Chapter 2
A Taste of Multimedia

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Agenda

2.1 Multimedia Tasks and Concerns

- More ***basic concerns*** will impact multimedia as it now appears in products
- e.g., we expect impact from Computer Vision: a ***professional camera owner might be encouraged to think like a computer scientist and ask:***

"What is going on in an image?"

"Where has this image been taken?"
(scene recognition)

"Does the image contain a particular object?"

(object classification)

"Where is an object of interest?"

(object detection)

"Which object does each pixel belong to?"

(image segmentation)
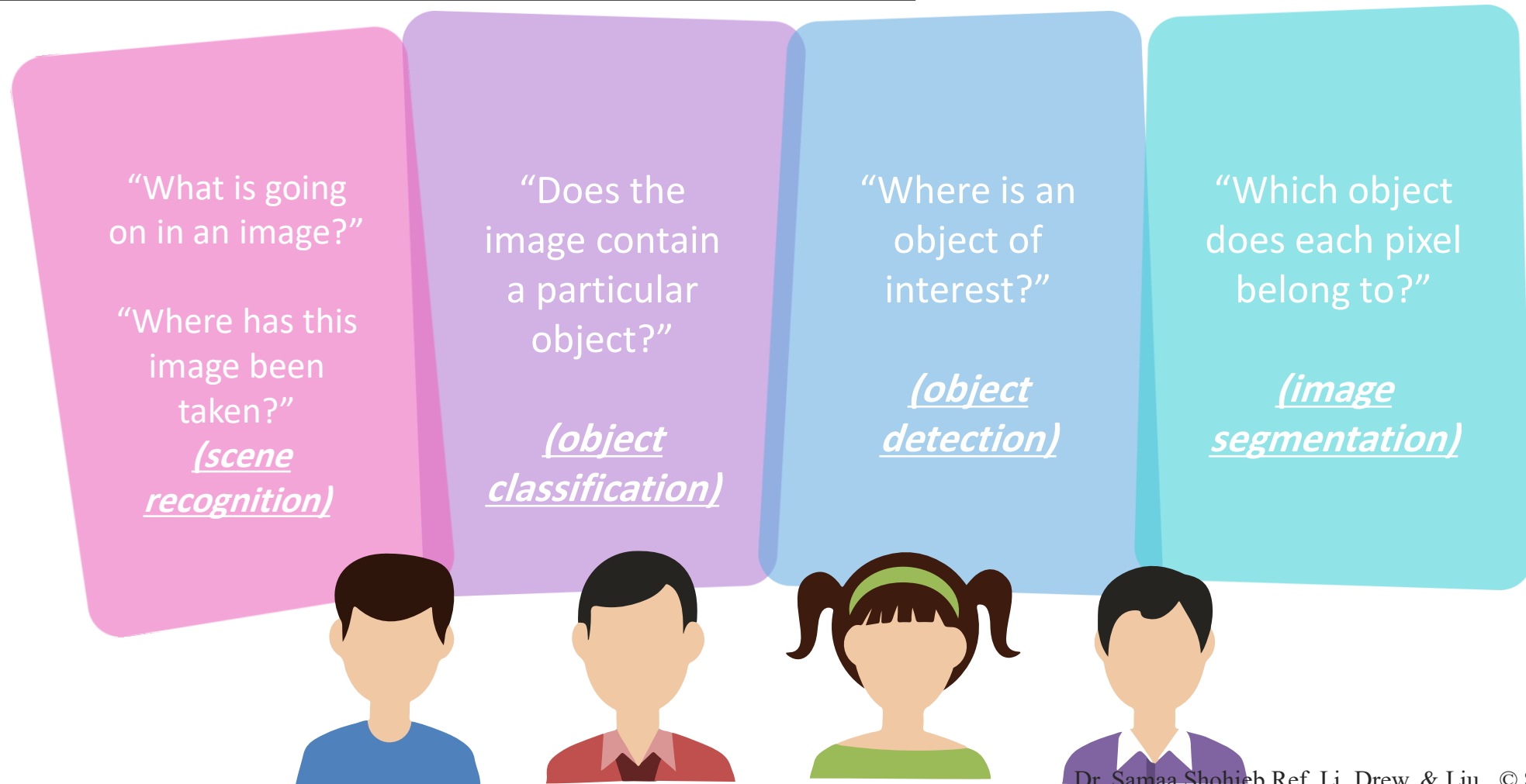
2.2 Multimedia Presentation

- **Graphics Styles**: Human visual dynamics impact how presentations must be constructed.

  a) **Color principles and guidelines**: Some color schemes and art styles are best combined with a certain theme or style. A general hint is **to not use *too many* colors**, as this can be distracting.

  b) **Fonts**: For effective visual communication in a presentation, it is best to use large fonts (i.e., 18 to 36 points), and no more than 6 to 8 lines per screen (*fewer than on this screen*!). Fig. 2.1 shows a comparison of two screen projections:
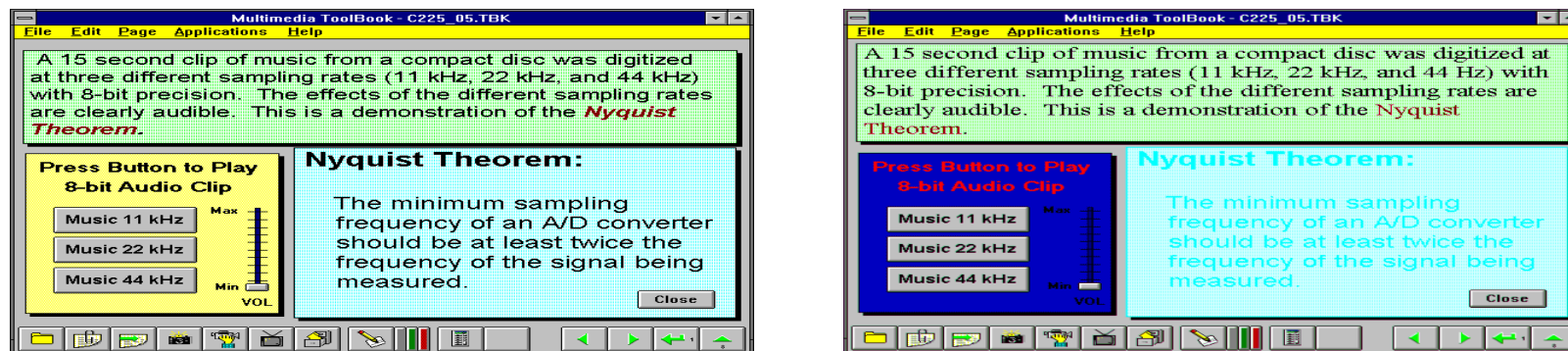

