Fundamentals of Multimedia

3rd Edition

Chapter 2 : A Taste of Multimedia

- This chapter introduces:
  - A set of tasks and concerns that are considered in studying multimedia:
    - What a MM content is made of?
    - How a MM application works?
    - How MM special effects are produced?
  - Issues in multimedia production and presentation are discussed
    - Color principles
    - Compression meaning
    - Multimedia sharing
    - Useful tools

2.1 **Multimedia Tasks and Concerns**

- Multimedia content is ubiquitous in software all around us, including in our phones.
- We are interested in making interactive applications (or "presentations"), using:
  - video editors such as **Adobe** Premiere or **Cyberlink** PowerDirector
  - still-image editors such as **Adobe** Photoshop in the first instance,
- but then
  - combining the resulting resources into *interactive* programs by making use of "authoring" tools such as **Flash** and Director that can include sophisticated programming.

2.1 Multimedia Tasks and Concerns

- Problems and considerations involving computer science
- Computer Vision and Artificial Intelligence to *understand* image content
  - Smart cameras → find faces in the images
  - Scene recognition: "Where has this image been taken?"
  - Object classification: "Does the image contain a particular object?"
  - Object detection: "Where is an object of interest?"
  - Image segmentation: "Which object does each pixel belong to?"
- Multimedia systems in general have to deal with these problems borrowing algorithms and tools from computer science but these are not covered in this course.

2.2 Multimedia Presentation

- What effects to consider for multimedia presentation
  - **Color Contrast**
  - **Sprite Animation**
  - **Video Transitions**

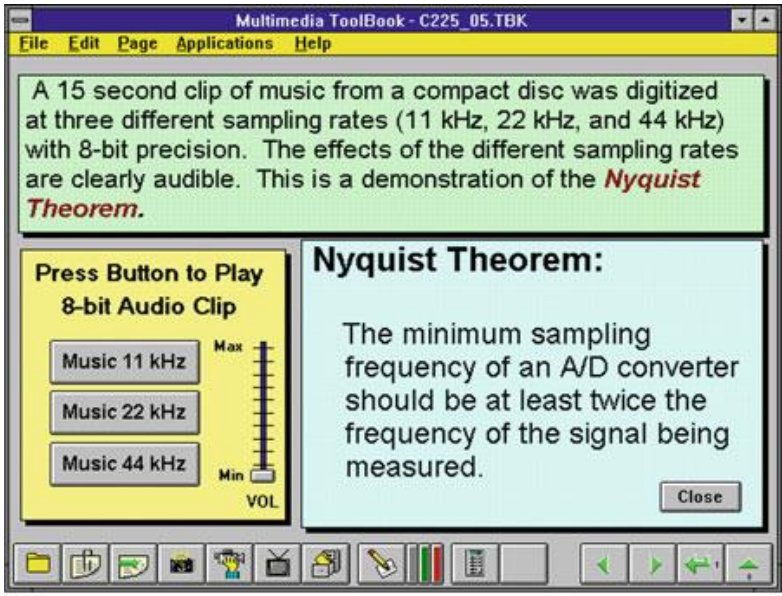
- Guidelines for content design
  - *good* use of color and fonts
  - careful combination of color schemes and graphics
  - human visual dynamics considerations

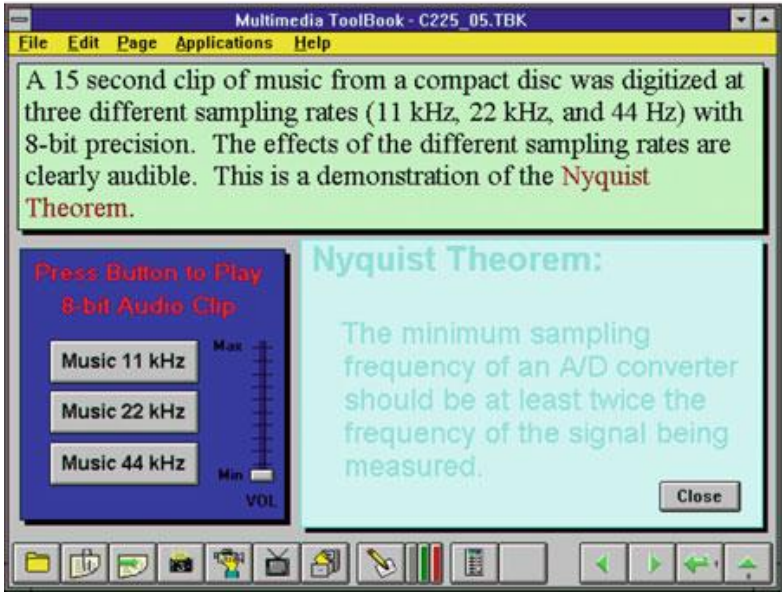
2.2 Multimedia Presentation

- **Graphics Styles**
  - Careful thought has gone into combinations of color schemes and how lettering is perceived in a presentation.
  - When constructing presentation then the Human visual dynamics should be considered.
- Human visual dynamics :As soon as the eye moves (saccades ترمش) it re-adjusts its exposure both chemically and geometrically by adjusting the iris القزحيةwhich regulates the size of the pupil بؤبؤ.
  - تمرین اختیاری: define in more detail what is Human Visual Dynamics.

