

# Introduction

Many films and games contain amazing visual effects which are created using computer animation. Most of us have also enjoyed cartoons, from short children's TV programs right through to full-length animated feature films. Animation is used for a wide variety of purposes, including various forms of entertainment, advertising and simulation.

Although almost all animation is now done using digital techniques, animation has a long history which pre-dates the use of computers. Animation is an exciting and fast-moving area which provides an opportunity to combine creative and technical skills. However, animation also requires patience and attention to detail.

In this unit you will learn about animation techniques and terminology, and how to design, create, test and review a simple computer-animated product.

**Assessment:** You will be assessed by an onscreen test lasting 1 hour.

## Learning aims

In this unit you will:

- a investigate the applications and features of digital animation products
- b design a digital animation product
- c create, test and review a digital animation product.

Completing the animation unit was challenging as it required quite a lot more patience and skills than I first thought, but it was really exciting to see the final result. I am proud of the animation I produced and it really made all the effort I put into it worthwhile.

Wendy, 16-year-old animator

Comment [RL1]: Unit title

Comment [RL2]: Intro head

Comment [RL3]: Intro text

Comment [RL4]: Assessment

Comment [RL5]: Learning aim head

Comment [RL6]: Learning aim text

Comment [RL7]: Learning aim a list

Comment [RL8]: Student voice

# Creating Digital Animation

**Comment [RL9]:** Chapter title

*Photo*

**4**

**Comment [RL10]:** Chapter number

## BTEC Assessment Zone

This table shows what you must do in order to achieve a **Pass**, **Merit** or **Distinction** grade, and where you can find activities in this book to help you.

**Comment [RL11]:** Assessment head

**Comment [RL12]:** Assessment activity

**Comment [RL13]:** Assessment grid

**Comment [RL14]:** Assessment table head

**Comment [RL15]:** Assessment table text

**Comment [RL16]:** Assessment table bullet

**Comment [RL17]:** Assessment table text

**Comment [RL18]:** A head

**Comment [RL19]:** Text

Assessment and grading criteria			
Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim A: Understand the applications and features of digital animation products</b>			
1A.P1 Identify the intended purpose and features of two animation products.	2A.P1 Explain the intended purpose and features of two different animation products.	2A.M1 Review how the products are fit for purpose and their intended effect on the audience.	2A.D1 Discuss the strengths and weaknesses of two animation products
<b>Learning aim B: Design a digital animation product</b>			
1B.2 Identify the audience and purpose for the design of an animation.	2B.P2 Describe the audience and purpose for the design of an animation.	2B.M2 Produce a detailed animation product design, including reasons why alternative ideas have been discarded.	2B.D2 Justify the final design decisions, explain how they will: <ul style="list-style-type: none"> <li>fulfil the stated purpose and requirements of the brief</li> <li>meet the needs of the audience.</li> </ul>
1B.3 Produce an outline design for an animation product, with guidance. The design must include an outline storyboard.	2B.P3 Produce designs for an animation product of at least 30 seconds duration. The design must include: <ul style="list-style-type: none"> <li>description of requirements from the brief</li> <li>a storyboard</li> <li>a list of ready-made assets</li> <li>audio.</li> </ul>		

English English Functional Skills signposting

I & C Information and Communication skills signposting

Maths Mathematics Functional Skills signposting

## How you will be assessed

[Content to follow]

# Types of animation

## Introduction

Animation uses a series of images shown in quick succession to create the illusion of movement.

Comment [RL20]: A head

Comment [RL21]: Text intro head

Comment [RL22]: Text intro text

### Starter Stimulus

Brainstorm with a couple of your classmates the different types of animations you have seen at the cinema, on TV and on the Internet. Make a list of them. What types can you identify? What are the key features of each type?

Comment [RL23]: Starter stimulus

Comment [RL24]: Starter stimulus text

Comment [RL25]: C head

## Flick or flip book

Flick or flip books are one of the simplest forms of animation. Drawings showing the steps in some kind of movement (such as a person running) are drawn on successive pages of a book. Flipping through the pages creates the illusion of movement.

Comment [RL26]: Text

Comment [RL27]: Activity

### Activity 4.1 Creating a flip book

Find an old exercise book or a sticky note pad with at least 30 sheets. For every second of animation you will need at least five sheets. Start at the bottom sheet and draw your first character at the corner of the sheet near the edge – a simple stick person or a basic face is fine – then bring the next sheet down on top of the bottom one. Draw the next step aligned with the previous one, but make a very minor change in the drawing. Once you have completed about 30 sheets, flip quickly through them and the character should appear to move.

Comment [RL28]: Feature text

## Cel animation

Cel animation is the traditional technique used to make animated cartoons such as Tom and Jerry and Walt Disney feature-length cartoons up until the 1990s. With this technique each frame of the animation is drawn and painted by hand. Moving characters are drawn on transparent sheets (called cels) and placed over fixed backgrounds. Each set of cels (foreground action and fixed background) is then photographed. Normally 12 or 24 drawings are required for each second of the film.

## Stop motion

Stop motion is a technique where actual models of the characters and backgrounds in the animation are photographed and moved by a small amount for each frame to create the illusion of motion. Well known examples of stop motion include the Wallace and Gromit films. Stop motion has also been used to create special effects in films such as Star Wars and RoboCop. Although stop motion has been mostly replaced by computerised techniques it is still used today in some projects.