Fig. 2.1: Colours and fonts

2.2 Multimedia Presentation cont.

  c) **A color contrast program**: If the text color is some triple (R,G,B), a legible color for the background is that color subtracted from the maximum (here assuming max=1):

- $(R, G, B) \rightarrow (1 - R, 1 - G, 1 - B)$ (2.1)

- Some color combinations are more pleasing than others; e.g., a pink background and forest green foreground, or a green background and mauve foreground.

- Fig. 2.3, shows a "colour wheel", with opposite colors equal to (1-R, 1-G, 1-B)
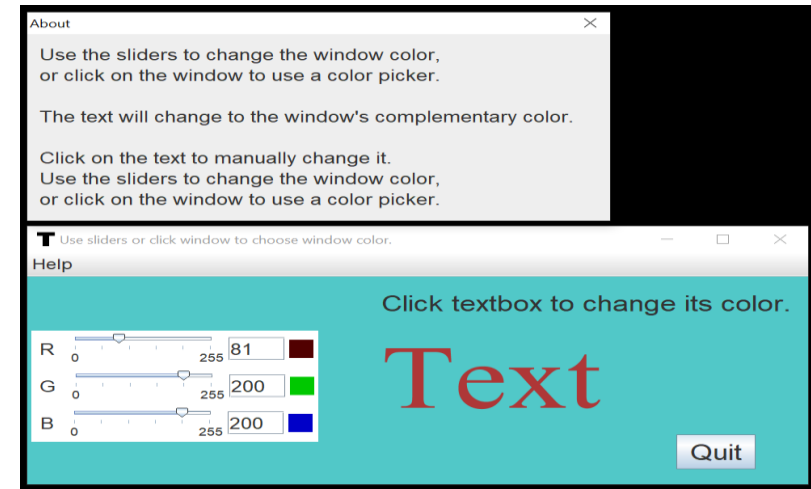
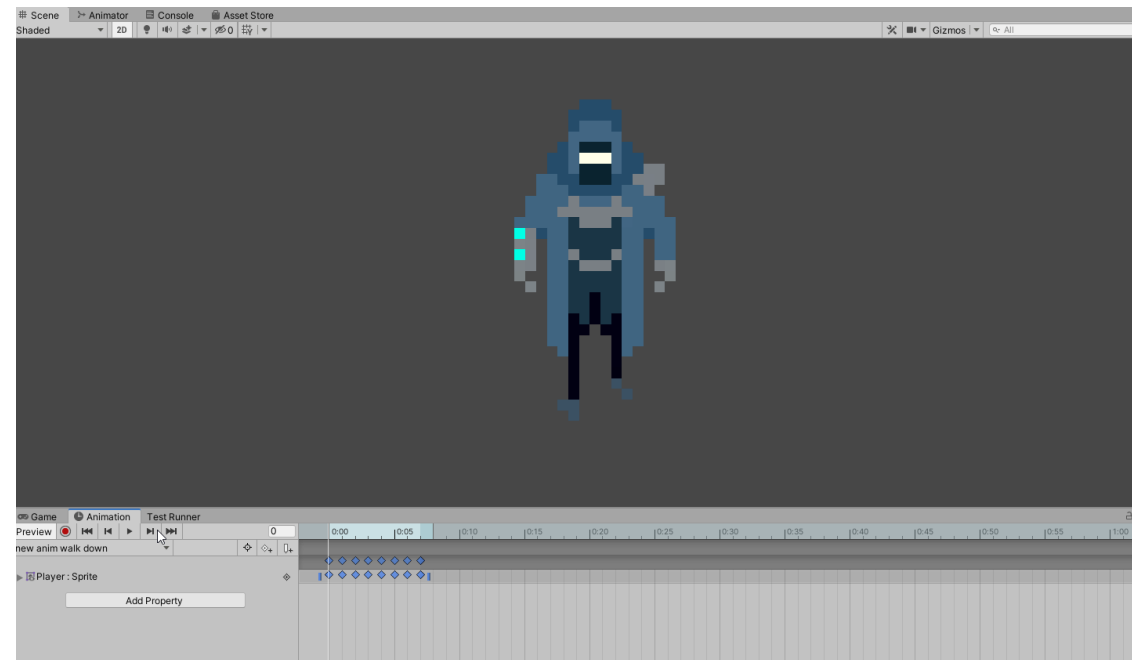
- **Fig. 2.2**: Program to investigate colors and readability.
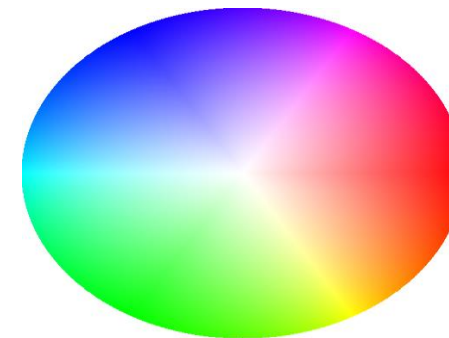
- **Fig. 2.3**: Colour wheel

2.2 Multimedia Presentation cont.

- ## <u>Sprite Animation</u>

- **The basic idea**: A sprite is defined as **a two-dimensional** *image/animated image* that **plays a specific role**, often **independently** manipulated, **within a larger image environment**.

