Module 5 - 2D & 3D Transforms in CSS

CSS Transform

CSS Transforms allow you to visually manipulate elements—move, rotate, scale, or skew them — without changing their actual position in the document layout.

Why we use CSS Transform?

- **Visual Manipulation:** Easily move, rotate, scale, or skew elements without affecting the layout of other elements.
- **Performance:** Transforms are hardware-accelerated in most browsers, making animations smooth and fast.
- **Interactivity:** Enhance user experience with interactive effects like hover animations, flips, and slides.
- **Design Flexibility:** Create complex visual effects and 3D-like animations without extra HTML or images.
- **Maintain Layout:** Transforms don't cause reflow or repositioning of surrounding elements, preserving page structure.

Types of Transforms in CSS

2D transform in CSS means changing the appearance of an element by moving, rotating, scaling, or skewing it along the two axes — X (horizontal) and Y (vertical) — without adding any depth.

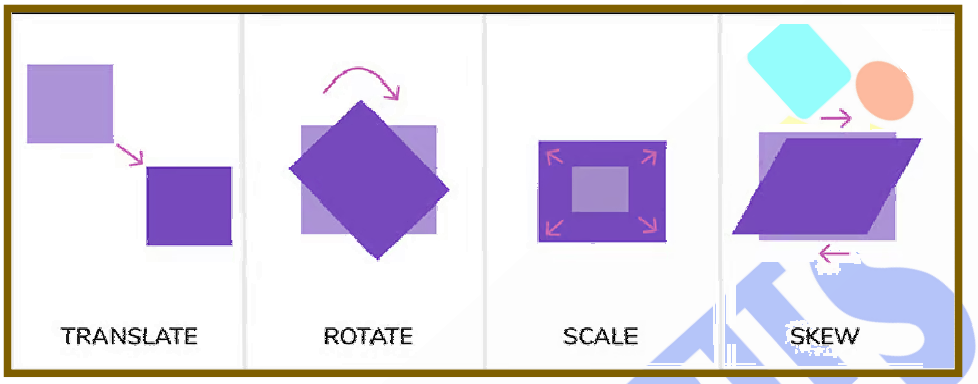
It keeps the element flat on the page but lets you visually adjust it in these ways:

- **Translate:** Move left/right or up/down
- **Rotate:** Spin the element around a point
- **Scale:** Make it bigger or smaller
- **Skew:** Slant or tilt it sideways
- **matrix(a, b, c, d, e, f)** — Combines multiple 2D transforms using a transformation matrix.

3D transforms in CSS let you manipulate elements in three-dimensional space by adding the **Z-axis** (depth) to the usual X (horizontal) and Y (vertical) axes. This means you can move, rotate, and scale elements not just left/right or up/down, but also closer to or farther from the viewer, creating depth and perspective effects.

Dynamic HTML Advanced

- **translate3d(x, y, z)** — Moves an element in 3D space.
- **rotateX(angle)** — Rotates around the X-axis (horizontal axis).
- **rotateY(angle)** — Rotates around the Y-axis (vertical axis).
- **rotateZ(angle)** — Rotates around the Z-axis (same as 2D rotate).
- **scale3d(x, y, z)** — Scales the element in 3D space.
- **perspective(value)** — Sets the depth perspective for 3D transforms (applied on the parent element).



3D Cards

Creating a 3D card flip effect using CSS transforms involves rotating a card element around the Y-axis (or X-axis), so it flips between its front and back sides. This is commonly used in UI elements like profile cards, flashcards, etc.

Key Concepts Used:

- transform: rotateY(180deg) - Rotates the card around the Y-axis.
- perspective - Adds depth, so the 3D effect looks realistic.
- transform-style: preserve-3d - Ensures child elements maintain their 3D positioning.
- backface-visibility: hidden - Hides the back side when it's not facing the viewer.

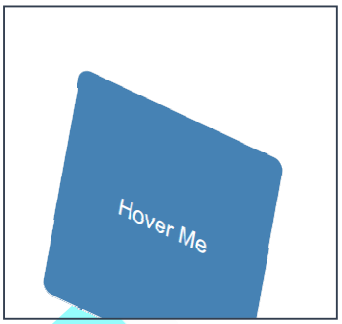
CSS Transform Properties Code

```
<!DOCTYPE html>
<html>
<head>
  <title>CSS Transform Example</title>
  <style>
```

Dynamic HTML Advanced

```
  body {
    display: flex;
    justify-content: center;
    align-items: center;
    height: 100vh;
    margin: 0;
    align-items: center;
    font-size: 20px;
    border-radius: 10px;
    background-color: #f4f4f4;
    font-family: Arial, sans-serif;
  }

  .box {
    width: 200px;
    height: 200px;
    background-color: steelblue;
    color: white;
    display: flex;
    justify-content: center;
    transition: transform 0.5s ease;
  }
  .box:hover {
  transform:
   translate(40px, 20px)  /* Move */
   rotate(20deg)          /* Rotate */
   scale(1.2)             /* Resize */
  skew(10deg, 5deg);      /* Skew */
  }
  </style>
</head>
<body>
  <div class="box">Hover Me</div>
</body>
</html>
```



Explanation

- A with class "box" contains the text **"Hover Me"**.
- This is the element that will be transformed using CSS.

CSS: .box:hover Transform Effects

- translate(40px, 20px) — Moves the box 40px right and 20px down.
- rotate(20deg) — Rotates the box 20 degrees.

- scale(1.2) – Enlarges the box to 120% of its size.
- skew(10deg, 5deg) – Tilts the box horizontally and vertically.
- **All effects happen smoothly due to the transition.**

2D Transform

```
<!DOCTYPE html>
<html>
<head>
  <style>
    .box {
      width: 100px;
      height: 100px;
      background: orange;
      transition: transform 0.3s;
    }
    .box:hover {
      transform: rotate(45deg) translateX(20px);
    }
  </style>
</head>
<body>
  <div class="box"></div>
</body>
</html>
```

Explanation

- .box is a square div with orange background.
- On hover, it:
- Rotates 45 degrees.
- Moves 20px to the right.
- transition makes the transform smooth.

3D Transform

```
<!DOCTYPE html>
<html>
<head>
  <style>
    .container {
      perspective: 600px; /* Adds 3D depth */
    }
    .box {
```

Dynamic HTML Advanced

```
    width: 100px;
    height: 100px;
    background: tomato;
    color: white;
    display: flex;
    align-items: center;
    justify-content: center;
    transition: transform 0.5s;
    transform-style: preserve-3d;
   }

   .box:hover {
    transform: rotateY(180deg); /* 3D rotation */
   }
  </style>
</head>
<body>
  <div class="container">
    <div class="box">Flip</div>
  </div>
</body>
</html>
```

Explanation

- **.container** sets the **perspective** to add 3D depth.
- **.box** is the element that **rotates on the Y-axis** when hovered.
- **rotateY(180deg)** flips the box in 3D space.
- **transform-style: preserve-3d;** ensures the 3D effect is preserved.
- **transition** makes the effect smooth.
- This creates a basic **3D flip effect** on hover.

Assignment

Create a div tag.

- You have to put this content in a div. "A virus is **an infectious microbe consisting of a segment of nucleic acid (either DNA or RNA) surrounded by a protein coat**. A virus cannot replicate alone; instead, it must infect cells and use components of the host cell to make copies of itself."
- Use Color of div is blue and color of content is black and font size is 16 px.
- Transform this tag skew 20 degree.