### Cut out animation

Cut out animation is similar to cel animation but the characters and backgrounds are cut out of paper or card. This is one of the earliest techniques used to make animated films. Today a similar look can be created using computer techniques with scanned or computer-drawn images replacing the paper or card cut outs.

#### Did you know?

Motion capture is widely used in computer games to capture the movements of athletes, martial artists etc. It is also used in live action films to create computer-generated creatures such as Gollum in Lord of the Rings, Na'vi in Avatar and Clu from Tron: Legacy. During the filming of sequences, actors wear reflective markers on the body and face which are tracked by the software and used to animate the computer-generated character.

Comment [RL29]: Feature head

Comment [RL30]: Margin

### Adobe® Flash® animation

'Flash' animation is a computer animation created using the Adobe® Flash® software. The Flash® software provides a relatively easy-to-use method to create simple 2D animations and is widely used to create animation for web pages. Flash® is also used for the example animations in this unit.

#### Key term

**CGI (computer-generated imagery)** – CGI is a general term used to describe computer-generated animation included in live action films. Many action, science fiction and fantasy films include special effects created using CGI.

Comment [RL31]: Key term

Comment [RL32]: Margin

### Other types of animation

Other types of animation include rotoscoping and skeletal animation, which are covered later in this unit.

## How animation is used

There are many ways in which computer animation is used. The most obvious is in the creation of animations for entertainment. This can include children's cartoons for TV and full length animated feature films.

Animation is also often used in adverts and in music videos. Other uses include creating simulations (such as what happens during an earthquake or how a spacecraft will land on Mars).

### Did you know?

You can watch an animation of the way the Mars spacecraft Curiosity will land on the planet on YouTube. Just search You Tube for 'Mars Science Laboratory Curiosity Rover Animation'. The project was launched in 2011 and should reach Mars in August 2012.

Animations are also widely used on the internet and for mobile content. This can range from simple animations to liven up web pages to complex animations included in games.

Animation can create scenes which would be impossible or very difficult (or expensive) to reproduce with live action, such as to create animals that can talk, monsters or aliens.

Animation is also used to create an atmosphere or mood in a film which cannot easily be created with live action. Children's cartoons, for example, can create a silly, crazy feel, which is exciting and fast moving and totally unrealistic, with animals and inanimate objects (such as cars or trains) taking on human attributes.

Animations can also show how something works (or will work) more clearly than could be done with words or still images. This is called a simulation.

Animation can be aimed at many different types of audience and can be used to make people laugh, make them sad, educate them or for many other effects. When designing an animation product you will need to consider who the audience are and what kind of effect you want to have on them.

### Activity 4.2

Imagine you were considering making a short animated film. You want to target the film at a particular audience but you haven't decided yet what audience that is. Brainstorm a list of the different sorts of things you might include in the animation to appeal to the following audiences (one example has already been included for you):

- Young Children: Bright colours
- Teenage boys
- Teenage girls
- Adults (aged 21–40)
- Older adults (aged 40–60).

## Workspace

Comment [RL33]: Workspace

Simon has been working as a junior animator at an animation company in Bristol for two years now. 'I was lucky to get a job as there is a lot of competition in this industry,' he says. 'I got into animation at school and I went on to study Computer Animation at University, but after I completed my degree it took me almost a year to find a paid job in animation. During that time before I got a paid job I created a number of showreels (example animations) which showcased my skills, and in the end that helped me get a job, but I also needed to demonstrate I had very good knowledge and skills in using Flash®. I spend most of my working hours creating Flash® animations for children's TV. I work from rough storyboards that the designers produce. I need to work quickly and accurately and I need good drawing and design skills. I always have to work to quite tight deadlines as the TV shows have to be completed and fit into a schedule so if I get behind I just have to stay back and get the work done! The work can be quite tough and some aspects of it can be a bit tedious but I get a tremendous kick out of seeing animations I have created shown on the TV. In the future I am hoping to progress to become a designer as I have some great ideas that I think will make amazing animations.'

## Think about it?

- 1 What attributes did Simon need to get a job as an animator?
- 2 What challenges does he face in his day-to-day work?
- 3 What does he like best about his job?

# Features of digital animation

## ► 2D or 3D

Two-dimensional (2D) animation has a flat look to it. Characters and backgrounds are created using simple graphic images. This is simpler to create but lacks realism. With 3D animation, characters and backgrounds have textures and lighting effects added to give the impression of depth. While much more complex to create, 3D animations have a greater realism and so are often used in applications where realism is important such as games. See Figure 4.1.

<artwork>

Figure 4.1 – 2D and 3D animation examples

Comment [RL34]: A head

Comment [RL35]: B head

Comment [RL36]: Artwork small

Comment [RL37]: Caption

Comment [RL38]: Link

Comment [RL39]: Margin

### Link

Image type – Both bitmap and vector images can be used in animation software to provide characters and backgrounds. Bitmaps are best suited to images such as photos where realism is important, vectors on the other hand are best suited to non-realistic images such as diagrams or cartoon characters. More detailed information on these types of images and how to edit them can be found in Unit 6 Creating Digital Graphics.

## ► Frames per second (FPS)

The number of different images displayed per second is known as the frame rate. Both live action and animated films are made up of consecutive still images to produce the illusion of movement. Various different frame rates are commonly used in TV and video ranging from 24 fps up to 60 fps. Traditional hand-drawn animation is designed to be played at 24 fps and this is also the default frame rate that Flash® uses.