2.2 Multimedia Presentation

- **Color Principles and Guidelines**
- See these two figures. Which one is more legible?
- 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.
- It helps to be consistent with the use of color
- Then color can be used to signal changes in theme.

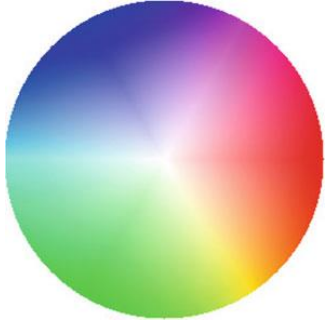




2.2 Multimedia Presentation

- **Fonts**
- For effective visual communication,:
  - large fonts (18 to 36 points) are best,
  - with no more than six to eight lines per screen.
- (*See Figure in previous slide*.)
- Upper part is **good**, while bottom one is poor.
  - (*Why do you think?*)

2.2 Multimedia Presentation



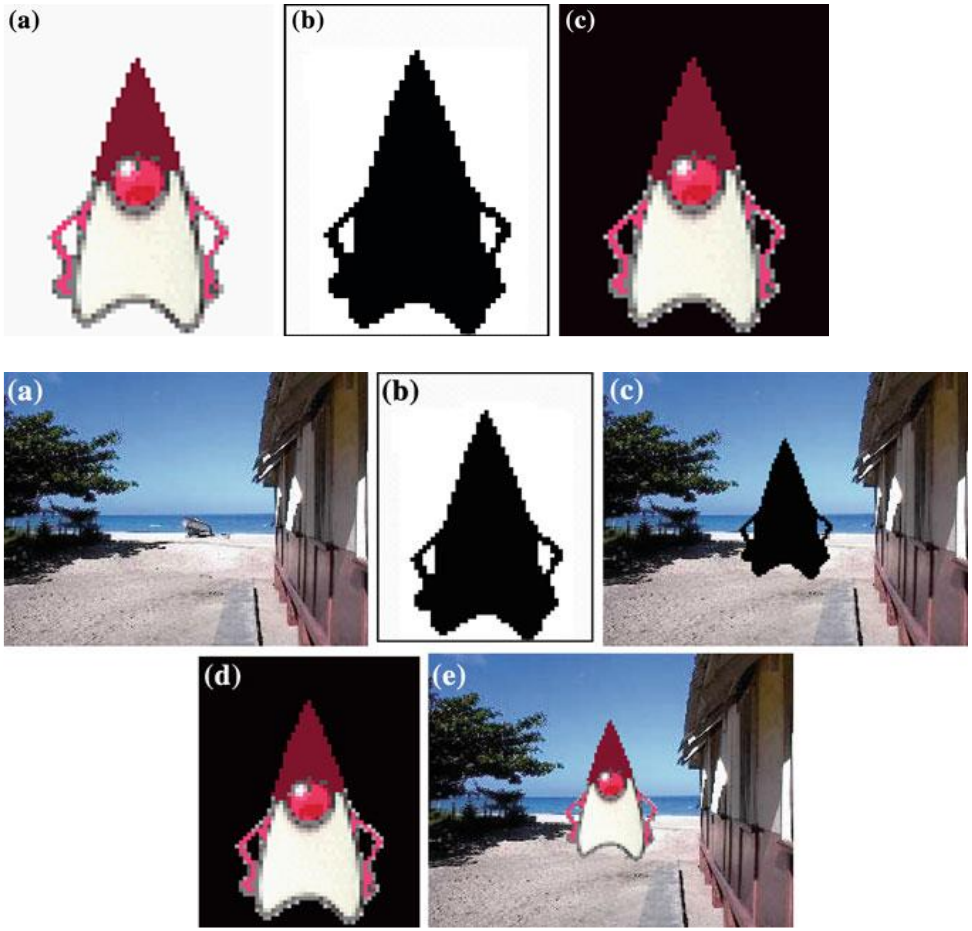
- **A Color Contrast**
- The simplest approach to making readable colors on a screen is to use the principal complementary color as the background for text.
- For color values in the range 0–1 (or, effectively, 0–255), if the text color is some triple (Red, Green, Blue), or (R,G, B) for short, a legible color for the background is likely given by that color subtracted from the maximum:

$$(R, G, B) \Rightarrow (1 - R, 1 - G, 1 - B) \text{ or}$$
$$(R, G, B) \Rightarrow (255 - R, 255 - G, 255 - B)$$

- A way to make reasonable color on a screen is the color "opposite": if the text is bright, the background is dark, and vice versa.

