Goldsmiths
UNIVERSITY OF LONDON

DIGITAL CONNECTIONS II

BFI Film Forever

USING STOP MOTION ANIMATION FOR YOUR PROJECT

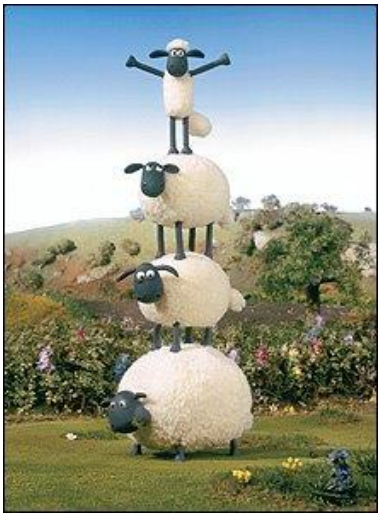
Aardman – Curse of the Were-Rabbit, UK, 2005

BFI SOUTHBANK

OCT 2015

This is designed to help you if you decide to create stop motion animations for your project..

Suggestions apply to either '3D' (upright puppets/characters) or paper/card 2D cut-out technique when creating animations.



FOCUS ON ANIMATION:

In the beginning there was…ANIMATION TIMELINE

30, 000 BC Prehistoric man in Lascaux, France, paints on cave walls the images of animals in motion. The animals are depicted with more than four legs to suggest movement.

2, 000 BC Egyptians create murals showing scenes from Egyptian life. Many murals show series of characters in slightly altered positions, suggesting movement.

1824 Persistence of vision (POV) discovered by P Roget.

1825 Thaumatrope (Greek 'wheel of magic') invented by Dr John Ayrton Paris.

1832 Phenakistoscope (Greek 'optical deceiver') invented by Belgian physicist Joseph Plateau.

1838 William Henry Fox Tablot develops the camera obscura.

1861 Kinematoscope patented by Coleman Sellers. Uses a paddle-wheel to project continuous motion through a stereoscopic viewer.

1877 Charles Emile Reynaud develops the Praxinoscope: moving images, which could be viewed, by a number of individuals at the same time by the use of mirrors to reflect the drawings.

1880 Eadweard Muybridge carries out his best-known experiment with 24 cameras and trip wires to record horse movement.

1882 Etienne-Jules Marey uses a camera gun to film birds in flight and analyse movement.

1882 Eastman-Kodak invents celluloid film.

1890s Friese-Green and Mortimer Evans develop a 'box-projector' which could project four to five frames per second.

1892 Charles Emile Reynaud's early inventions produce the théâtre optique.

1895 The Cinématographe, first live-action motion pictures projected onto a screen in Paris by the Lumière brothers Louise and Auguste.

1899 Arthur Melbourne Cooper makes *Matches: An Appeal*, the world's first animated commercial, using moving matchsticks and the stop-motion technique.

1902 *Voyage to the Moon* by Georges Méliès is an example of early special effects.

1906 James Stuart Blackton makes *Humorous Phases of Funny Faces*, a combination of animated, live and trick photography techniques. Blackton is seen as one of the most important practitioners of trick photography.

1908 *Dreams of Toyland* is made by Arthur Melbourne Cooper.

1910 Emile Cohl makes *En Route*, the first paper cut-out animation.

1914 Winsor McCay makes the animated film *Gertie the Dinosaur*, displayed as part of a vaudeville act. McCoy interacts with the character on stage.

1915-17 Winsor McCay invents the animation cel.

1919 *Felix the Cat* created by Otto Messmer.

1921 Walt Disney animates his first film.

1928 Disney releases *Steamboat Willie*, Mickey Mouse's first sound cartoon.

1929 Disney's Silly Symphonies are the first cartoons to have music as the motivating element.

1933 Lillian Friedman is the first woman animator in a US animation studio.

1933 Willis O'Brien animates *King Kong*.

1934 Warner Brothers Studios open, producing Bugs Bunny, Merrie Melodies, Looney Tunes and Daffy Duck.

1935 Len Lye's hand-painted films Colour Box and Kaleidoscope made by directly painting onto film stock. These are the oldest existing films using this method.

1937 The Van Beuren Studios produce *Tom and Jerry*.

1937 Disney release *Snow White*, their first animated feature film.

1940 *Fantasia* is released by Disney. This animated work was developed from the musical composition, 'The Sorcerer's Apprentice', by Paul Dukas. Disney and the musical director Leopold Stokowski produced a two-hour animated feature incorporating seven different classical musical pieces.

1941 Otto Messmer animates the world's first TV commercials, a series of Botany Tie ads/weather reports. They are shown on NBC-TV in New York.

1946 Disney's film *Song of the South* sparks protests over the depiction of black people in animated film.

1955 Annecy, the oldest international animation festival, takes place in France for the first time.

1956 Floyd Norman, the first African-American animation artist starts work at Disney.

1961 Japanese animation is first introduced in the US.

1964 Ken Knowlton starts developing computer techniques for producing animated movies while working at Bell Laboratories.

1972 *Fritz the Cat* by Ralph Bakshi becomes the first X-rated animated feature successfully released in the US.

1988 *Who Framed Roger Rabbit?* is released.

1989 *Tin Toy* by John Lasseter wins the first Oscar for a computer-animated film.

1990 Disney's *Rescuers Down Under* is the first animated feature to use the computerised ink and paint process (no acetate cels or paint).

1992 The Cartoon Network is the first TV network to offer animation programming 24 hours a day.

1996 *Toy Story* made by Pixar is the first fully computer-generated feature to be released.

1999 *The Old Man and the Sea*, a 22-minute film, is made by Alexander Petrov specifically for IMAX. Petrov painted the film on layers of glass directly under the camera using slow-drying oil paints.

2000 *Fantasia 2000* is the first Disney animated feature to be blown up from 35mm to 70mm for IMAX theatres.

2001 Michael Dudok de Wit wins Oscar for *Father and Daughter* a drawn animation.

2002 Dreamworks' *Shrek* wins the first animated feature film Oscar.

2004 Castle Rock Entertainment's *The Polar Express* is the first feature length 3D digital animation film, directed by Robert Zemeckis and was academy award nominated. It used performance capture technology.

2005 *Valiant* is the first feature length CGI produced in the UK, with characters voiced by Ewan McGregor, Ricky Gervais and John Cleese. Partially funded by the UK Film Council.

2006 *Peter and the Wolf*, a traditional stop-motion short directed by Suzie Templeton wins a Bafta for Best Animation – for teachers pack go to: http://www.peterandthewolffilm.co.uk

2009 *The Fantastic Mr Fox* directed by Wes Anderson, makes its stop-motion debut.

2010 *Up* by Disney Studios (3D CGI) wins two Academy Awards including Best Animated Feature Film of the Year.