### Did you know?

Because of the expense of drawing 24 frames for every one second of film, almost all hand-drawn animation is done 'shooting on 2s' where each frame is shown twice, making only 12 different frames per second. Many low budget films are created using 'shooting on 4s' with only 6 different frames per second.

## ► Resolution

Resolution is a measure of the number of pixels in a bitmap image. With more pixels in an image of a given size the better the quality of the image but more pixels will also mean a large file size. This is an important consideration because computer animations can be made up of thousands of different images which can create very large files. It is important therefore to have in mind the size the animation is likely to be viewed at.

### Link

You can find more about resolution in Unit 6 Creating Digital Graphics.



## ► Timing and length

Unlike in a live action film where scenes are played out naturally, in an animated film special attention has to be paid to the timing of scenes as they are created to ensure they appear realistic when played back. For this unit you are only required to create quite short animations of at least 30 seconds, but this will probably be made up of 720 or more frames. Animation software such as Flash® helps you by creating many of the frames for you, but you will still need to plan out how long each part of the animation will take.

## ► Special effects

Special effects include the following:

- Rendering
- Morphing
- Camera angles
- Motion blur/fade

More details on these are given later in this unit.

## ► Audio

Most animations will include a sound track. The simplest form of sound track just consists of music. More sophisticated versions include sound effects and speech.

### Link

Recording and editing audio is covered in detail in Unit 5: Creating Digital Audio.

### Assessment **activity**

Select at least two different digitally animated products and describe what the purpose of each of them is and what sort of features they include (e.g. what sort of animation technique is used, what effects are used).

### Grading **■**

To achieve a Merit grade you will need to how the products meet their purpose and what effect they are intended to have on the audience they are targeted at.

**Comment [RL40]:** Activity

**Comment [RL41]:** Tip

# What goes into the design?

## ► Intended audience, purpose and user requirements

Before you can create a design for your animation you must develop an idea for your animation. You should look at other examples of short animations for inspiration but it's good to develop some ideas of your own too.

### Remember

Your final product for this unit only needs to be 30 seconds long (although it can of course be longer), so look for a storyline which is short and punchy rather than long and complex.

Comment [RL42]: Feature head

Make sure you are clear about what the purpose of the animation is. For example it may be to amuse people or to educate the audience.

You must also clearly identify the audience for your animation and ensure you include features which will appeal to them. Features you should consider targeting at your audience include the story your animation will tell, the colours and characters you use, and the sound track (including the type of language and tone used).

## ► Initial ideas and prototypes

Initial design ideas, such as storyboards or prototypes, are a very useful way for you to try out ideas.

### Key term

**Prototype** – A prototype is an initial version of something you create to test out an idea. A prototype does not have to be fully complete or working and it may be quite rough and unfinished. It allows you to try something out to see if it works and it will be worth putting all the additional work in to create the fully completed version. You may create several different prototypes before deciding on the one to develop into a completed product. You can also show prototypes to other people to get their opinions on them.

**Storyboarding** is the method often used by professional filmmakers to design scenes in both animated and live actions film. A storyboard is a series of drawings which allows you to visualise how the final product will look. You should produce a storyboard for each of the **keyframes** in your animation.

Storyboards do not have to be well drawn and, as working documents, they can end up quite messy with arrows showing direction of movements and hand written notes.

Your animation will probably contain **graphic assets** such as characters and backgrounds. You should produce a list of where these assets will come from. Some will be drawn by yourself, but you may be creating them in another units, such as Unit 6 Creating Digital Graphics. Other assets may be ready made and you will need to identify where you obtained them from (e.g. the website you used).

### Just checking

- 1 Name three design features that you might tailor to your audience.
- 2 Name two ways in which you can record initial design ideas.

Comment [RL43]: Feature head

Comment [RL44]: JC num list

### Case study

Sally has been contacted by a charity which works supporting young mothers. They have asked her to produce a short animation encouraging young mothers to think about the dangers of smoking and how secondary smoking may harm the health of their children (secondary smoking is where a person does not actually smoke themselves but they inhale the smoke of someone close to them who is smoking). Sally discusses the requirements with the charity director and agrees that the animation should be thought-provoking rather than entertaining. They decide that it should emphasise the love that exists between a mother and her child and contrast that with the potential dangers that a mother exposes her child to by smoking. Sally produces two prototype sketches to show to the charity director. If the director is happy with her ideas, Sally will develop them into storyboards.

Comment [RL45]: Activity

<artwork4.2>

Figure 4.2 Two prototype sketches for the animation

### Did you know?

The storyboard design technique was developed by the Walt Disney Studio in the 1930s. Storyboards continue to be used for both live action and animated films to this day.

### Assessment activity

You have been asked to create a design for an animation which is to be used on a friend's website. Barry uses his website to advertise his services as a DJ. People hire him to play at their parties, weddings and other special occasions. He wants something a little more interesting than just text and pictures on his website and he thought an animation would be a good idea. The audience Barry is targeting is people in the 19–30 age group who might want to use his DJ services. He wants the animation to convey that he is a fun-loving guy who is really good to have at a party and he plays really good music which would make any party go well. Apart from that he doesn't really have ideas as to what the animation should contain. He wants you to come up with some ideas.

#### Tasks

- 1 Produce a design for the animation to go on Barry's website, which should be at least 30 seconds long.
- 2 Describe the purpose of the animation, the audience that it is aimed at and what you understand Barry's requirements to be.
- 3 Create a series of storyboards for your animation.
- 4 Make a list of ready-made assets (e.g. clip art, music tracks etc.) that you will use in the animation.
- 5 Create a design for the audio track that will accompany your animation.
- 6 Write a justification of the decisions you made in creating your design.