2.2 Multimedia Presentation

- **Sprite (شبح) Animation**
  - *Sprites are often used in animation.*
  - *This simple example of animation (page 29-30)..توضیحات مربوطه را مطالعه کنید*



2.2 Multimedia Presentation

- **Video Transitions**
  - Video transitions are syntactic نحوي means to signal "scene changes" and often carry semantic دلالات لفظية meaning.
  - Many different types of transitions exist; the main types are:
    - *cuts,*
    - *wipes,*
    - *dissolves,*
    - *fade-ins,*
    - *fade-outs.*

2.2 Multimedia Presentation

Types of Transitions:

- **A cut:** carries out an abrupt change of image contents in two consecutive video frames from their respective clips. It is the:
  - simplest and
  - most frequently used video transition.

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

- **A dissolve:** replaces every pixel with a mixture over time of the two videos, gradually changing the first to the second.

2.2 Multimedia Presentation

Video Transitions: Dissolve

- Type I (cross dissolve): every pixel is affected gradually.

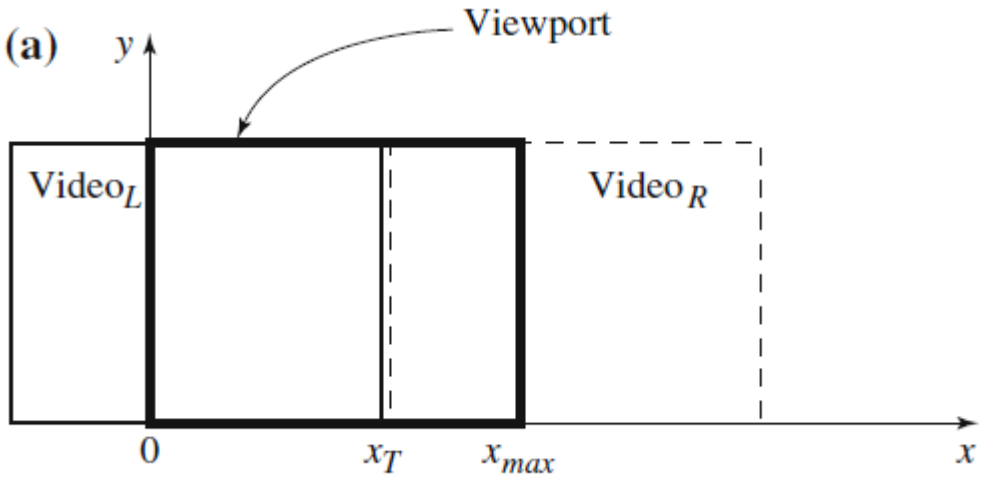
$$\mathbf{D} = (1 - \alpha(t)) \cdot \mathbf{A} + \alpha(t) \cdot \mathbf{B}$$

$$\alpha(t) = kt, \quad \text{with} \quad kt_{\max} \equiv 1$$

  - Fade-in and fade-out are special types of a Type I dissolve
- Type II (dither dissolve) video A will abruptly (instead of gradually, as in Type I) change to video B part by part. The positions of the pixels subjected to the change can be random or sometimes follow a particular pattern.
  - Wipes are special forms of a Type II dissolve

2.2 Multimedia Presentation

Video Transitions: Dissolve- Slide in/out




```
for t in 0..t_max
    for x in 0..x_max
        if ( x/x_max < t/t_max )
            R = R_L ( x + x_max * [1 - t/t_max], t)
        else
            R = R_R ( x - x_max * t/t_max, t)
```

2.3 Data Compression

- One of the most evident and important challenges of using multimedia is the necessity to compress data.
- we need excellent and fast data compression in order to avoid such high data rates that cause problems for storage and networks. (See Table 2.1 for Uncompressed Video sizes)