Currently, 3D CGI animation full-length features are being released with steady regularity, with Aardman Studios one of the few likely contenders to remain true to the puppet stop-motion animation technique. Tim Burton is another stalwart of stop-motion . His last full length feature *Frankenweenie*, openeed the 2012 London Film Festival – the first time an animation film has opened the festival in its history.

There is lots of information about the early development of film animation online but for a nicely potted history you could have a look at: http://www.digitalmediafx.com/Features/animationhistory.html

2. WHAT IS ANIMATION?

Animation is the recording of static images, one image or frame at a time, in a sequence. The replaying of the recorded images in quick succession creates the appearance of movement. The word 'animate' literally means 'bring to life'.

The following two phenomena help us understand how our eyes actually see these images as moving rather than still.

1 **The Persistence of Vision:**
Although passing in front of the eye very quickly, each image remains on the retina just long enough to link with the following image and if each image is slightly different to the one before, the images appear as if they are moving.

2 **The Phi phenomenon:**
The Phi phenomenon is the ability the human eye has to ignore gaps that occur between these rapidly changing images, creating the illusion of movement.

Persistence of vision and the phi phenomenon can be demonstrated with flick books.

There is also a marvellous collection of DVD's which were created around Werner Nekes personal collection of early moving image optical devices which you can purchase from the BFI Shop: the series of his films are called **Media Magica** and which show optical devices in action very clearly.

A camera capable of recording (capturing) one or more frames at a time are used to record still images. The camera is fixed to a tripod to keep it completely still and the object or drawing is placed in front of or below the camera and photographed once. This creates one frame. The model or drawing is then modified, moved slightly or replaced and another photograph is taken. This process continues, building up a sequence of frames, until the whole film has been shot. The process is a long one and requires patience - 24 frames are required for each second of film (or 25 frames for each second of digital video). However, software can adjust this need. Settings can reduce the amount of frame captures per second; the adjustments are dependent on the software you are using.

In analogue terms, 24 frames was always the capture rate to create a stop motion effect, however software that adjusts this number down saves time and labour when producing stop motion animations.

Explaining frame rates:
PAL, the European digital video system requires 25 frames for each second of video.
NTSC, the American system uses 30 frames per second.

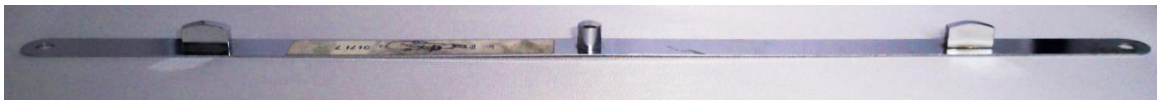
- The Hobbit, the Peter Jackson epic filmed at 48 frames per second which may herald a new exploration into this technical area…but we don't need to concern ourselves about that!

Software adjustments:
For this course we are using **Zu3D software.** It has great functionality in its frame settings which means that animations can be created more quickly. Settings can be altered as the animation is being made – experiment by moving the 'frames per capture settings' to see what the difference is. Through being experimental you will quickly see what the best frame capture rate is. You can also adjust the speed and flow of your animation when editing your film using the onboard Zu3D edit function.

3. Animation Techniques

From early developments in animation, using simple line drawings, to the use of computer-generated images (CGI), animators have experimented with a variety of techniques and styles.

Traditional Drawn style:
Using a peg-bar to register the pieces of paper, drawings are made on separate sheets, each one differing slightly from the one before.



A peg-bar

A light box is used to illuminate the drawings, enabling the animator to trace the previous picture, modifying it slightly each time.

An animation drawing, registered on a peg-bar © Tom Hillenbrand

Key drawings are made, showing the main positions the characters will move from and into during the sequence to be animated.

For example if one is animating a bouncing ball, the key drawings would be:

- the ball at its highest point prior to hitting the ground

- the ball squashing as it hits the ground
- the ball as it reaches its highest point and leaves the edge of the frame

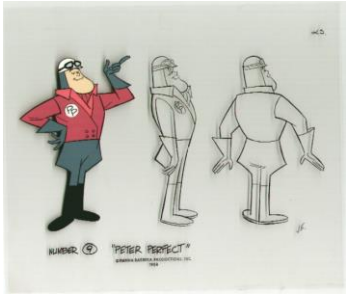
In-betweens (drawings that occur in between the key drawings) are
then added to make up the detailed movement in the animation. **To watch a tutorial by award winning animator Joanna Quinn, who is an expert in this technique, have a look at:**
http://www.youtube.com/watch?v=rWfVEdbvdoE

You can replicate this style through using a graphics tablet – Wacom Bamboo tablet is recommended. Each drawing is saved as an individual jpeg file and editing pulls the frames together in a similar way to creating an animation using a digital camera.

Toon Boom animation is software that also replicated a drawing style of animation using a computer programme: **http://www.toonboom.com**
To see a film of this technique go to: **http://www.youtube.com/watch?v=3JJtmyOEvvU**

- **An easy and cost effective way to emulate this technique is to use a white board and dry wipe pens – just draw your character etc. then erase and draw in changes in movements required – for example, from a side view a persons nose growing longer and longer.**

Cel



Peter Perfect from *Wacky Races*, 1968/69 Hanna-Barbera

A cel is a clear piece of acetate, used to create animations, on which the original drawing is duplicated using paint rather than pencil. Different parts of a character's body can be placed on a separate cel and animated individually, rather than as a whole. For example, if a character only moves an arm in a scene, the cel layer with the arm is the only one that needs to be replaced and not the entire figure. Cel also allows the backgrounds to be seen through the unpainted areas, which means that only the animated parts of the scene need to be redrawn and not the static backgrounds.

Cel animations are based on drawn animations which are tested first before the colour is added. Different parts of a character can be painted on to separate cels. These separate cels can then be arranged in layers to construct a complete character.
Increasingly these days, the original drawings to be animated are scanned into or drawn directly into a computer, then coloured, with special software programs to create the appearance of a painted cel and then animated digitally.

With the advance of computer technology, cel animation has largely died out as computer animation saves on man-power, time and money - and allows the animation team to make changes quickly.

Cut-out

Charlie and Lola, Tiger Aspect, from 2005

This type of filmmaking involves the animation of cut-out pieces of card or paper. Characters are constructed from separate pieces of card or paper (the joints of which are fixed together using Blu-tac, split-pins or thread) and animated directly under the camera. Each cut-out piece is moved frame-by-frame to create the movement required. Each cut-out piece can be drawn from a variety of different angles, which enables the animator to move the character using side, back and front views. Limbs are articulated through being created of separate pieces and a variety of faces and different eyes, eyebrow shapes, mouth shapes etc. enable great functionality in creating expression and drama. 'Charlie and Lola' and 'South Park', the animation series on TV, replicate this style but are animated via the computer rather than under a camera.