- Sprites are also known as icons.

2.2 Multimedia Presentation cont.

Video Transitions

- ***WILL TALK IN DETAILS IN CH 3***
- Many different types of transitions:
1. ***Cut****:*
- A ***SUDDEN change of image contents*** formed by abutting two video frames consecutively.
- This is the simplest and most frequently used video transition.

MATCH CUT

2.2 Multimedia Presentation cont.

Video Transitions cont.

2*. Wipe:*

- A replacement of the pixels in a region of the viewport with those from another video.

- Wipes can be left-to-right, right-to-left, vertical, horizontal, like an iris opening

2.2 Multimedia Presentation cont.

Video Transitions cont.

3. *Dissolve:*

✓ replaces every pixel with a mixture over time of the two videos, gradually replacing the first by the second. Most dissolves can be classified as two types: **cross dissolve** and **dither dissolve**.

• *Type I: Cross Dissolve*

✓ Every pixel is affected gradually.

✓ Fade-in and fade-out are special types of Type I dissolve:

• *Type II: Dither Dissolve*

✓ Wipes are special form of it

2.2 Multimedia Presentation cont.

Slide Transition

A slide transition is the visual effect that occurs when you move from one slide to the next during a presentation

Fig 2.8: Pseudocode for slide video transition

```
1: for t in 0..t_max do
2:     for x in 0..x_max do
3:         if (x/x_max < t/t_max) then
4:             R = R_L(x + x_max * [1 - t/t_max], t)
5:         else
6:             R = R_R(x - x_max * t/t_max, t)
```

$$1:\ \textbf{for } t \text{ in } 0..t_{max} \textbf{ do}$$
$$2:\quad \textbf{for } x \text{ in } 0..x_{max} \textbf{ do}$$
$$3:\quad\quad \textbf{if } \left(\frac{x}{x_{max}} < \frac{t}{t_{max}}\right) \textbf{ then}$$
$$4:\quad\quad\quad R = R_L\left(x + x_{max} * \left[1 - \frac{t}{t_{max}}\right],\ t\right)$$
$$5:\quad\quad \textbf{else}$$
$$6:\quad\quad\quad R = R_R\left(x - x_{max} * \frac{t}{t_{max}},\ t\right)$$
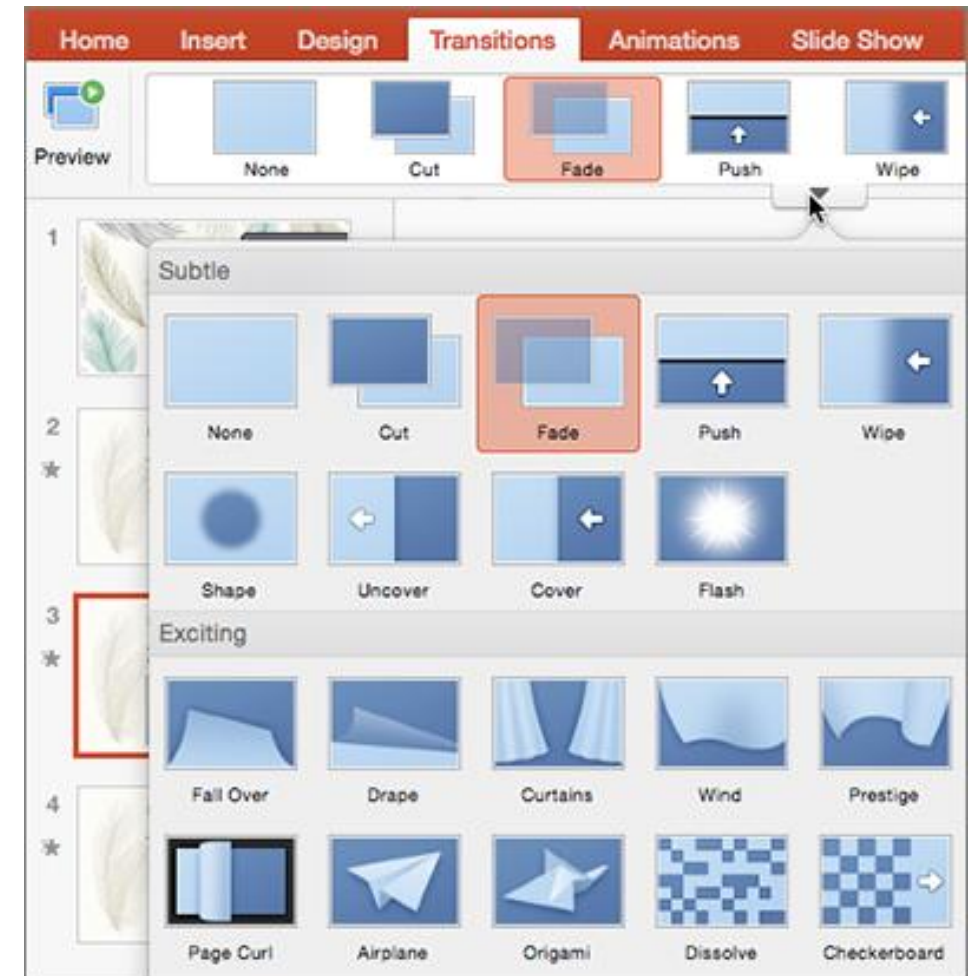
2.3 Data Compression

Table 2.1: Uncompressed video sizes.