Table 2.1 Uncompressed video sizes

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

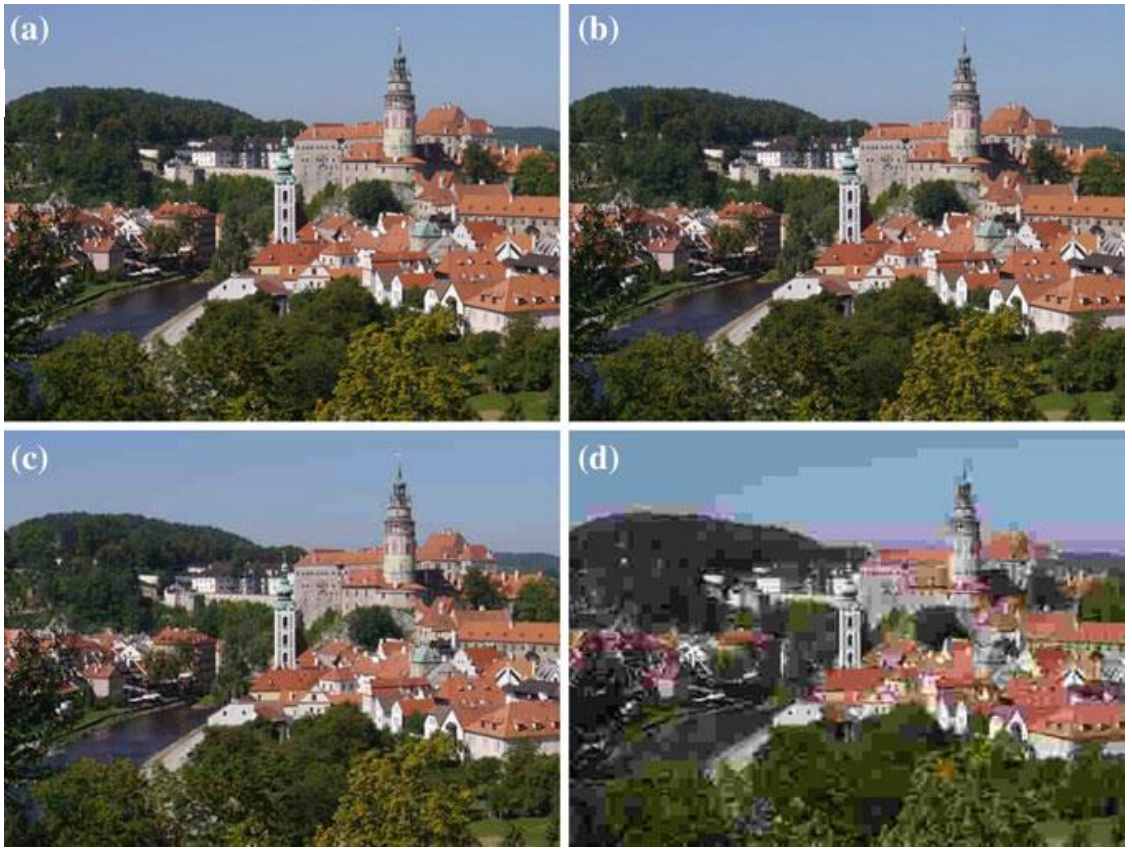
2.3 Data Compression

- The more image compression is done, the worse the quality (Q) of that image is.

- Next slide Figure 2.9a shows an original, uncompressed image taken by a digital camera that allows full-accuracy images to be captured, with no data compression at all.
- In Fig. 2.9b,c that while Q = 75 and 25 are not terrible, if we insist on going down to a Quality Factor of Q = 5 we do end up with an unusable image Fig. 2.9d.

2.3 Data Compression

$364 \times 485 \times 3 = 529,620$ bytes



Quality factor	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

- What is the best compression ratio for JPEG images and for MPEG video, while remaining reasonable quality?
- تحقیق کنید.

- how expensive image and video processing is in terms of processing in the CPU?
- JPEG compression takes some 300 instructions per pixel or, in other words, 100 instructions per image byte → of 2.8 billion instructions per second for standard definition and 19 billion instructions per second for high definition, → a real constraint!
- Simple image darkening: three loads, three shifts, and three stores → total of 12 instructions per pixel, i.e., per 3 bytes and four instructions per image byte → for standard-definition video, we have 28 MB/s, meaning 28 × 4=112 mega instructions per second. For high definition, at 187 MB/s, we need 748 mega instructions per second.

```
for x = 1 to columns
{
   for y = 1 to rows
   {
      image[x,y].red   /= 2;
      image[x,y].green /= 2;
      image[x,y].blue  /= 2;
   }
}
```

2.4 Multimedia Production

- multimedia production can easily involve a host of people with specialized skills:
  - 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.

2.4 Multimedia Production

- During the production timeline:
- The **programmer** is involved when the project is about 40% complete
- the **design** phase consists of:
  - storyboarding,
  - flowcharting,
  - prototyping, and
  - user testing, as well as
  - a parallel production of media.
- Programming and **debugging** phases would be carried out in consultation with marketing, and
- the **distribution** phase would follow.

- *Assignment*: describe what can be done in each part of the design phase.