2D TIP

It is worth distinguishing between which elements will need to remain static during the animation and those requiring to move. Any static elements should be well fixed with blu-tac or glued down e.g. buildings, trees, sky etc. Remember if a character needs to pass behind an object, e.g. a door or tree, not to glue it but use Blu-tac instead.

3D puppet animation

Huxley Pig, Film Fair for Central TV (1989/90)

Models are constructed from clay, latex, foam rubber or other materials with an internal armature made from aluminium wire or an engineered ball and socket armature.

The model is posed and a static camera on a tripod takes an image of the pose. Then the character is moved into a new pose and another image taken. This process is repeated, building up a sequence of frames to make the film.

- Animators use the **'onion skinning'** function to check the previous movement of their character.

Calling this style '3D' is still common in animation making, not to be confused with Stereoscopic 3D. It distinguishes rather that the animation is to be filmed looking 'across' rather than 'down' which is how 2D cut-out animation is created.

3D puppet animation was the most common of styles for TV in the past, think of examples such as Camberwick Green, The Wombles, Paddington Bear, Bagpuss to name a few (now ancient) examples, however, it's a demanding format and there are very few 3D puppet creations made currently. More recent ones are 'Fifi and the Flowertots' and 'Bob the Builder' – not forgetting 'Postman Pat' and 'Pingu' – but even these are becoming distant memories and are not in production, or have not been for some time.

3D Puppet TIPS

Keep everything that you don't want to move fixed down, eg:

- Tripod
- Lights
- Background
- Props
- Table

- **Try to avoid flying** – it is tricky to get this to look good on a low budget
  Please note: Zu3D has a function that can erase rods or other visible means that have been used in the production, however, it is time consuming and not always completely successful.
  Big productions use green-screen technology and have special clamps and rods to hold objects in place when animating a flying sequence. A shot of the background with no characters in is filmed first (known as a 'pass'), then the character is filmed against green/blue screen background and the green/blue is removed in the editing process and the two shots are mixed together (composited).

  Flying objects can include…
  - Birds
  - Planes
  - Rockets
  - Fireworks etc...

- Ensure your character is able to **stand up** sufficiently well. Draw a scale model of it first before making an aluminium wire skeleton. This will allow you to determine the length of the wire needed.

The general rules for making 3D models are:

- Short legs
- Broad feet
- If possible have a skeleton made of aluminium wire – this may not be practical as you will have to use wire cutters or scissors to cut the wire to the desired length. It is also a fiddly process trying to get the legs the same length.
- Twist two strands of wire together (preferably in a slow drill if possible) in order to strengthen the skeleton

- Consider how the armature will work inside your puppet e.g. how many fingers, tail, bending joints etc.
- Use a lightweight material e.g. balsa wood for the head, chest and hips
- The wire for the spine, arms & legs will be glued into the balsa wood

- **Scale**
  - Characters should be in proportion to the background
  - It might be best to make the background first
  - Characters should be in proportion to each other
  - If too small, they become difficult to manipulate
  - If too big they may have difficulty standing and may dwarf the background

- **Keep the models lightweight**
  - Ensure that they are not top-heavy. The legs ought to be able to support the rest of the body.
  - Use light materials e.g. balsa wood for the bulky parts of the body, then cover them with fabric or a layer of modelling clay.
  - Do not give your characters over-sized heads as these will need to be supported, or construct them from lightweight material such as polystyrene or papier-mâché.

Silhouette

The Adventures of Prince Achmed by Lotte Reiniger, 1926

Requires the use of a light box. This technique requires cut-outs of black silhouette shapes which are placed on top of a lightbox and their movements filmed frame by frame. Similar to cut-out animation, the figures are made of black card and the joints are fixed using blu-tac, split-pins or thread. For an indication of this style of animation you can look for animations by Lotte Reiniger on Youtube. Lotte Reinigers DVD's can be purchased through the BFI Shop: **http://filmstore.bfi.org.uk/acatalog/info_10841.html**

For examples made by children take a look at the BFI Family Films Youtube channel:
http://youtu.be/Z4Yymv0LYR4

Pixilation

The Secret Adventures of Tom Thumb (1993)by the Bolex Brothers which uses the pixilation techniqueThis describes a process whereby photographs of real objects or
people are animated frame-by-frame. This technique can also be used

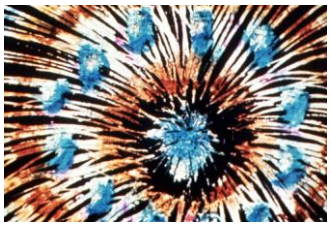
with inanimate objects such as furniture or fruit. Czech surrealist filmmaker **Jan Švankmajer** is an exponent of this technique and has won many awards for his astonishing films.
Go to Youtube.com to find examples of his films:
http://www.youtube.com/results?search_query=jan+svankmajer&aq=f
Other pioneering examples include 'Neighbours' and 'A Chairy Tale' by Norman Mclaren.which you can Google for.

Rotoscope

A Scanner Darkly USA 2006 Dir. Robert Linklater

Rotoscoping is the duplication of live-action film captured frame-by-frame - or the process of creating animated characters through the tracing of real-life action frame by frame. Performed via computer today, rotoscoping was originally accomplished in the early 1900s by projecting each movie frame onto a frosted glass easel, from which the illustrator traced and redrew the image. Rotoscoping is also used to superimpose cartoon images into a real movie, where cartoon-drawn people, animals and objects intermix with human characters and settings (as in *Roger Rabbit*). Many animation software applications include this option as part of their repertoire of effects but you would need to check this against their specifications.

Camera-less animation



Norman McLaren pioneered this technique

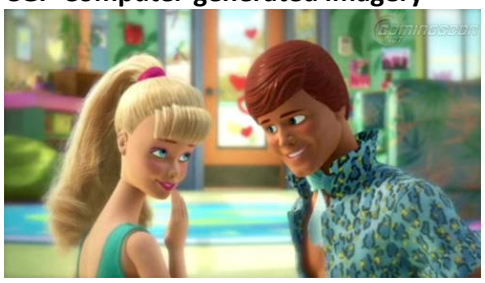
This technique involves using 16mm or 35mm film stock without any camera. Permanent ink can be applied directly to the film surface, frame-by-frame, and then projected. Scratching on film also produces some interesting results, as layers of film emulsion are removed to reveal different colour levels. No photography is involved in this technique. A technique pioneered by Norman McLaren – watch some of his startling films here: **http://www.nfb.ca/explore-by/director/Norman-McLaren/**

- Zu3D offers a 'drawing' facility where you can draw directly onto individual frames which can replicate this technique (to a degree).