### Key term

**Keyframe** – A keyframe is where there is a signification change in your animation. For example, if a character moves across the screen then you would insert two keyframes: one as they start to move and another as the movement is completed.

### Grading tip

To achieve the Merit grade your design must be detailed, with outlines of alternative ideas and at least 12 comprehensive storyboards.

To achieve the Distinction grade you need to explain how each aspect of the animation meets the purpose and requirements of the brief and meets the needs of the audience.

## Creating the animation

### ► Gathering ready-made digital assets from other sources

With ready-made assets such as clip-art it may simply be a case of finding the suitable image on the Internet and importing it into your animation software.

### ► Hand drawing or use graphics editing software to create original assets

With assets you will create yourself you will need to use graphics editing software to draw and edit the images.

#### Link

Creating and editing graphics images is covered in Unit 6: Creating digital graphics.

### ► Importing original and ready-made assets

Ready-made assets you identify may be in a variety of graphic, video or audio formats file formats. You will need to check that animation software you are using supports that format.

With graphics images it is probably best to import them into the Flash® library. That way you can include them in any frames as and when they are needed. To do this:

- Go to the File menu in Flash® and choose Import. This will pop out a sub menu, where you should choose Import to library.
- Then select the file you wish to import.

Remember to keep a table of all the ready-made assets you use, with their sources. This is required for your assessment and also helps you demonstrate that you have used copyright-free assets.

#### Discussion point

Why is it important to make sure that you do not use copyright materials without permission?

### ► Graphics editing software

You will need to create some of the assets yourself, using graphics editing software. Let's look at some simple examples of editing vector graphics in Flash®.

#### Vector editing

To draw a basic rectangle:

- Select the rectangle tool on the left.
- Drag out a shape on the stage (see Figure 4.3).

*Figure 4.3      Drawing a rectangle [needs annotating]*

Click and hold on the rectangle tool and a menu will pop out allowing you to select other shapes such as an ellipse or polygon.

To select a shape you have already drawn, use the Selection tool and click on the shape. The Properties panel will show you, and allow you to edit, the fill colour and line style (Flash® calls the line style the stroke) of the selected shape.

As you create a drawing made of different shape it's a good idea to group the shapes together so they can be treated as a single drawing object. To group shapes:

- Make sure you have the Selection tool selected in the toolbar on the left.
- Drag out a marquee over the whole collection of shapes to select them all.
- From the Modify menu in the menu bar choose Group.

If you later decide you need to edit an individual part of a grouped object you can ungroup it, by choosing Ungroup from the Modify menu.

Once a set of shapes has been grouped, you can fill, scale, rotate and flip it.

## ► Text

To add text to a Flash® drawing:

- Click the Text tool in the toolbar on the right.
- Click on the stage where you want the text to appear.
- Type some text.

The properties panel on the right allows you to choose the font, size, colour and many other attributes for the text. See Figure 4.4.

**Figure 4.4** Adding text

## ► Layers

Layering is a very important graphics drawing technique for animation.

### Key term

**Layers** – Layers are like transparent sheets layered on top of each other. Layers are shown in Flash® in the timeline. Graphic objects on the top layer will appear in front of those in lower layers. Parts of a drawing or character you want to animate must be on separate layers.

To create a new layer:

- Right click the existing layer in the timeline at the bottom of the Flash® screen (see Figure 4.5).
- Choose Insert new layer.
- Double-click the layer name and change it to something meaningful.

**Figure 4.5** Flash® layers

Shapes are added to the currently selected layer. In Figure 4.4 the pupils of the eyes need to be animated so a separate layer called Eyes has been added and the pupils drawn on that layer. The rest of the face is drawn on the Face layer. Note that the Eyes layer is shown above the Face layer; if

this was not the case, the pupils would be hidden behind the face! You can change the order of a layer by dragging it above or below another layer in the timeline.

## ► Photo editing

You can import various types of bitmap (photo) graphics files into Flash® by choosing the Import option under the File menu. However, the photo editing facilities inside Flash® are quite limited so you should edit the file first in a photo editing package such as Photoshop. In particular you should ensure you resize the image to close to the size it will be when used in your animation to avoid creating very large files.

Once you have imported a bitmap, you can resize and rotate it by selecting it with the Free Transform tool.

### Link

Photo editing is covered in detail in Unit 6: Creating digital graphics.

In general, vector graphics will occupy much less file space than bitmaps so it is wise to use vector graphics for all the characters in your animation. Using bitmap graphics for your characters would create an animation with a very large file size. However, you can use bitmap images as backgrounds as they these probably don't change very often in the animation so the size issue is not so important.

### Activity 4.3

Use the vector editing facilities in Flash® to create a simple character with a face, limbs and body. Place the main parts of the body and face on different layers so you can animate them later. Create a background using bitmap editing software and place this on the bottom layer behind the layers of your character.

### Just checking

- 1 What do you use so you can animate parts of your scene separately?
- 2 Why is it better to use vector graphics instead of bitmap graphics for the characters in your animation?
- 3 Should you use bitmap graphics at all? If so, when should you use them?

## ► Rotoscoping

Another method to add more realism to the movement of your characters is rotoscoping. This involves tracing over the frames of a video. Although it produces realistic animation, it's a lengthy process that requires patience. For a 5 second video, shooting in twos (one tracing for every two frames) you will need to trace 60 frames.

