation, shadow and lights it holds some value in each segments that we used.

For shadows, lighting and rotation of our frontend the data we used:

temporal	1
frames	60
alphatest	0.85
scale	10
rotation	$[\text{Math.PI} / 2, 0, 0]$
position	$[0, 0, -0.14]$

Table 1. Shadow

amount	4
radius	9
intensity	0.25
ambient	0.5
position	$[7, 5, -10]$

Table 2. Lighting and Rotation

## 5 METHODOLOGY

We used React JS, Node JS, Three JS, Generative AI. React.js for the frontend or website. Things like buttons and menus were a part of that. Node.js helped with the authentication. Gemini Pro for generative artificial intelligence help. For the 3D animations, we used Three.js. It made our gemstones look real, with shadows and light effects. By putting all these things together, we made a fun website where people can design their own jersey in 3D.

### 5.1 React JS

For the frontend React JS framework was used. It is user-friendly, easy to use and fast at the same time. React uses html and javascript together and the file format is JSX. The benefits of using React in a 3D project are pretty easy compared to other frameworks. Since React makes it easy to organize your code into reusable parts, it can save you a lot of time and effort when building complex interfaces. Besides, React has a quick updating system that ensures that your 3D project runs smoothly and looks great at the same time. For our 3D models we used Three JS which is a React library. Moreover, React JS is excellent for web development right now.

### 5.2 Three JS

Three.js is a library that can create 3D web content. Developers can use this unique set of codes to produce stunning 3D visuals that anyone can view on websites and in applications. With Three JS anyone can create a plethora of interesting things. This includes realistic-looking moving objects, colors, and forms. It's similar to using digital clay to create imaginary worlds that come to life on screen. Three.js can be used for a wide range of tasks, such as creating virtual environments, games, animations, and 3D product displays. It's similar to possessing a superpower that makes exploring the internet more thrilling and enjoyable. The world is growing and the technologies are moving towards three dimensions and 3D animations and applications soon take over the industry. Learning three js can help in such situations and grow equally at that pace.

### 5.3 Responsive 3D model and Texture

A 3D model should be responsive. It must be visually appealing and functional across a range of devices which includes desktops and smartphones or tablets. Responsive websites are a must nowadays. Better user experience is all we aim for. The 3D model can be made to appear more realistic by adding shadows, ambient light and a backdrop. While ambient light gives gentle lighting to make an object appear more realistic. Shadows give the impression that it is standing on a surface. By producing a background that enhances the object. The backdrop provides the scene for the 3D model. We may adjust the 3D model's perspective and ensure that it seems good from any aspect by using a camera rig. In our project we certainly created a dataset for these objects. We can make a 3D model that is visually appealing, responsive, and looks fantastic on all devices by merging these components.

### 5.4 Color Picker

For developing a color picker part for our project involving the design of jerseys. Three essential components are imported: the actual React framework, the SketchPicker element from the react-color library and the useSnapshot hook from Valtio which facilitates state management for our application. We can make reusable components like this color picker with ease using React. The SketchPicker component provides us with an easy to use interface for choosing colors and we can get the state of our application at any time by using the useSnapshot hook. We render the SketchPicker and set its initial color to the value saved in our application state inside the ColorPicker component. We adjust the status in accordance with the user's selection of a new hue. In this manner, we can dynamically select and apply colors to our jersey design.

### 5.5 Logo Picker

We're building a FilePicker component with the help of React for our jersey design project. In this segment the project lets users upload an image file as jpg/png format and gives them buttons to select the image's layout on the jersey. User can use this as a logo or the full jersey design. When a file is selected, the FilePicker component produces an input element and shows the file name below. Furthermore, two CustomButton components with the labels "Logo" and "Full" are present. Clicking them initiates a function that reads the uploaded file. Depending on which button is pressed. This function decides how the logo should be applied to the jersey design. This implementation makes the customizing process simple for users by allowing them to upload any logo and select how it should be used in their jersey design.