- App to create McLaren-like animations is available to download for free from iTunes. McLaren's Workshop
  By National Film Board of Canada – Office national du film du Canada
  Description: CREATE YOUR OWN ANIMATION USING MCLAREN'S GROUNDBREAKING TECHNIQUES

  (APP STORE BEST OF 2013 in Engaging Educational Apps by Apple Canada. It includes 51 CLASSIC ANIMATED FILMS BY OSCAR-WINNING DIRECTOR NORMAN MCLAREN… FOR FREE!)

CGI -Computer-generated imagery



Barbie and Ken from *Toy Story 3*, Pixar, 2010

Specially-designed software programs create films - they can create three-dimensional model-type characters or two-dimensional drawn or cel-type animations. The animator instructs the computer to move the character frame-by-frame into specified positions and the computer carries out the instructions, thus generating animated movement.

Elaborate sets and backgrounds can be constructed using the computer screen rather than a studio space. Special effects can also be added and stunning effects created. This technique is readily available with some excellent and simple packages, which are freely downloadable, to afford a better understanding of the processes involved. You Tube provides access to tutorials and this availability is creating a whole new world of possibilities for animated films as well as providing challenges for animators who wish to further develop their skills with animation technology.

Muvizu is free to download, has many support tutorials and is a good introduction to this technique for younger learners.. www.muvizu.com

image © Muvizu

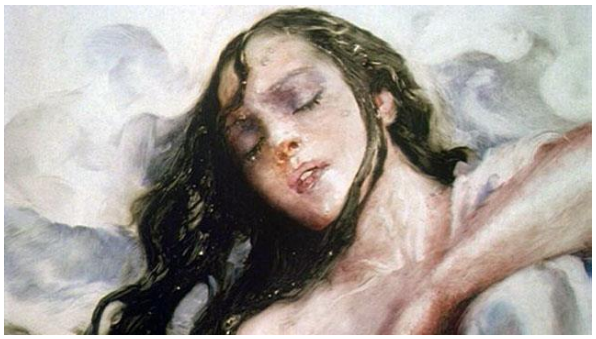
SAND OR OIL ON GLASS

Another form of stop-motion, these techniques require sand or paint - sand is lit from beneath (lightbox) and paint is lit from above – images to be created and manipulated frame-by-frame - either by fingers or brushes. A rostrum camera – one that is attached to a frame, which hangs parallel directly over the animation table/lightbox – can be used to record the images when filming professionally – for beginners a tripod is fine.

Notable practitioners of these techniques include:
Caroline Leaf (animator) http://www.carolineleaf.com/workbio.html

You can find animations created by Caroline Leaf on YouTube and by visiting her website above.

Aleksander Petrov - The Old Man and the Sea and The Mermaid – his films are on YouTube.



© Aleksander Petrov – *The Mermaid*

4. SOFTWARE

This is a good point at which to introduce a few thoughts about stop-motion software.

Stop-motion animation software and packages are in abundance and include software on disc or via download or through multi-function packages such as Corel which is primarily an editing package but supplies a stop-motion function. There are also 'full packages' including camera and software – these include Hue Animation Studio **www.hueanimation.com** or Animation in a Box **http://www.animationinabox.co.uk/**

Aardman have recently joined forces with I Can Animate software which is now being repackaged and sold as an Aardman product – Animate It! **http://www.animate-it.com/**

Zu 3D is another package which you can purchase via download and comes complete with sound effects and other plug ins: **www.zu3d.com**

I have tried all of them and they are all fine to use and it just then comes down to budget, so the advice is to do your own research and check your budget before purchasing – also do check that the software is **compatible with the Operating System on your computers or laptops - XP/Windows 7/Vista/Windows 8/ Windows 8.1.**

A good website, I've found which has a members forum with lots of keen amateurs and professional animators ready to offer advice, is **www.stopmotionanimation.com** a website that was established by one of Tim Burton's animators. This has a useful list of stop-motion animation software giving lots of

information about what's included with them and general analysis. It also links to trial versions and it's a very good idea to trial a package before purchase to see if it offers what you require for your intended purposes. The site has recently been redesigned and updated and you need to create an account to have full access but it is very helpful – the handbook area is where software is listed.

USING APPLE MACS

While it's assumed by many that Mac computers are preferred for creative media activity, not everyone – individual, organisation or institution has the financial capacity to be able to budget for them and this was certainly an issue when introducing stop motion filmmaking at the BFI, however, MAC's can sometimes come pre-loaded with stop motion software - iStop Motion – but do check if you are considering purchasing a Mac Book or computer. Otherwise, the Aardman (Kudlian) product Animate IT is compatible with MAC. Others are also compatible but do check their specifications.

3-D computer animation – in addition to those referred to above:

- 3d Studio Max by Kinteics **www.discreet.com** 3d character animation tool
- Bryce by Corel **www.corel.com** 3D landscape & animation tool
- Poser by Curiouslabs **www.curiouslabs.com** 3D character animation tool

Technical Requirements:

Ram, Processors, Operating Systems and External Memory

While creating animations shouldn't be too taxing for most laptops or desktops these days, editing the footage is where demands on the system will kick in – look for quad core processing matched to the latest operating system and the highest level of RAM – this will all of course depend on the depth of your pockets too! The basic guide is – the larger these get, the bigger the price. It's not a bad idea to take a trip to one of the big electrical retailers and having a look at the models on show and talk to the assistants about things like best models to suit your needs, it could save a lot of heartache should you place an online order for something less than adequate only to find when your purchase arrives, it's just not up to the job. It's a good idea to have an external drive, such as a Seagate, so you can clear your machine regularly if you are making a lot of films. Or set up cloud storage or a Youtube channel so you can store your films there – either for viewing or just for saving.

The Low Tech Route:

Stills Camera

A frequently asked question, when running animation workshops is -

"Why do we need to bother with software and webcams/camcorders – why not just take individual pictures with a digital camera?"

The response is: "there is a lack of functionality, it takes much longer and there is an inherent lack of understanding about what is happening – it is also difficult to maintain a continuing project" – meaning you can't easily pick up where you left off the previous week, which you can do using software.

So the most important consideration when using software is it more easily allows a return again and again to a project as the previous shot can be picked up where it was left and the action continue – even if everything has been put away and set it up a week later. This is possible through the 'onion skin' function – you would need to mark out where your set/background was situated, but the characters could all be repositioned as they were the moment filming stopped the week before. This is much more difficult when using a digital camera.

However, if still cameras are all that is available it is possible to replicate the stop-motion process but each still photo would have to be imported into an editing suite (Windows Movie Maker/iMovie, Corel Video Studio, Sony Vegas, Serif MoviePlus etc.) and the duration of each individual photo would have to be adjusted down as they vary in length but are commonly about 3-5 seconds in length – far too long to provide an animated sequence that would run smoothly. This adjusting process is very lengthy. A quicker method is to turn all the images into a movie and then speed up the resulting film using the editing effects function – in movie maker this is listed as 'speed up double' – this will be demonstrated during the course.