2.5 Multimedia Sharing and Distribution

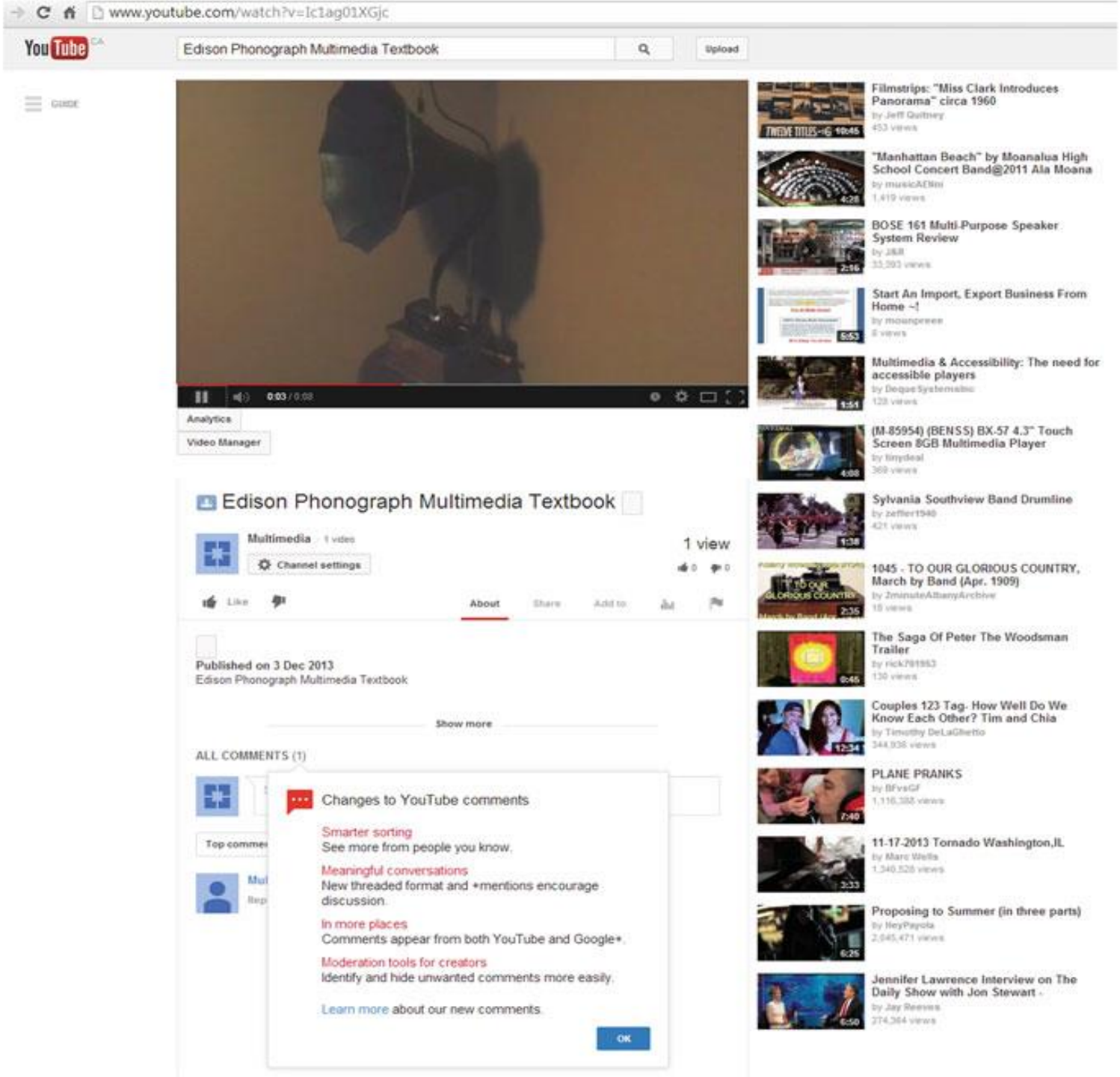
- Multimedia content, once produced, needs to be published and then shared among users:
  - Optical disks
  - USB
  - Internet
- Consider YouTube, the most popular video sharing site over the Internet, as an example.
- A user can easily create a Google **account** and channel (as YouTube is now owned by Google), and then upload a video, which will be shared to everyone or to selected users.
- YouTube **further** enables titles and tags that are used to classify the videos and link similar videos together (shown as a list of **related** videos).
- The link to this video can be fed into such other **social** networking sites such as Facebook or Twitter as well, potentially propagating to many users of interest in a short time

2.5 Multimedia Sharing and Distribution

- The Internet is reshaping traditional TV broadcasting, as well.
- In the **UK**, the BBC's **iPlayer** has been successfully broadcasting high-quality TV programs to both TV subscribers and public Internet users with Adobe Flashplayer since 2007.

- In the **US**, CNBC, Bloomberg Television, and Showtime use **live-streaming** services.