First you need to record a short video of some kind of movement and then import it into Flash®:

Go to the File menu and choose Import, then Import video. You will then see the dialog box shown in Figure 4.6.

*<photo I>Select video*

**Figure 4.6**      **Import video dialog box**

- Choose the video you want to import by clicking the Browse button. Click the option Embed FLV in SWF and play in timeline.

### Link

Recording and editing video is covered in Unit 7: Creating Digital Video.

- Click Next and you will see the Embedding dialog box. Turn off the Include audio check box unless you want to include the audio track from the video and then click Next. You will then see the Finish importing video dialog. Click Finish. The first frame of the video will then be shown.
- Rename the layer the video is on to 'Video', then add another layer and call it 'Drawing'.
- Find the first frame you want to use and insert a blank keyframe in the Drawing layer. Then, using the brush tool, draw around the moving object. The example shown in Figure 4.7 is a video of fingers walking.

**Figure 4.7**      **Tracing around a moving object**

- Now move forward two frames (we are 'shooting in twos' here) and insert another blank keyframe in the Drawing layer and draw around the moving object in this frame of the video.
- Continue through every two frames of the video, inserting a blank keyframe and drawing around the moving object. Once you have completed about 24 frames (tracing 12 of them) you can use the playhead to preview your animation. Hide the video layer to see how it looks without the video behind the animation.



# Using animation-editing software – Animation techniques and animation-editing software effects

## Introduction

Your design will probably have defined the animation techniques (cut-out, rotoscoping and skeletal animation) you will use and what your keyframes will look like. To actually create the animation you will now need to set up those keyframes in your animation software and then use techniques such as tweening to create the intermediate frames.

### Key term

**Tweening** – Tweening or in betweening is a process in which intermediate frames are created between two images to give the impression that the first image changes to the second one.

## ► The timeline and keyframes

The timeline in Flash® is where you control how the movie plays and what is displayed on the stage at any time. The timeline is divided into frames and layers. When editing any part of your animation it is very important you check which frame and layer you currently have selected. You need to insert keyframes into the timeline when something changes in your animation. In Figure 4.8 a series of text titles for an animation is being created. The two titles are on separate layers, with the colour background on another layer, below it so it appears behind the text.

**Figure 4.8** *Timeline and layers*

So that the titles will appear for a certain length of time, frames must be added further down the timeline.

Suppose your main title will appear in the animation for 4 seconds:

- Insert a keyframe at frame 96, by right-clicking in that frame and choosing Insert Keyframe.
- To have the background appear along with the main title, insert a keyframe at frame 96 for that layer too.

The subtitle is needed on the screen for two seconds after which it will be replaced by another sub-title:

- Add a keyframe to the Sub title layer at frame 48. This will mean the subtitle will not show after frame 48.
- Add another layer above the background layer and insert a keyframe in that layer at frame 49. Flash® automatically adds frames so that the new subtitle shows to the end of the sequence (see Figure 4.9).

You can remove frames or keyframes by right-clicking on them and choosing Clear frame. You can also copy and paste frames by right-clicking on them and choosing the appropriate option.

**Figure 4.9** *Completed sequence*

## Tweening

Earlier we created a vector drawing of a happy face. The pupils of the eyes were placed on a separate layer from the rest of the face. Now we can animate the pupils so they look from one side to the other.

- Make sure you have the eyes layer selected.
- Select the two pupils (click the Select tool in the toolbar on the right, then click one pupil, hold down the Shift key then click the other).
- From the Modify menu choose Convert to symbol. This will display the Convert to Symbol Dialog box as shown in Figure 4.10.

<photo>

**Figure 4.10**      **Converting to a symbol**

- Right-click the Eyes symbol and chose 'Create Motion Tween'.

Flash® will automatically create a 24 second sequence in the timeline. If you want the animation to be longer or shorter than this, drag the blue selected layer backwards or forwards. The timeline will jump forward to the end of the Tween, as shown in Figure 4.11.

<photo>

**Figure 4.11**      **Creating a motion tween**

To be able to see the rest of the face at the end of the tween you need to create a keyframe on the Face layer.

Right-click the frame in the Face layer at the end of the tween (frame 24) and choose Insert Keyframe. Your animation should now look like Figure 4.12.

<photo>

**Figure 4.12** Keyframe for the Face layer

Now select the Eyes layer again and, making sure the playhead is at the end of the tween, click on one of the pupils (as they are both part of the symbol we created earlier, this will select both pupils) and drag them to the left side of the eyes. See Figure 4.13.

Now if you drag the play head up and down the timeline you will see you have created an animation of the eyes moving from one side to the other.

<photo>

**Figure 4.13** Moving the eyes

## ► Cut out animation

If you find drawing your characters on the computer difficult you can use the cut out technique and hand-draw them. Then scan them into the computer. However it's best to draw and scan each part of the character you want to animate separately, then you can easily import each part of the character onto a separate layer.

### Just checking

- 1 In an animation design, what shows the timings when events happen?
- 2 What is the marker used at the start and end of a sequence of animation?
- 3 If you draw an animation and scan it in, what is this process called?

## ► Camera angles, pan and zoom

To create a camera pan or zoom effect you will need to create a background that is bigger than the stage, like that shown in Figure 4.14.

### Key terms

**Pan and zoom** – Camera pan is where the camera moves (usually horizontally) across a scene. Zoom is where a camera starts with a wide view of a scene (sometimes called wide angle shot) and then moves in to focus on a small part of a scene.