The biggest disadvantage is not being able to play back footage. Using Zu3D or other software means you can quickly check on the progress and play your footage as you go along, delete frames, change the frame function or rewind– all not possible using the digital stills method.

Using Webcams:

Check your webcam is HD

Nowadays, linking to the software means having to use a webcam, and thank goodness there are those that are compatible with HD so good quality footage is possible. Non HD webcams produce very poor quality images and have to be used in very bright light to produce anything like something passable. The main drawback with webcams is there is no control over exposure or focal length. The camera has to be physically moved nearer or further away from the subject in order to achieve the desired shot. Webcams do not have the necessary fittings to attach to the tripod docking plate and will need to be attached with strong tape which makes the plate sticky and difficult to work with after a time and it can easily be dislodged by all the action going on around the filming area.

Frame Capture Camcorders:

Some Sony digital camcorders have an individual frame capture function (Frame Record). This is in effect a stopmotion camcorder and negates the need for purchasing animation software. The functionality, however, is not as high as with animation software and the cameras are old now – they've long gone out of production. However, I have used them and they can be considered as a bridge between the software linked to camcorder approach and a digital camera taking individual shots technique.

Suggested models: **DCR- PC106E** and **DCR-PC107E**

These can only be purchased on Ebay or through second hand means – again, this is redundant technology. The frames are recorded straight onto the mini DV tape and the animation is downloaded as a complete film ready to be edited. The quality of the images is slightly different – a bit flatter and with a matt quality but you would need a laptop with firewire port to be able to use these.

Lotte Reiniger's 2D paper *Jack and the Beanstalk* from Fairytales (1956)

Costing your animation kit:

Microphone

Most laptops carry an onboard mic so do a test to see if the quality will sufficient before spending out on one.

Sound accounts for at least half of the consideration of the quality of your film and is often overlooked so bearing the quality of your recording in mind is important.

Consider using a digital voice recorder (tracer) – these are good as you can take the recorder somewhere quiet, or record your own sound effects.

Philips have lots to choose from and are reliable with good audio quality.

Approx £40.

Zoom are recognised as first rate audio recorders. Cost for Zoom H1 is **about £80 new**.

Tripod

Important to keep the camera still during filming.

Extendable

These allow the animator greater adaptability in terms of camera angles and height. Webcams can also be taped onto the tripod in order to gain height.

Approx: £15 upwards (not really worth buying an expensive pro-tripod)

Gorillapods, useful for gripping onto backs of chairs etc.
COST: **£10-£40**

Lights

It is advisable to have as much control over the lighting as possible.
In professional animation studios, all windows are blacked out and the animation stage is lit by studio day light lamps. In a home situation, simple table lamps will be fine. They will need to be fixed down, as any slight change of position of the lights will be noticeable when viewing the footage. I've seen these mini photo studios (I don't have any myself) but they look ideal for creating the right condition for 3D model animating if the set will sit within it.

- **Shadows and Light**
    - Try to work in the best light possible and evenly light the animation area to avoid shadows – you can use desk lamps which are an affordable option to brighten the area you are working in.

- Step back from the animation table/stage and ensure no shadows are being cast over the artwork before each frame is captured.
- If the worst comes to the worst and you can only film in a poorly lit space, you can increase the brightness of your film through the editing process.

Mini photo studio – cost approx. £30.00

Space

Ensure there is sufficient room to access the models and sets without knocking the animation table/stage or tripod. The tripod should be sufficiently far back from the artwork in order to avoid being knocked as this will cause the picture to wobble on playback.

IN CONCLUSION:

Requirements:

- HD webcam with USB
- Laptop or computer with as much RAM as possible and the highest specifications in terms of processing speed (ask the manufacturer or IT department about this)
- Best graphics card – look for NVIDIA GeForce
- Animation Software
- Tripod
- Microphone or digital recorder
- Controlled lighting – desk lamps or other
- Sufficient space

Or: using 'old style' technology:

- Computer or laptop with IEEE (firewire) port and mini-DV camcorder
- Camcorder likewise that has a firewire port OR frame record mini-DV camcorder
- Firewire Lead – 4 pin to 4 pin for PC, 4 pin to 6 pin for MAC

Laptop or destop? …. laptops are preferable to static computers as they offer greater manoeuvrability.

- A good way to save money is to purchase **refurbished** models – you can buy these through the major retailers, Curry's/PC World, through a manufacturers' website or through refurbish outlets on Ebay. Very often they are models that were sent to a customer who decided they didn't want them and have likely not even used them at all, so there are good savings to be made.

5. Creating your animation:

Storyboarding

A storyboard is a plan of the film, which looks like a comic book.

In order to create your animation you will need a story to base it around - basically making an animation is all about telling a story.

Storyboards are used by all film-makers whether they are making a live-action film or animation. This is an extremely creative part of the overall process. A blank storyboard is contained within your pack. The storyboard is used to make sketches of the action and will usually include camera shots, sound effects and dialogue. This is really useful as it keeps the story 'tight' – it's easy to wander away from original ideas – which is great creatively, but the storyboard keeps this tendency to 'run away' under control and is useful when having to stick to tight restrictions on time. It also is where you will have thought about where to include close ups, long shots and scene changes.

Animating (timing and movement)

An easy way to visualise this is to think of a flick book with each frame representing a separate page with a single image on it.

When animating it is important to consider how many frames are needed to make enough information visible on the screen for viewers to be able to focus on the action. Animation frame-by-frame is a time-consuming business and animators often halve the number of frames they produce for a second's worth of animation to roughly 12 frames – this would be the equivalent of producing professional quality animations. However, when starting it's fine to reduce this number even more so there is the potential to create a satisfying animation film within a manageable time scale.

To animate models, the model is posed in a position and photographed by the camera. It is then moved slightly and the next frame is taken.

Points to remember

- When you are animating a character, avoid making it move all of the time, especially in a longer animation.

You are reading this sheet now; perhaps you blink occasionally or scratch your nose, but you do not move around a lot. In fact you may be stationary for quite a few seconds at a time. You don't want your incidental characters to remain motionless as subtle movements are more realistic than being completely static. A character that stands still and blinks occasionally is enough to convince the audience that it is alive.

• In order to create realistic movement a hold, or still moment, in the animation movement can be used.

The following sequence from the example of a character lifting his hat creates moments, just as in real life, for the viewer to take in the action:

- The film starts with a 'hold' (still position)
- Character moves his hand to his hat
- hold (still position)
- lifts his hat
- hold (still position)
- replaces his hat, moves his hand down
- hold (still position) again at the end of the motion.