- **China**, the largest *Internet Protocol TV* (**IPTV**) market by subscribers (12.6 million) to date, is probably the most vigorous market.


www.youtube.com/watch?v=Ic1ag01XGjc
YouTube
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Analytics
Video Manager
Edison Phonograph Multimedia Textbook
Multimedia
Channel settings
1 view
Like
About
Share
Add to
Published on 3 Dec 2013
Edison Phonograph Multimedia Textbook
Show more
ALL COMMENTS (1)
Changes to YouTube comments
Smarter sorting
See more from people you know.
Meaningful conversations
New threaded format and +mentions encourage discussion.
In more places
Comments appear from both YouTube and Google+.
Moderation tools for creators
Identify and hide unwanted comments more easily.
Learn more about our new comments.
OK
Filmstrips: "Miss Clark Introduces Panorama" circa 1960
"Manhattan Beach" by Moanalua High School Concert Band@2011 Ala Moana
BOSE 161 Multi-Purpose Speaker System Review
Start An Import, Export Business From Home ~!
Multimedia & Accessibility: The need for accessible players
(M-85954) (BENSS) BX-57 4.3" Touch Screen 8GB Multimedia Player
Sylvania Southview Band Drumline
1045 - TO OUR GLORIOUS COUNTRY, March by Band (Apr. 1909)
The Saga Of Peter The Woodsman Trailer
Couples 123 Tag- How Well Do We Know Each Other? Tim and Chia
PLANE PRANKS
11-17-2013 Tornado Washington,IL
Proposing to Summer (in three parts)
Jennifer Lawrence Interview on The Daily Show with Jon Stewart -

2.5 Multimedia Sharing and Distribution

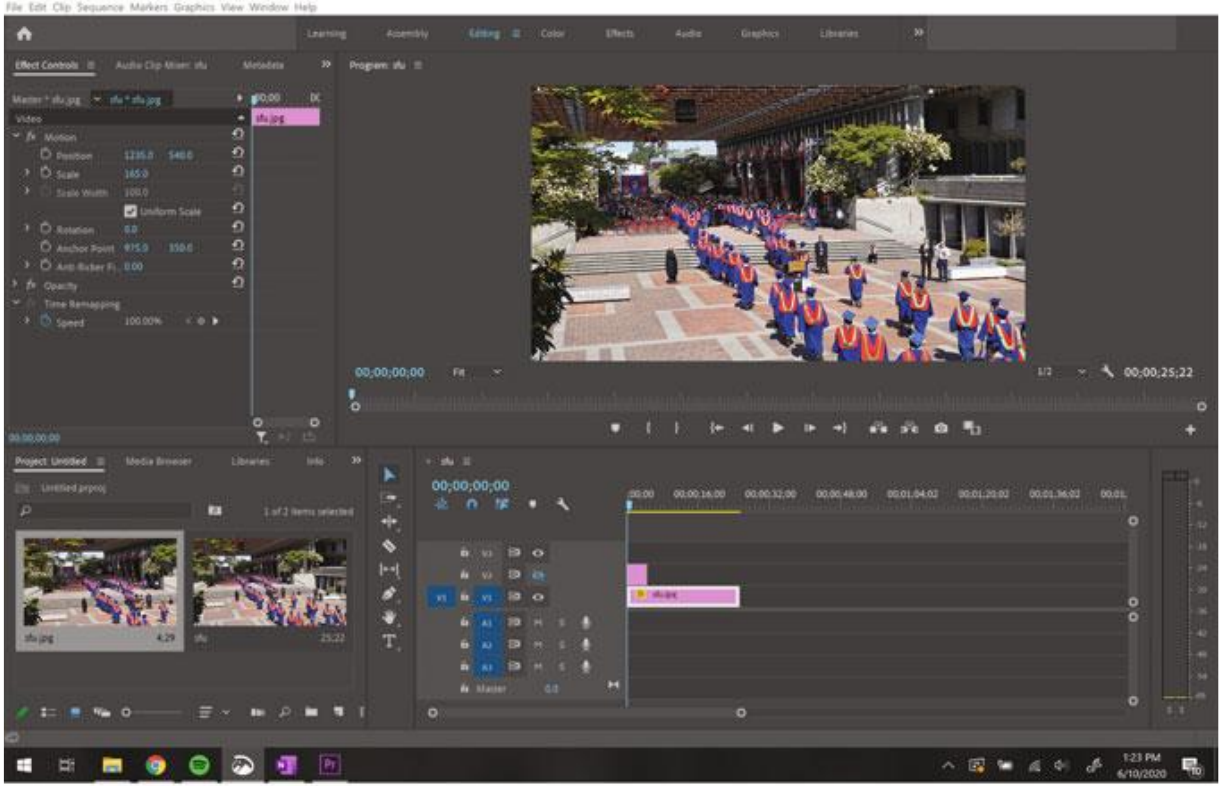
- Users' viewing habits are also changing

- IPTV services are becoming highly personalized, integrated, **portable**, and **on-demand**.