<photo>

**Figure 4.14** Background which is bigger than the stage

### Remember

Remember the stage is what will be displayed when you play the completed animation, but you can place items off the stage.

Comment [RL46]: Feature head

To create a camera pan effect you need to convert the background to a symbol:

- Go to the Edit menu, choose Select All, then right-click in the selected images and choose Convert to symbol.
- With the background symbol still selected go to the Modify menu, choose Align and then select Align to stage.
- Go to the Modify menu again, choose Align and this time choose Left. This will align your background to the left edge of the stage.
- Right-click the background symbol and choose Create Motion Tween, which will create a 24 frame (1 second) tween.
- Drag the end of the tween in the timeline to frame 48 (this will make the camera pan last 2 seconds).
- Click in frame 48 in the timeline and, using the same technique as before, align the background to the right edge of the stage. The result is shown in Figure 4.15.

<photo>

**Figure 4.15** Final frame aligned to the right of the stage

Now if you use the Playhead to run through your animation, the background looks like it is moving from right to left. However, if you choose the Control menu and the Test Scene option, the animation will play as the user would see it (with only the stage shown). This gives the impression that a 'camera' is panning across the scene.

Suppose, after the camera pans across the screen, you wanted it to zoom in to the right-hand tree in the scene. To do this:

- First add in another layer called Zoom.
- Insert a blank keyframe in the new layer at frame 49. See Figure 4.16.

<photo>

**Figure 4.16** Blank keyframe in the Zoom layer at frame 49

- The background symbol does appear in the frame so click in frame 48 on the Pan layer, right-click and choose Copy frames.
- Go back to frame 49 in the Zoom layer, right-click and choose Paste frames. This frame is still part of the Pan Tween so right-click on the background symbol (in frame 49) and choose Remove tween. Now right-click on it again and choose Create motion tween to start the new zoom effect.
- Drag the tween bar (coloured blue) in the timeline up to frame 96 (to make a 2 second zoom).
- With the play head still on frame 96, click the Transform tool in the toolbar on the right then click the background symbol and drag the scale handle on the top left to make the background scale up.
- Use the Modify, Align, Right options to realign the background to the right edge of the stage. See Figure 4.17.

<photo>

**Figure 4.17** Background scaled to give a zoom effect

- If you use the Test Scene option again you will see that the 'camera' now appears to pan across the scene and then zooms in.

If you want to use different camera angles (perhaps during dialogue between two characters you want to show one character talking, viewed from one angle, then swap to a view of the other character from a different camera angle) you can simply move the background and characters relative to the position of the stage without any tweening. This will create the impression of a sudden change of camera angle/position.

#### Activity 4.4

Extend the background you created earlier or make a new one which is much wider than the stage. Add the character you created earlier at one side of the stage. Pan across the stage and then zoom in on your character.

## ► Skeletal animation

You can use skeletal or bone animation in Flash® to animate connected parts of an object, such as a character's arms and legs:

- Create the limb by drawing the different parts and converting each part of the drawing into a symbol (right-click the drawing shape and choose Convert to symbol). Figure 4.18 shows a series of rounded rectangle and ellipse shapes arranged to look like the arm of a cartoon character.

<photo>

**Figure 4.18**      **Character's arm**

- Click the bone icon in the toolbar on the left.
- Click on the top of the arm then drag down to the top of the lower arm section. This will create a coloured 'bone' within the arm.
- Now click again with the bone icon on the top of the lower arm (where the first bone ends) and drag down to the joint with the hand. The arm should now have two bones inside it, as shown in Figure 4.19.

<photo>

**Figure 4.19**      **Bones linking limbs**

Note that the limbs with the bones are automatically placed on a new layer called Armature\_2.

If you now click the Selection tool and drag the hand across the stage the rest of the limbs will follow. To bend a limb without moving the other limbs or the hand:

- Move the mouse over the limb, press and hold the Shift key and then drag with the mouse.

To animate the arm:

- First make sure you have it positioned in its starting pose.
- Right-click in the Armature\_2 Layer in the timeline at frame 50 and choose Insert pose.
- Now position the limb in the required ending pose. Note that any drawing on Layer1 will not be visible on this frame until you insert a keyframe for Layer1. See Figure 4.20.

<photo>

**Figure 4.20**      **Final pose**

If you now move the playhead back and forth you will see that the arm animates from the starting pose to the ending one in frame 50. Inserting a keyframe for Layer 1 at frame 50 will show the rest of the character's body throughout the animation.

#### Just checking

- 1 What is it called when a camera moves sideways across a scene?
- 2 Give an example when you might want to use different camera angles in a scene.
- 3 What do you have to convert the parts of your drawing to before you can use them in a skeletal animation?

## ► Transition effects – Motion blur

You can add motion blur to moving objects to make them look more realistic. Figure 4.21 shows a drawing of a rocket. This has been created by grouping together various shapes and then made into a symbol. A copy has been added to the library.

<photo>

**Figure 4.21**     **Rocket Symbol**

First we need to add a blur filter to the rocket.

- Make sure you have the rocket symbol selected then click on the Properties tab to display the properties pane on the right. At the bottom of the pane click the Add filter button. See Figure 4.22.

<photo>

**Figure 4.22**     **Adding a filter (needs annotating)**

- Select a blur filter.