As well as holds, animation movements are usually eased in and out of the hold position, that is to say the distance between the movements at the start and end of a movement are smaller than those in the middle of a movement. This is to allow the movement to pick up speed and slow down, as it would in real life. It also prevents the action from starting with a sudden judder and stopping again violently

Animating (timing and movement)

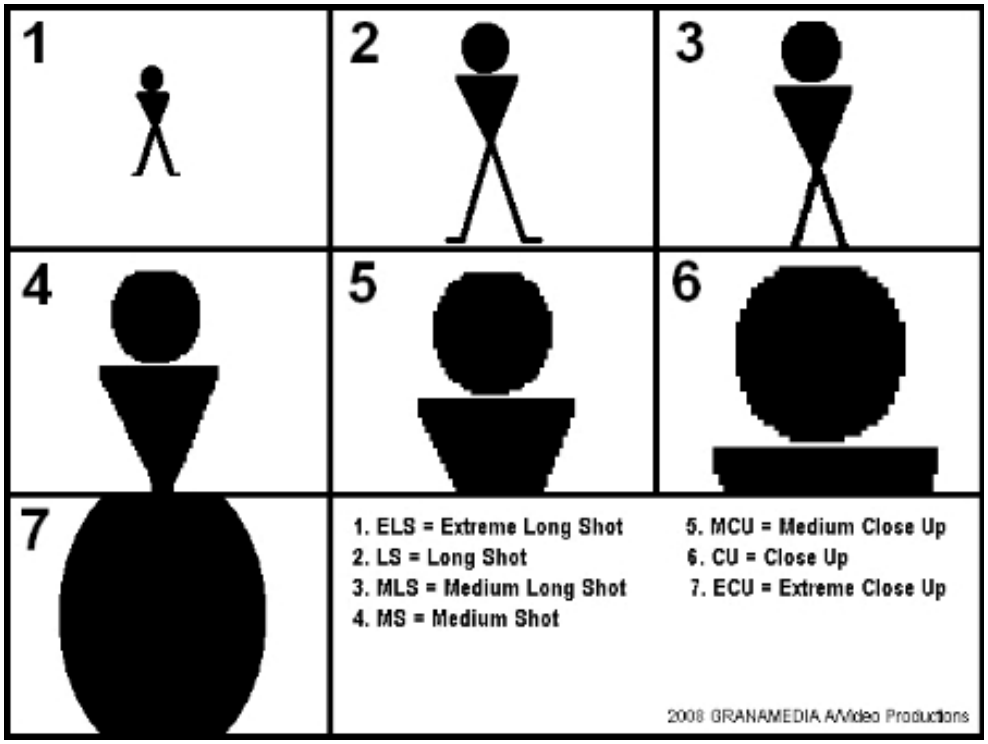
Don't be tempted to make characters move all at the same time. If one character is talking, it is important to let the viewers' eye be drawn to that character.
The animation should give the talking character the most interesting movements. The other characters, if there are any in the scene, should not move around too much otherwise they will distract the viewers' attention. This is especially true if characters do not move their mouths when they speak, and use gestures instead. Having other characters gesticulate makes it hard to distinguish who is talking.

When starting out try not to be too ambitious. Practice makes perfect.
Create a character and use it to animate as many different reaction shots, walk cycles, movements and gestures as you can. You will notice that your films do improve over time and as you build up your personal

library of achievements you will be able to see this and revisit previous projects and note how your skills have picked up. Also you will be more confident about using creative ideas – in animation the motto is 'anything is possible!'

Good activities when starting out are creating footage of a ball rolling or a car moving (you can use a model car for this) where you concentrate on small movements to begin the sequence extending to longer movements 'in the middle' to denote faster momentum with the ending being a slowing down of motion through smaller movements.

Again, practice makes perfect!



Camera Shots:

There are several popular types of shot that are used frequently in storyboarding – from the storyboard they are transferred to the final shoot.
There are illustrations of these in the pack – see supplementary sheets.

Long Shot (LS) – Typically person occupies 3/4 to 1/3 of screen height and often the default camera shot
Medium Shot (MS) The most common camera shot used during filming
Close Up (CU) – to draw attention to an oveall expression or discrete action
Wide Shot (WS) - A wide view of the scene often used as an establishing shot.
Very Close-up (VCU) – on a face, mid-forehead to above chin
Extreme Close-up (ECU) - Detail.
Also worm's-eye view – shooting from below the subject and Bird's-eye view – shooting from above.

Setting the scene:

During the course we will consider a few methods of creating 'backgrounds'. One ready-made solution for 3D scenes are Pop-Up books which provide an instant background and useful if time is short or for demonstrations. Also photocopies, which we will have access to when required.

However, this is a process that is very creative with backgrounds constructed of almost anything – photographs, material, paper, paintings, objects etc.

- Also, don't forget the potential of the chroma key process which we have covered during the course so you can drop in background scenes including video.

Generally speaking, it's best to try to create a 'scene' using a constructed background rather than rely on the chroma key process as there can be problems with quality using this approach – it's tricky to get right even in a professional studio, so always use this as a last resort or for an effect, rather than for the whole animation if possible.

6. Suggested format for deciding on your animation:

Decide on the technique – claymation, 2D cut-out or other

1. **Ideas and brainstorming around the theme**
2. **Storyboarding**
3. **Scene construction**
4. **Model/character creation**
5. **and shoot!**
6. **Sound recording/ music soundtrack / sound effects**
7. **Editing, including credits**

Remembering … camera shots, overall style (comedic, playful, advertisement, dramatic, horror, thriller etc.), tempo of film, music, sound effects.

Flicker books – you can buy a selection from the BFI Shop.

8. Useful books:

***The Animator's Survival Kit*:** A working manual of methods, principles and formulas for computer, stop-motion, games and classical animators by Richard Williams.