- Most service providers are moving beyond basic video offerings toward richer user experiences, particularly with the support for
  - multi-screen viewing across TVs,
  - PCs,
  - **tablets**, and
  - **smartphones**.

2.6 Some Useful Editing and Authoring Tools

- Since the first step in creating a multimedia application is probably creation of interesting video clips, we start off with looking at a video editing tool:
- **Premiere**: video editing program that allows you to quickly create a simple digital video by assembling and merging multimedia components



2.6 Some Useful Editing and Authoring Tools

- HTML Canvas
- HTML5 canvas is an element used to drawanimated graphics on a webpage overtaking Flash and Shockwave.

```
<canvas id="canvas" width="300" height="300" style
="background-color: red">
 </canvas>
   var canvas = document.getElementById("canvas");
   var ctx = canvas.getContext("2d");
   // a rectangle with filled color
   ctx.fillRect(x, y, width, height);

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

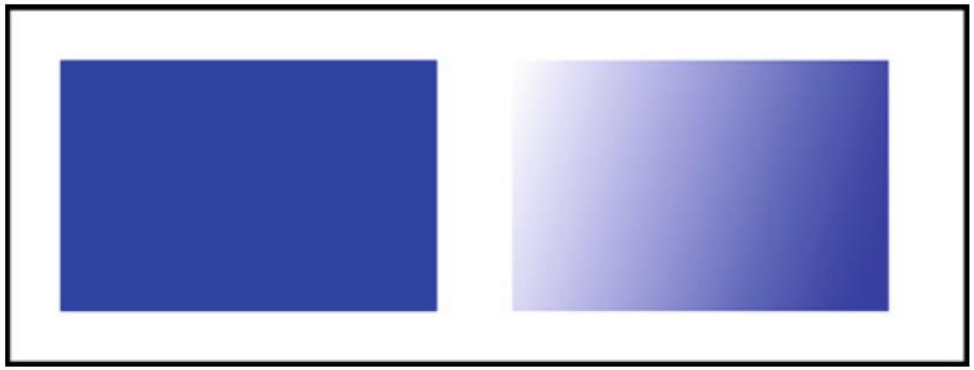


Fig. 2.15 A rectangle with pure color (left) and a rectangle with gradient color (right)