The blur filter setting allows you to define how much blur you want to add on the horizontal (X) axis and the vertical (Y) axis. Since the rocket will be flying horizontally across the stage, the X blur has been set to 25 and the Y blur to 0. The quality has been set to medium; setting it to high may make the animation play slowly. See Figure 4.23.

<photo>

**Figure 4.23**     **Blur added**



- Insert another layer in the timeline (above the existing one) and drag another copy of the rocket symbol from the library onto the new layer. Place it over, but slightly ahead of, the blurred rocket. Your screen should now look like Figure 4.24.

<photo>

**Figure 4.24**      **Another rocket symbol added**

- Now right-click in frame 1 of each layer and choose Create motion tween. This will insert a keyframe in frame 24 of each layer.
- Click in frame 24 and move both the blurred rocket and the non-blurred one across to the right of the stage, as shown in Figure 4.25.

<photo>

**Figure 4.25**      **Creating a motion tween**

If you now play the animation, the blur follows the rocket. However, you can make the effect more realistic by removing the blur from the first and last frames, when the rocket is not moving.

- In the layer which contains the blurred rocket, click on frame 1 and drag it to the right to frame two. This will leave a blank keyframe in frame 1 when the rocket is not moving.
- Do the same in the last frame, but this time drag the frame to the left, to frame 23 (see Figure 4.26). Now there is no blur shown until the rocket starts moving.

<photo>

**Figure 4.26**      **Timeline adjusted**

## ► Fading in and out

You can fade in or out any photo or graphic object (including text). Simply convert the object to a symbol (movie clip), then create a tween.

- Click in the first frame of the tween then, with the selection tool, click on the symbol.
- In the Properties panel, click the Color Effect drop down and choose Alpha (see Figure 4.27).
- Move the slider to 0% (the symbol seems to disappear but its selection box is still visible).

<photo>

**Figure 4.27 Adjusting the Color Alpha setting**

- Click in the last frame of the tween and click on the symbol again, and then move the Alpha slide back up to 100%. The symbol will then fade in.

To fade a symbol out just set the Alpha to 100% in the first frame of the tween and 0% in the last.

## ► Morphing

You can morph one shape into another using a shape tween. Unlike a motion tween, a shape tween can only be used on graphic shapes, not symbols or bitmaps. To create a shape tween:

- Draw a shape, then add a keyframe in the shape's layer about 30 frames on.
- Modify the shape in the new keyframe then right-click in the layer on the timeline and choose Create shape tween. The shape will then smoothly morph from its original version to the modified one.

### Activity 4.5

Create a short animation which demonstrates motion blur and fading in and out. For example, you could create some movie titles which fade in and out and create a motion blur for a racing car or other moving object.

# Rendering

## Introduction

**Adding rendering effects to fill colours can help make your animations look more realistic. Shading is an example of such an effect, and is quite easy to apply.**

The character shown in Figure 4.28 has a solid fill applied to his face. However, the side of his face which is nearest to the sun should be lighter than the side which is away from the sun.

<photo>

**Figure 4.28** Character with solid fill

To apply a gradient fill:

- First make sure the character's head is selected.
- Click the colour palette and from the drop-down choose Linear gradient.
- Adjust the colour panel to give the right colours as shown in Figure 4.29.

<photo>

**Figure 4.29** Applying a linear gradient

This gradient runs from left to right with the darker side towards the sun, which is the opposite of what we want. To adjust the gradient:

- First click and hold on the Free transform tool in the toolbar until the submenu pops up, and choose the Gradient transform tool.
- A box will appear around the character's face with a rotate icon in the top right. Move your mouse pointer over the Rotate icon until it changes shape, then drag the gradient until the light part is facing the sun, as shown in Figure 4.30.

<photo>

**Figure 4.30** Gradient aligned to the sun

### Activity 4.6

Add shading effects to the characters in your animation.

## ► Audio

You can add an audio file to your animation:

- Choose Import from the File menu, then Import to library from the sub menu.
- Select the audio file you want to use. This will import the audio file into your library.
- Create a layer for the audio and insert a keyframe where you want the audio to start, then drag the audio file from the library to the stage.
- To make the sound play you will also need to add a keyframe further along the timeline where the sound will stop playing. See Figure 4.31.

<photo>

Figure 4.31 Audio file added to the timeline

Take it further
There is various software you can use to create your own audio tracks, including Audacity and Apple Garage Band.
Link
Editing audio clips is covered in Unit 5: Creating Digital Audio.
Activity 4.7
Create a simple audio track to accompany your animation, using the techniques explained in Unit 5. Start off with a simple music track and then try to add some sound effects to your animations.

Comment [RL47]: Feature head

## ► Lip sync

Synchronising animated mouth movements with an audio speech track is known as lip sync and requires practice and patience. You will need to record the speech, starting off with a short recording of just a few words. You also need to have your cartoon face drawn.

- Create a number of different mouth shapes you can use with your face and save them in the library. Start off with just a few mouth shapes as shown in Figure 4.32.

<photo>

Figure 4.32 Face with mouth shapes

- Now import the sound file onto own layer on the timeline as described earlier.

It is useful to be able to clearly see the audio wave form in the timeline:

- Right-click on the audio layer name and choose Properties.

- From the Properties dialog choose 300% from the Layer height drop-down. You can play sections of the audio by dragging the playhead along the timeline.

Now you need to decide which mouth shapes to use:

- Find exactly where the first word occurs in the timeline, using the waveform and the play head.
- Now insert another layer for the mouth (this needs to be above the face layer).