The Complete Animation Course: The principles, practice and techniques of successful animation by Chris Patmore

"Cracking Animation" by Aardman Animation

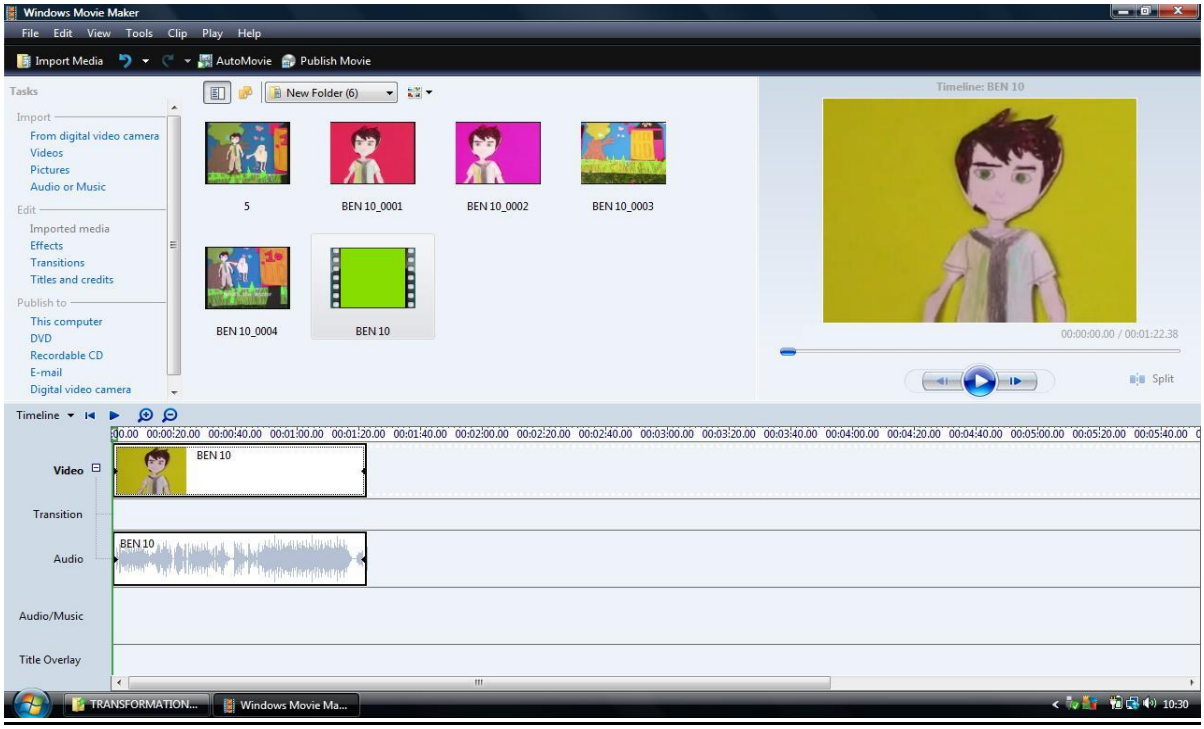
Stop Motion Craft Skills for Model Animation by Susannah Shaw (Director of Animated Exeter - annual animation festival).

The Encyclopedia of Animation Techniques by Richard Taylor (Focal Press) has a more low-budget approach to making puppets and shows achievable approaches to making puppets.

Editing your animation

Both iMovie (mac's home grown editor) and Movie Maker (Microsoft's) are the easiest to master and because we are working on PC, I've included an overview of using Movie Maker – it's not a bad place to start if you've never edited a video ever before. It has (some) limited functionality as you are stuck with one track for video and a couple for audio and one overlay – however, to quickly learn the basics, it's about as easy as it gets.

Editing your film using Windows Movie Maker Vista 6.0 (for PC only)



Installing Windows Movie Maker:

The following screen grabs show you the Windows Movie Maker 6.0 interface (timeline view), if you don't have this installed on your computer or laptop but would like to use this programme, you can download it for free from: **http://movies.blainesville.com/**

Windows Movie Maker 2.6 is very similar – it looks the same so following the below will be no problem, however it has less fonts and other functions but you can download this also for free from: **http://www.microsoft.com/en-gb/download/details.aspx?id=34**

- Once you've taken all the shots that make up your film, click file, make movie and export your film – Zu3D gives a few choices of format. Movie maker only likes **WMV.** Save to your desktop so you can find it easily.
- Open Windows Movie Maker
- Click on File – click on New Project
- Click on **'Import Media'** or **Tasks – Import – Videos**
- Find your newly named movie file
- Double click on this and it will load into Movie Maker
- Drag and drop this into the Timeline – the film will also emerge in the viewing box but the 'master' will stay in the media collection box
- You can use the viewing box to scroll quickly through the film (for example to find pictures that have been taken of hands, feet or heads that sometimes end up in the film to enable you to delete these
- To edit out footage (including trimming audio recordings) make sure the correct track is highlighted – either the video track or the audio/music one. When this is highlighted you can see the function called **Split** highlighted. Click on this to mark the 1st place where you wish your edit to begin. You can then position your mouse on this and while holding the left mouse button, scroll along to trim the offending audio or movie track.

You can increase the ease of this by increasing the size of the track – use the 'plus' button above the Video track. It also has a 'minus' to decrease the size again.

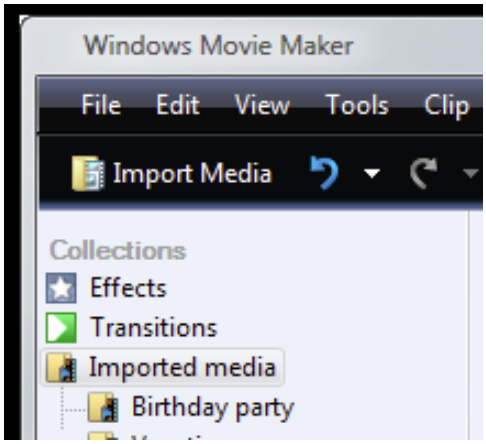
- You can toggle between Timeline and Storyboard as Storyboard shows clearly how scenes are cut up into their constituent blocks.
- You can add effects and transitions, audio and still images to your film while in Timeline mode and also subtitles or other credits. You can only add Effects and Transitions in Storyboard mode. You can pull up a list of functions when in Timeline mode by right clicking your mouse in the timeline.
- **Effects** are things like speeding up, slowing down, panning, zooming etc.
- **Transitions** are things like fading from one scene to another

For a full demonstration and reminder of how movie maker works go to

http://windows.microsoft.com/en-US/windows-vista/Getting-started-with-Windows-Movie-Maker

Illustrated overview:

The Tasks pane: provides several different 'panes' that you can work in, depending on which tasks you want to complete.



The tasks pane lists all the common tasks you'll be looking to perform when making your movie, including importing your video footage, editing using the effects, transitions and audio files, creating credits for your movie and publishing it - turning it into a completed movie at the end of the process.

The area where you create and edit your project is displayed in two views, the storyboard and the timeline. You can switch between these two views when making your film.

Timeline View:

Provides a more detailed view of your movie project and allows you to make finer edits. Using the timeline view you can trim video clips, adjust the duration of transitions between clips, and view the audio track. You can use the timeline to review or modify the timing of clips in your project. Use the timeline buttons to switch to storyboard view, zoom in or out on details of your project, narrate the timeline, or adjust the audio levels.