Standard Definition Video		
640×480 full color	=	922 kB/frame
@ 30 frames/sec	=	28 MB/sec
	=	221 Mb/sec
× 3,600 sec/hour	=	100 GB/hour
High Definition Video		
1,920×1,080 full color	=	6.2 MB/frame
@ 30 frames/sec	=	187 MB/sec
	=	1.5 Gb/sec
× 3,600 sec/hour	=	672 GB/hour

2.3 Data Compression cont.

(a)   (b)

Fig. 2.9: JPEG compression: (a) original uncompressed image; (b) JPEG compression with Quality Factor *qf* = 75 (the typical default).

2.3 Data Compression cont.

(c)　　　　　　　　　　　　　(d)

Fig. 2.9: JPEG compression: (c) Quality Factor *qf* = 25 and (d) Quality Factor *qf* = 5.

2.3 Data Compression cont.

Table 2.2: JPEG file sizes (bytes) and percentage size of data for JPEG compression with Quality Factor qf = 75, 25, and 5.

Quality Factor (qf)	Compressed File Size	Percentage of Original
-	529,620	100%
75	37,667	7.11%
25	16,560	3.13%
5	5,960	1.13%

2.3 Data Compression cont.

- Concerns with *How expensive image and video processing is in terms of CPU cycles?*

- Suppose we have an image whose pixels we wish to darken, by a factor of 2:

Algorithm 2.1: Darken by a factor of 2
1: **for** $x = 1$ **to** *columns* **do**
2:     **for** $y = 1$ **to** *rows* **do**
3:         image[x,y].red $/= 2$
4:         image[x,y].green $/= 2$
5:         image[x,y].blue $/= 2$

On a RISC machine, 12 instructions per pixel, i.e., per 3 bytes.

2.4 Multimedia Production *FROM PREV. CHAPTER*

- Multimedia production can easily involve an *art director, graphic designer, production artist, producer, project manager, writer, user interface designer, sound designer, videographer, and 3D and 2D animators*, as well as programmers.

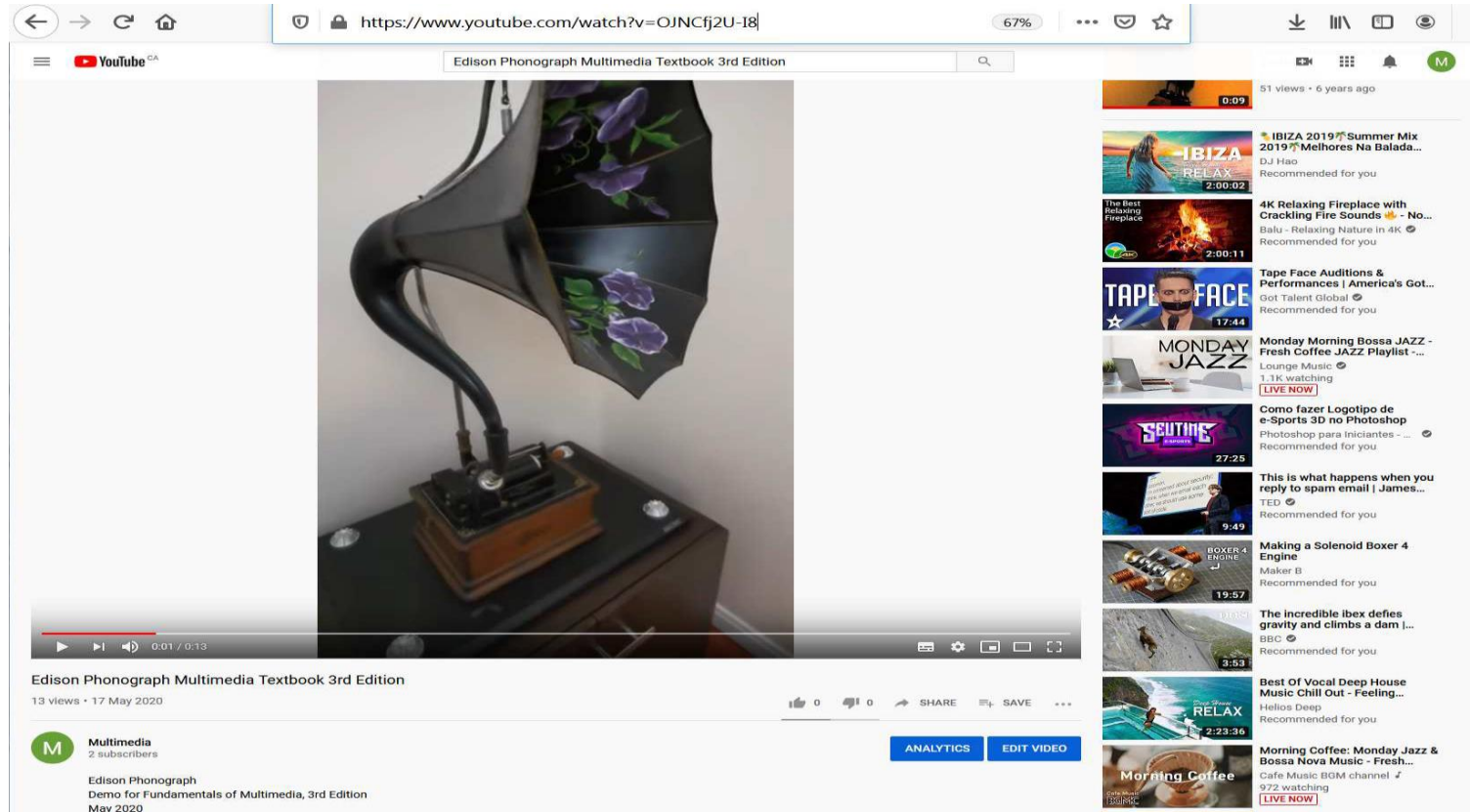# 2.5 Multimedia Sharing and Distribution *FROM PREV. CHAPTER*

Fig. 2.11: The YouTube page for the video uploaded. The list of related videos are shown on the right side, and users can post their comments, as well.