2.6 Some Useful Editing and Authoring Tools

- **Director**: complete environment for creating interactive "movies" and animation.
- Traditional animation is created by showing slightly different images over time.
- Stage, Cast and Score windows
- The set of predefined events is rich and includes mouse events as well as network events
- Behaviors, prewritten and user-defined, are developed in Lingo → behaviors respond to simple events, such as a click on a sprite

2.6 Some Useful Editing and Authoring Tools

- **Adobe XD**: a program to create mockups and prototypes of mobile apps, websites, and software using a series of artboards and links between them.
- It is primarily for user interface or user experience designers to test the visual appearance of their interface designs before it goes to a developer to build in code.

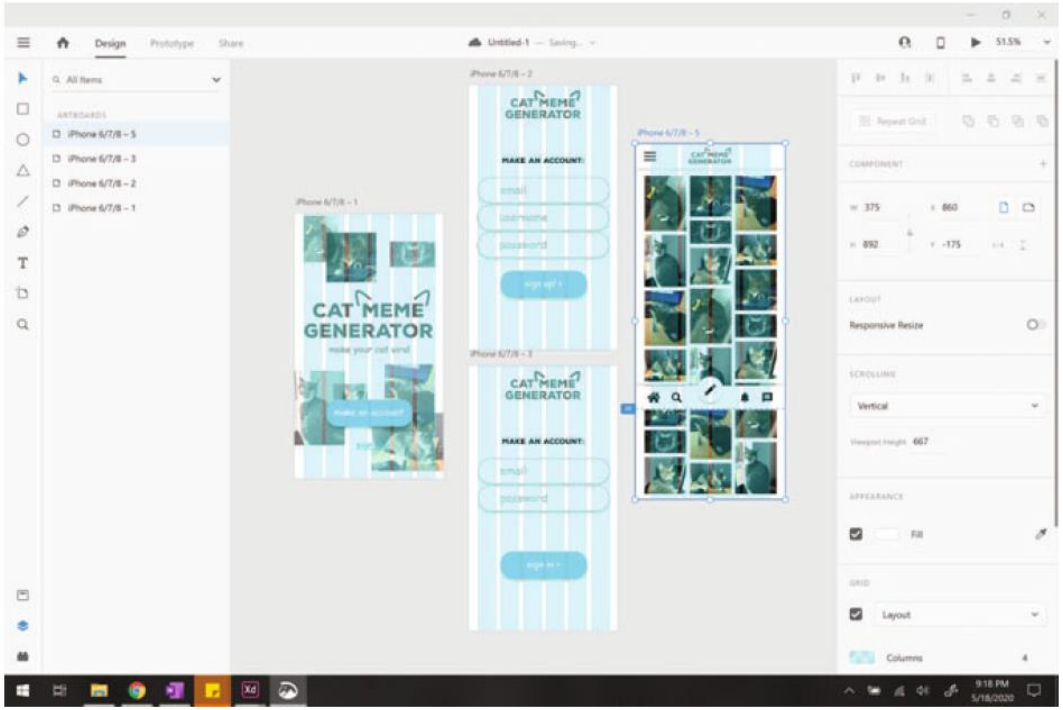


Fig. 2.18 The design mode in Adobe XD

Adobe XD

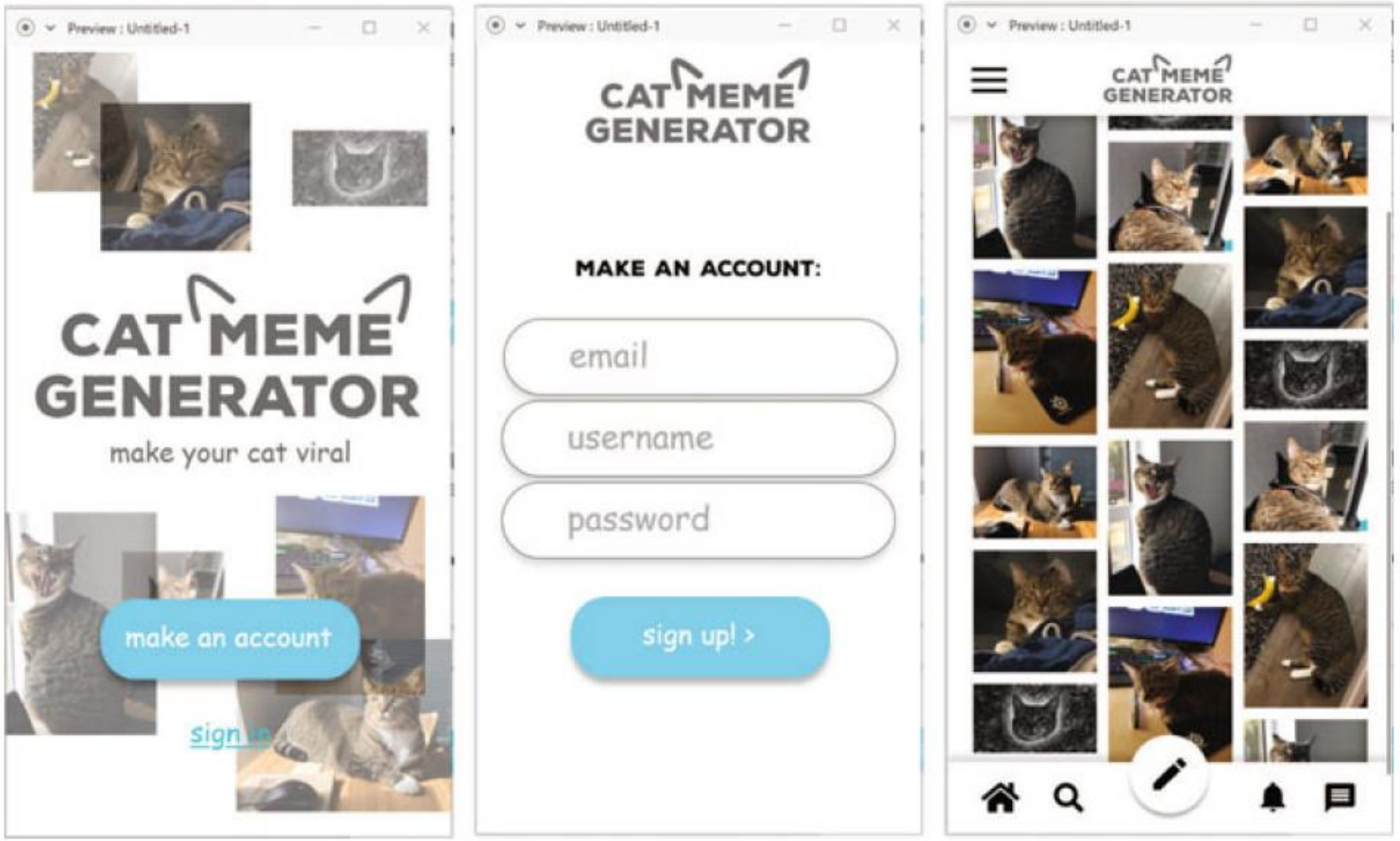


Fig. 2.20 Linked screens in the preview mode. Once linked in the prototype mode, the elements are clickable, allowing users to move between screens

End of Chapter 2