### 5.6 Generative AI

GoogleGenerativeAI can help the users to ask for help from an AI-powered model. Users can submit their inquiries or requests for assistance in the text input form included in the component. The "Answer" button on the component prompts the user to submit a question. After the submission the content is sent to the GoogleGenerativeAI model for a response. To show that the request is being processed, a loading spinner is shown while you wait for the response. After it is received, the response is shown in a conversational format beneath the relevant question. Users can simply communicate with the AI model in this way to seek help with their questions or issues. Using the text input as a guide, the AI model can present users with informative suggestions or responses.

## 6 IMPLEMENTATION AND VISUALIZATION

The application mainly has two pages for the users to display. The homepage with a little details which redirects us to the main customizer page. This React application's Customizer component combines a number of features for customizing images. It handles application state like the active tabs and filter choices and using state management with Valtio. To download photos and read file inputs the component imports helper functions. It also includes components for various customization choices such as FilePicker, ColorPicker and Help from AI. which are presented according to the tab the user is currently on. When an AI model is used to generate image content in response to user requests, the handleSubmit function makes communication easier. It also makes use of Framer Motion motion animations to improve the user interface through seamless transitions. The Customizer component combines these functions to give users an extensive toolkit for altering and using photos inside the program.

The images of our project are attached below:



Fig. 1. Home Page



Fig. 2. Customizer Page



Fig. 3. After Color Pick



Fig. 4. Logo/File Picker



Fig. 5. Without Logo



Fig. 6. Full Texture



Fig. 7. Ask Help From AI

## 7 RESULT ANALYSIS

Users can add a logo to their preference also they can use it for full texture as well. Users can seek help from Artificial Intelligence and it enhances their user experience. The UI of the project is amazing and adding more components will improve it further. Users can make their own custom jerseys in a 3D world, which can be really exciting and creative. The project even used smart AI to suggest unique designs, making the whole process even better. Key point is anyone can design on their own. Even without any knowledge they can just play with it around and can join in to create something awesome.

## 8 CHALLENGES

Challenges include the cost of these GLB files and different jersey shapes are expensive as of now. We are working with one glb file. But the extension will add more features to our project. We can extend the work from Jersey to other departments as well. GPT 4 is not free. This is the reason why we can't import any logo from the AI segment directly. We are relying on text/prompt for now. Dalle AI can be used for image generations. Gpt 4.0 is required for that. If we add more designs the time may require more time or the system may get slow. Creating a webpage that supports all



may become challenging. While we want to add cool new features, we also need to keep things easy to use and simple. We don't want to overwhelm people with too many complicated options. With hugging face models implementation of real pictures with resizing and appropriate space is a challenge too for the future.

## 9 FUTURE WORK

For future work, we would like to add more research on the algorithms that may be required to improve both the accuracy and the efficiency of the AI-powered design extraction function. This means improving the tool's ability to handle various forms of web material and ensuring that it is effective while getting complex designs from several sources. Several clothing options may be added to provide consumers even more creative choices. Adding more GLB files of shirts/ pants or even panjabi can be implemented through this project. The latest version of natural language processing models like GPT-4 may be used to upgrade the AI system and significantly increase the depth and quality of AI replies. With the help of this advanced model, consumers may receive better guidance and design suggestions in response to queries that are more accurate and contextually relevant. Customers can provide feedback on the concepts and designs that the AI provides by creating a user feedback system. Through this feedback loop, the AI algorithms would be improved over time, allowing the system to constantly adjust to the preferences and needs of its users. Implementing capabilities for collaboration allows multiple people to collaborate in real time on design projects. This could involve interactive things like commenting, sharing, and co-editing. We would like to work on some hugging face models to implement face or body textures and how it collaborates with the designed item. It will certainly add a new dimension to this project. People will get to know that the specific jersey designed fit for them or not. As it is 3D and color combination will give us proper output hopefully.

## 10 CONCLUSION

3D Jersey Design Project can be a game-changer for custom apparel creation. By implementing the power of modern technologies like React JS, Three JS, Node JS, and Valtio it opens up a world of creativity to users of all backgrounds. The project's incorporation of artificial intelligence adds an extra layer of innovation, offering personalized design suggestions and enhancing user engagement. This platform not only democratizes the design process but also fosters a sense of empowerment and self-expression among its users. Moving forward, it sets a precedent for how technology can revolutionize the creative industry, making it more accessible, interactive, and enjoyable for everyone. With the future work, we think it can bring significant change in designing.

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