2.6 Some Useful Editing and Authoring Tools *FROM PREV. CHAPTER*

•   One needs real vehicles for showing understanding principles   of and creating multimedia. And straight programming in C++ or Java is not always the best way of showing your knowledge and creativity.

• Some popular authoring tools include the following:
- **Adobe Premiere**
- **HTML5 Canvas**
- **Adobe Director**
- **Adobe XD**

• **Hint for studying this section**: Hands-on work in a laptop or Lab environment, with reference to the text.

Adobe Premiere

- Used for video editing and exporting. Features a "score" authoring metaphor, placing video clips in horizontal tracks that resemble a musical score.
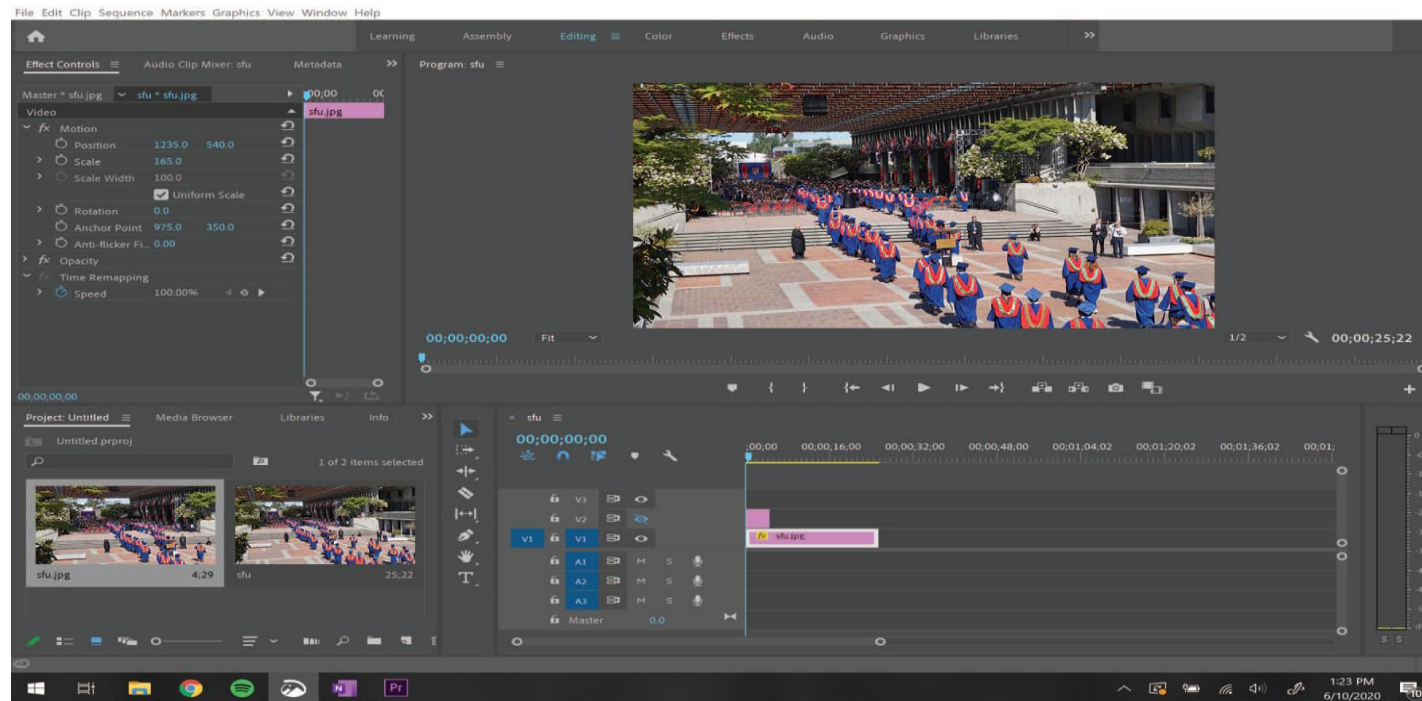

Fig. 2.12: Adobe Premiere Screen.

Adobe Premiere

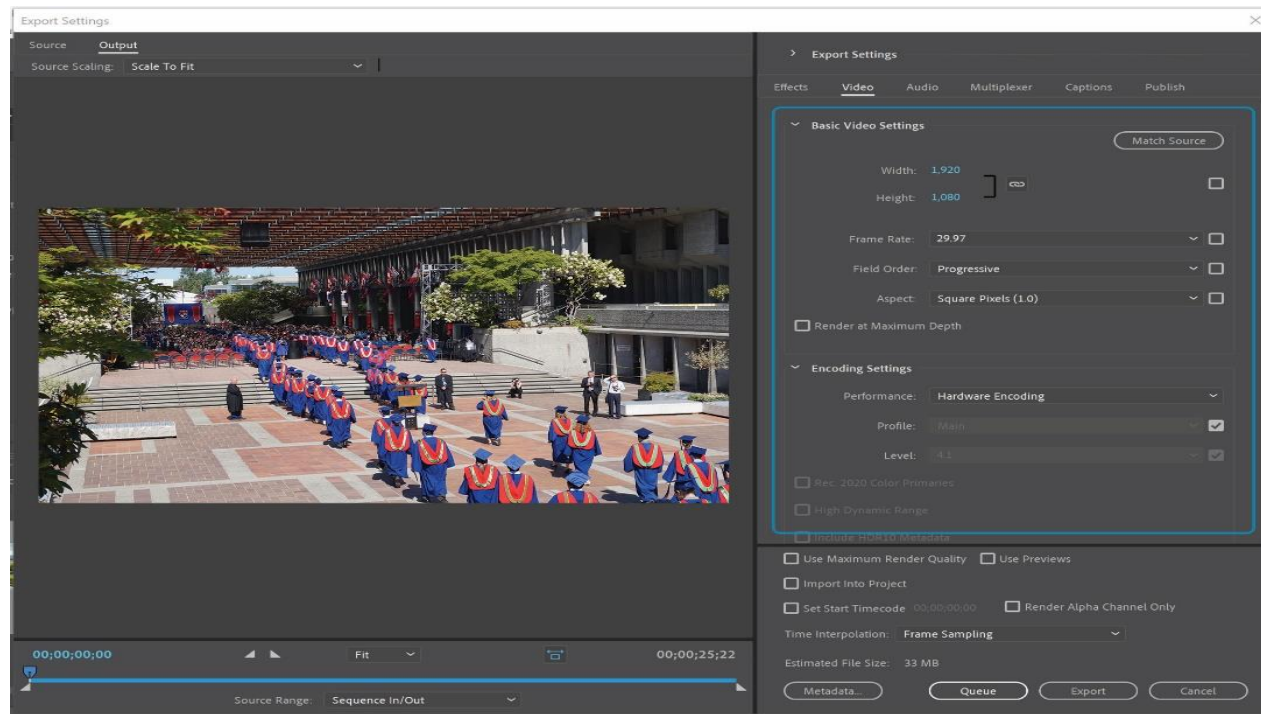- As a professional video editor, Premiere offers many controls for exporting and compressing the final product.