#### Activity 4.8

To help you decide which mouth shapes to use, get someone else to say the words in the audio track and carefully watch their mouth shape as they do so (or do it yourself using a mirror). You will probably need to get them to repeat each word several times. Each word will probably be made up of a least two mouth shapes.

As you will be changing around the different mouth shapes needed it is important that all the different mouth shapes are in the same place on the face. You can use guidelines to help you position the mouths.

- Click on the View menu and then choose Rulers so the rulers are displayed at the top and left of the editing window.
- Now drag a guideline (shown in blue) from the top ruler and position it in the middle of the mouth. Do the same from the left ruler.
- Insert a keyframe in the frame where the first mouth shape of the first word is needed, delete the existing mouth shape and insert the required mouth shape from the library.
- Now find within the audio track the next place where the mouth shape changes. Insert another keyframe there, delete the existing mouth shape and insert the new one. Repeat the process until the mouth shapes are added for the whole audio track. Figure 4.33 shows the technique in use.

<photo>

**Figure 4.33** *Synchronizing the audio track with the mouth shapes*

An alternative to using pre-drawn mouth shapes from the library is to create a motion tween for the first mouth shape, insert a keyframe when each shape change is needed and adjust the shape of the mouth as required at each keyframe. This method gives a smoother, more realistic result.

#### Activity 4.9

Try animating a cartoon face with a mouth to a short phrase like 'I love to make animations'. Record the audio first and then work out the mouth shapes and animate the cartoon face using the appropriate mouth shapes to match the audio recording.

#### Assessment activity

[To follow]

# Testing the animation

## Introduction

Developing your final animation required for the assessment in this unit is likely to be a lengthy process with you developing prototypes, practising techniques and refining aspects of the animation until you arrive at the completed product. Testing and previewing is therefore unlikely to be a single event, but rather it will occur throughout the development process as you test and review parts of the animation and you will probably decide, especially early on in the process, that some parts of your animation need further work before they are acceptable.

## ► Exporting and compressing animation files

Once your animation is complete you will need to export it from Flash® into a format that other people (who may not have the full Flash® software on their computer) can view. Flash® animations are designed to be played using a web browser (such as Microsoft® Internet Explorer® or Google Chrome™), but you can't do that with the editable Flash® file you have been working with so far. Instead, you need to export your animation as an SWF file.

### Did you know?

You can preview your animation from within the Flash® software by choosing the Control menu and selecting Test Movie and then from the sub menu in Flash Professional®.

When Flash® creates an SWF file it compresses the graphics in your animation to avoid creating a very large file. The larger your SWF file is, the longer it will take to download from a website. If your resulting SWF file is still very large you can adjust the compression setting:

- Choose the Publish settings option from the File menu.
- On the dialog box that appears you can change the JPEG quality value. The default is 80. Choosing a lower number will compress your images more but will result in a lower image quality. You will need to experiment with this setting to find the best compromise between file size and image quality.

### Activity 4.10 Testing the animation for functionality

You should test a number of things in your animation. For example:

- Does the animation follow your original design?
- Does it run smoothly?
- Is the animated movement realistic?
- Is the timing of the animation acceptable (e.g. do things happen too quickly or too slowly)?
- Is the overall length of the animation acceptable?
- Is the sound track audible and of acceptable quality?
- Is the sound track synchronised with the animation?

Create a test document for your animation in which you list all the things you are going to test in a table, and then go through your animation writing the results and any other comments against each test.

### Take it further

Ask other people for their comments about these questions too.

Now test your animation in a web browser:

- Go to the File menu in Flash® and choose Publish Preview, then Default – (HTML). This will then create the SWF and HTML files in the same folder as the original animation file and will open them in your default browser.

## ► Getting feedback

One of the best ways of testing and reviewing a product is to ask other people what they think of it. It is often difficult to see flaws or weaknesses in your own work but others can usually provide constructive feedback. For prototypes this feedback can be informal, but for the final version you must get formal feedback by using a written questionnaire or audio/video recorded interviews.

Questions you should ask about your final product might include:

- How well does it meet the needs of its intended audience? Make sure you tell your reviewers who your intended audience is.
- Is the movement of the characters realistic? Are there parts which are better than others?
- Is the timing of the movement and action appropriate or do things happen too quickly or too slowly?
- Is the quality of the sound appropriate? Does it synchronise well with the animation?

### Discussion point

What other questions can you think of to ask about your final product?

Comment [RL48]: Discussion point

## ► Reviewing the finished digital animation

You must write a review of the process you used to create the animation and the end result. As well as the issues listed in the previous section you will need to consider:

- How closely does your final product match your original design? If there are differences, explain why they occurred.
- How good is the quality? You can't expect to produce material of professional quality but comparing your animation against professional products can help you identify its strengths and weaknesses.
- How well does your animation match the original purpose you identified for it and the audience it was aimed at? Does it achieve its purpose? Will it appeal to its target audience?

### Activity 4.11

Find some people within the target audience group and ask them what they think.

- How would you do things differently next time to avoid the problems you encountered?

- How might you further develop the animation if you had more time? Is the content suitable? (Is it likely to cause offence to anyone? Does it contain any personal information?)
- Have you considered general safety issues including taking care with downloads to avoid viruses, health and safety issues such as taking regular breaks when using the computer and keeping food and drinks away? Did you take regular backups of your work?

You should also ensure your table of external sources is up to date and shows you have permission to use any copyrighted assets.