Fig. 2.13: Adobe Premiere export setting screen.

Adobe Premiere

- Premiere allows imports of .psd (Photoshop files), which can have alpha channels which can crop specific pixel in the picture.
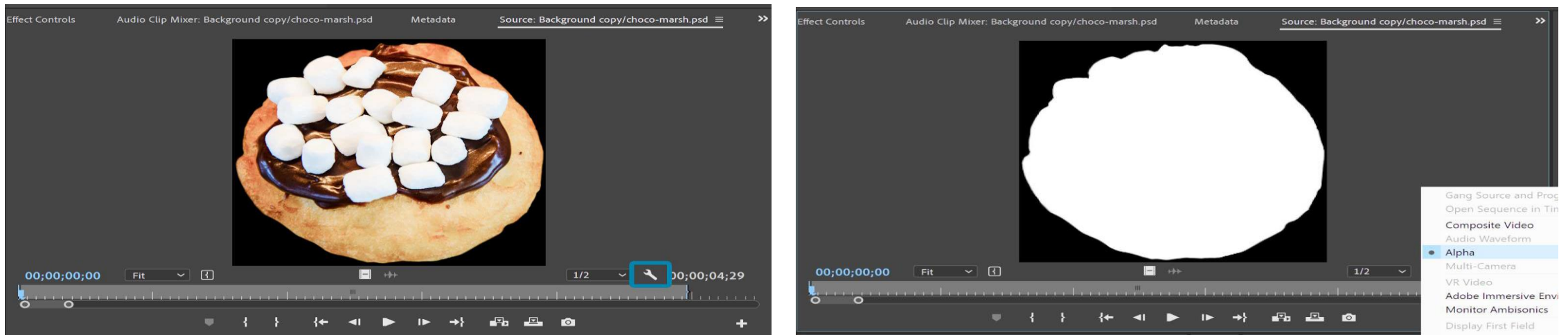

Fig. 2.14: Adobe Premiere clip viewer.

HTML5 Canvas

- HTML5 canvas is an element used to draw animated graphics on a webpage.

- The <canvas> element is a container for graphics.

  - A rectangular area that generated by HTML code with width and height attributes.

  - Using JavaScript, we can actually draw the graphical objects.

Draw Graphical Objects

- You can draw simple shapes, text, images, path or other objects on the canvas.
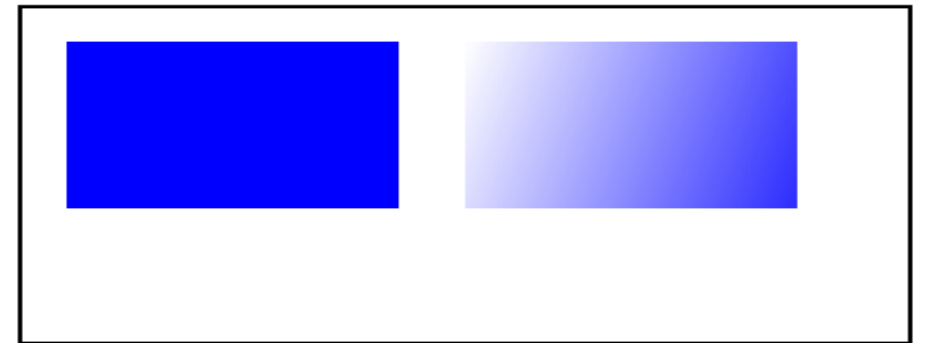
// a rectangle with filled color
ctx.fillRect(x, y, width, height)

// a rectangle with border
ctx.strokeRect(x, y, width, height)

// clear a rectangle area
ctx.clearRect(x, y, width, height)
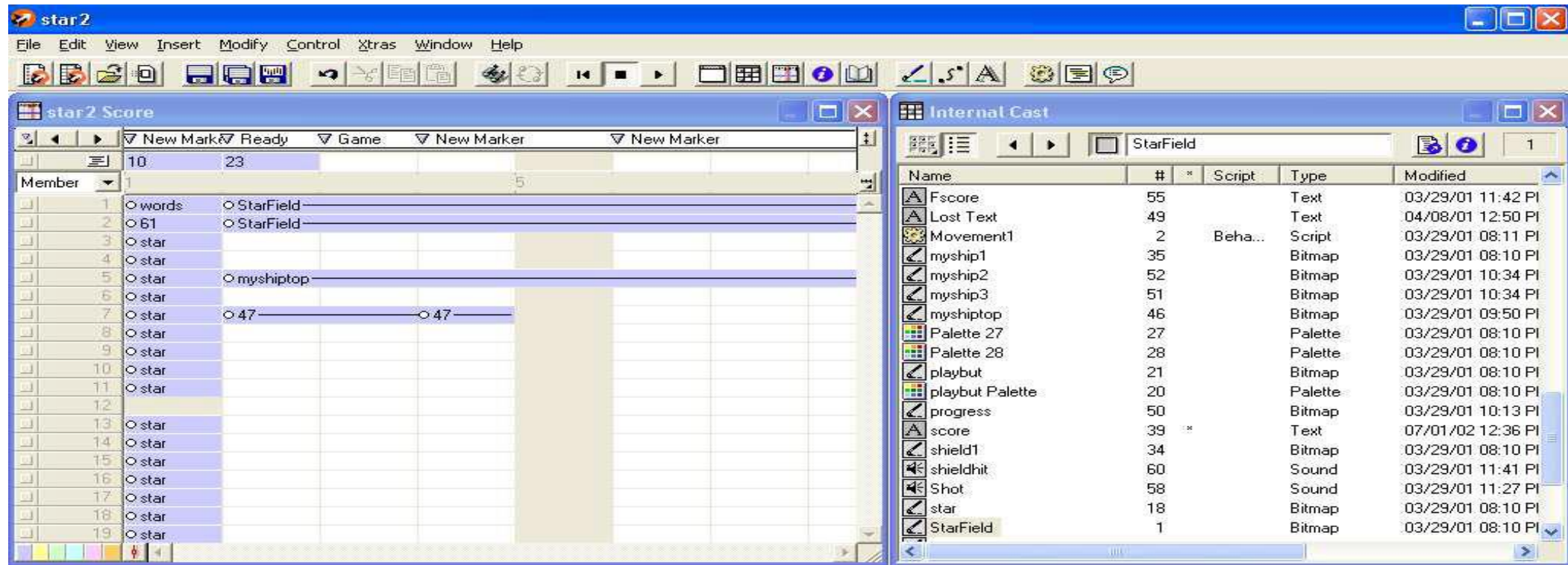
Transform and Animation

- The shapes of the graphics can be transformed by

  - Translate

  - Rotate

  - Scale

Steps to Create an Animation

- 1. clear the canvas: ctx.clearRect(x, y, width, height)

- 2. save the current state of canvas: ctx.save()

- 3. draw the graphics

- 4. restore the canvas state: ctx.restore()

Adobe Director

- Director is a complete environment for creating interactive "movies".

Animation

- Animation is created by showing slightly different images over time.
  - Using different cast members in different frames.
  - To control this process more easily, Director permits combining many cast members into a single sprite.
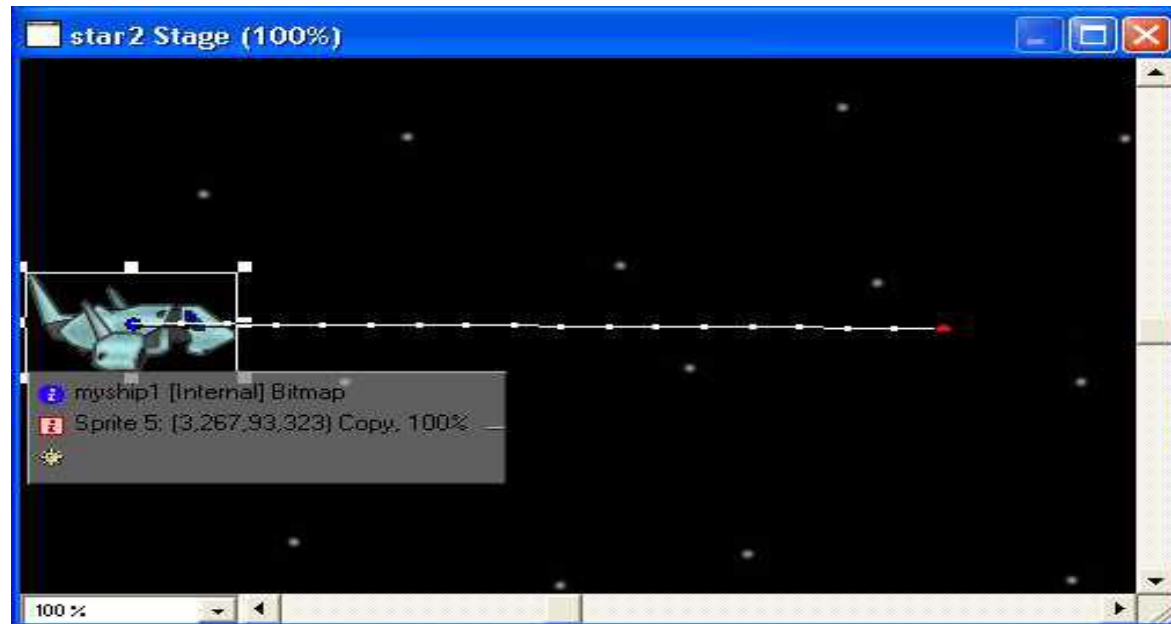

Fig. 2.17: A tweened sprite. Because several instances may be used for a single cast member, each instance is called a sprite. Typically, cast members are raw media, whereas sprites are objects that control where, when, and how cast members appear on the stage and in the movie.

Adobe XD

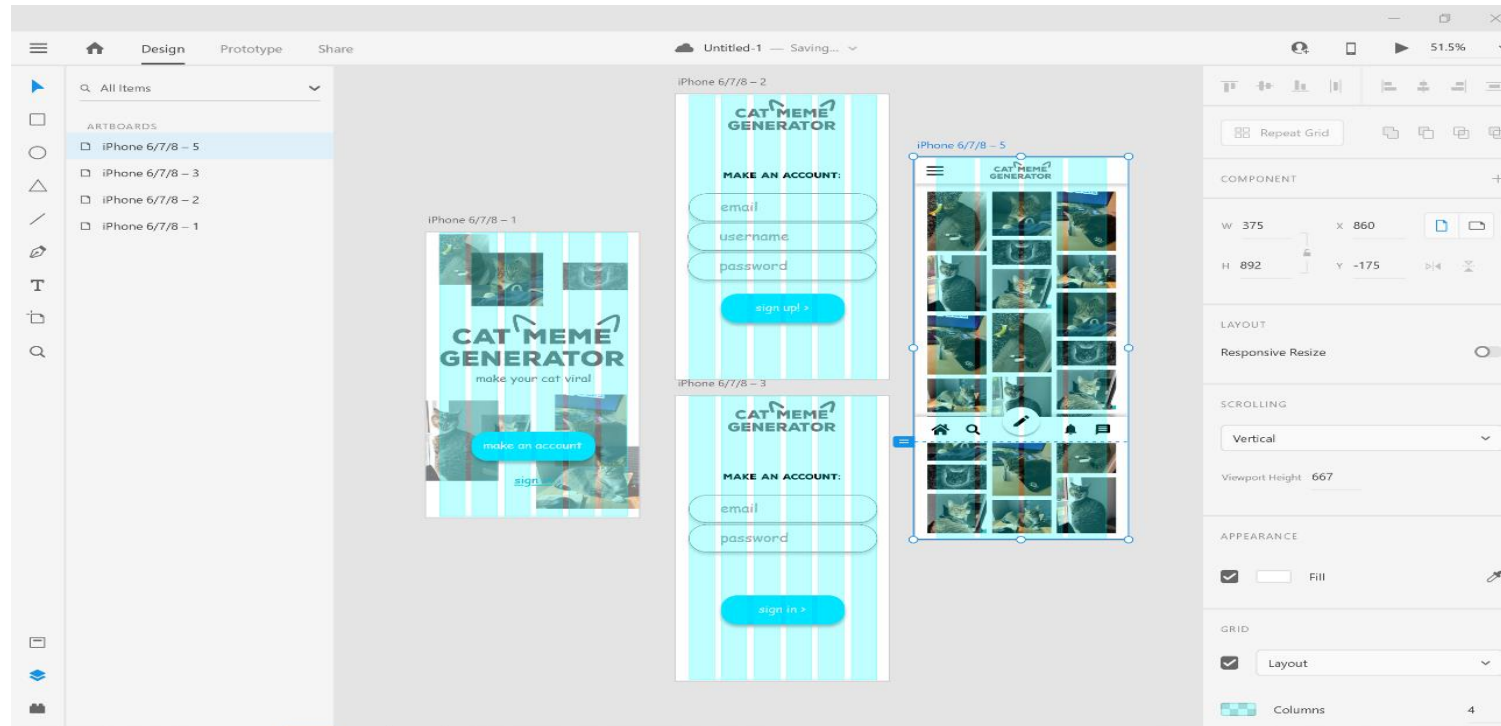- Used for making prototypes of websites and mobile apps without any code.

Fig. 2.18: The Design Mode in Adobe XD.

Adobe XD

- Screens are linked by making elements clickable, giving the "feel" of a real app.
- This is commonly used for UI design to be finalized before sent for programming.
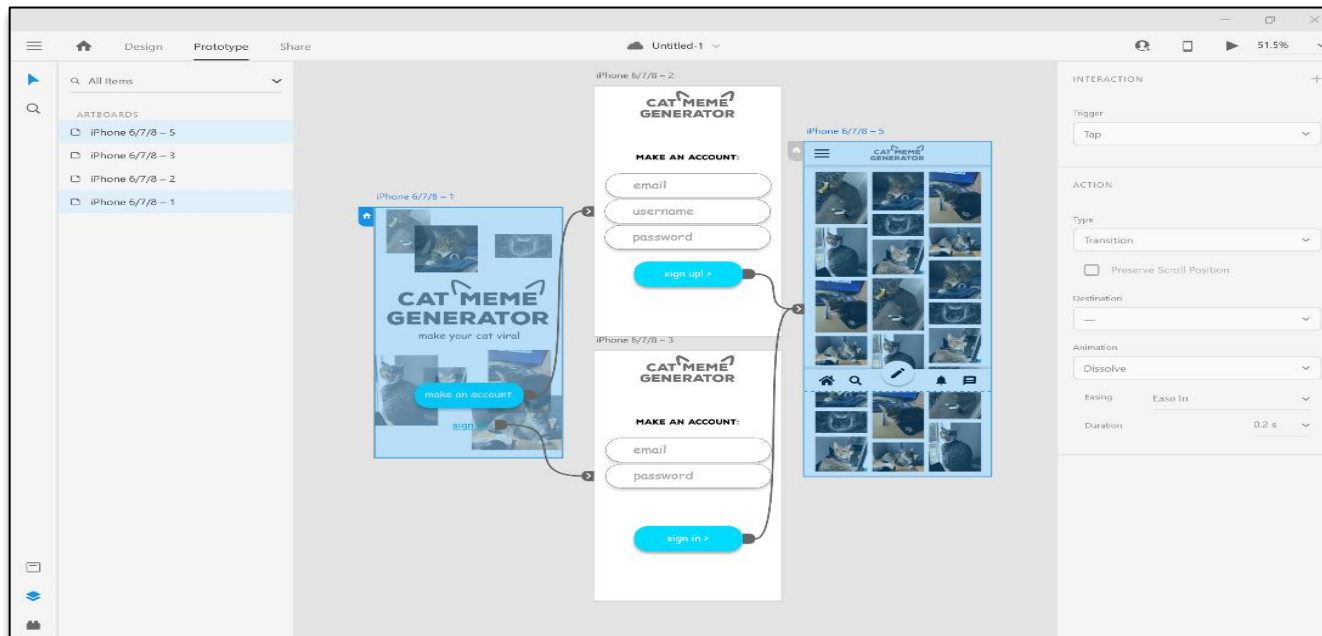

Fig. 2.20: The Prototype Mode in Adobe XD.

THANK YOU