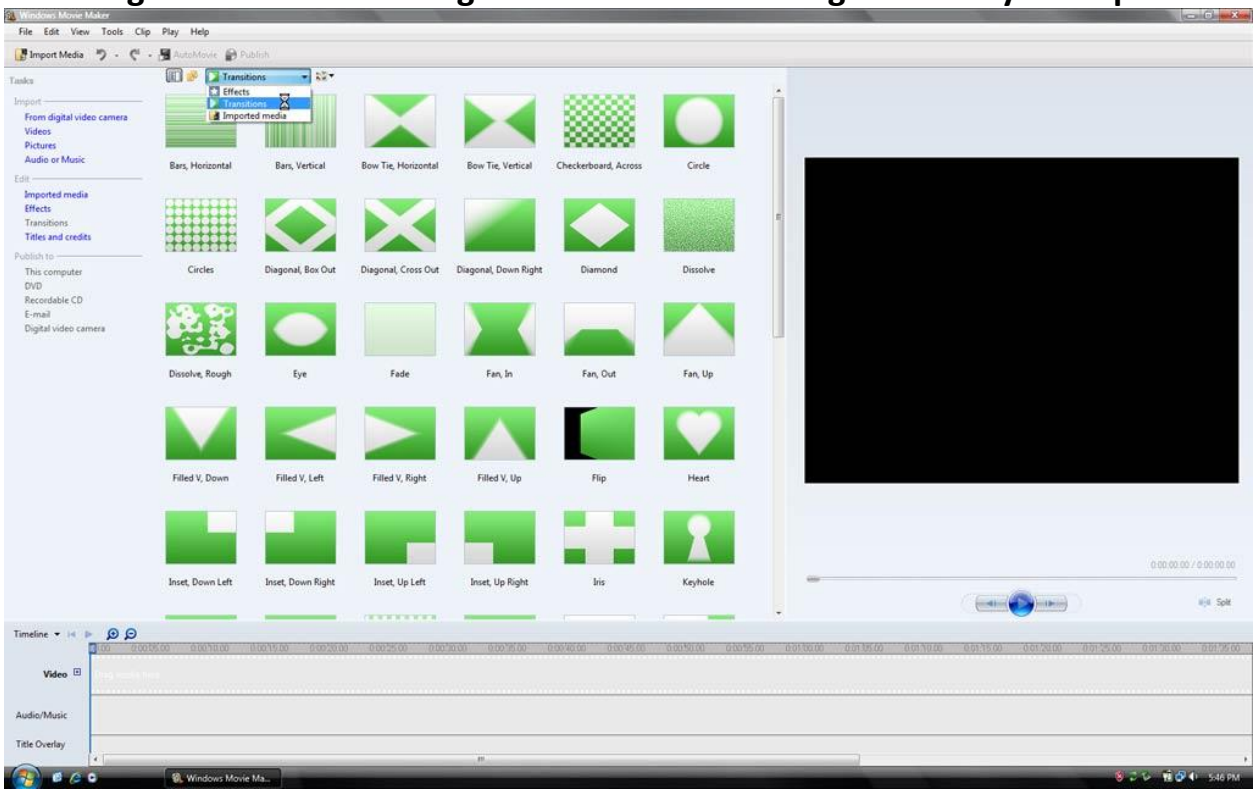
Storyboard View:

You can use the storyboard to look at the sequence or ordering of the clips in your project and easily rearrange them, if necessary. This view also lets you see any video effects or video transitions that have been added. Audio clips that you have added to a project are not displayed on the storyboard, but you can see them in the timeline view.

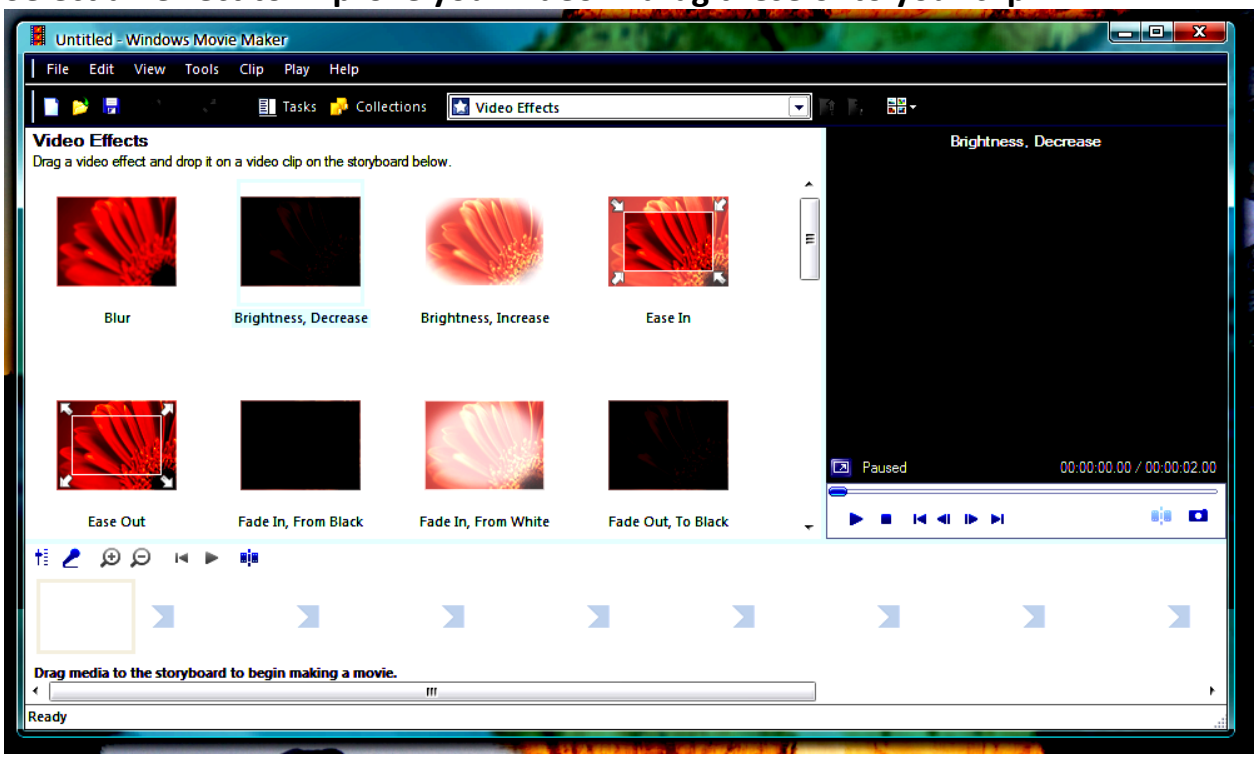
How the interface looks when you have your movie clips loaded:

TRANSITIONS: Once all the clips are assembled in the right order you can add transitions – for example you can add fade to look as though your scenes are fading in and out of each other. Many more options exist of course. -

Selecting a transition – cutting between scenes – drag between your clips



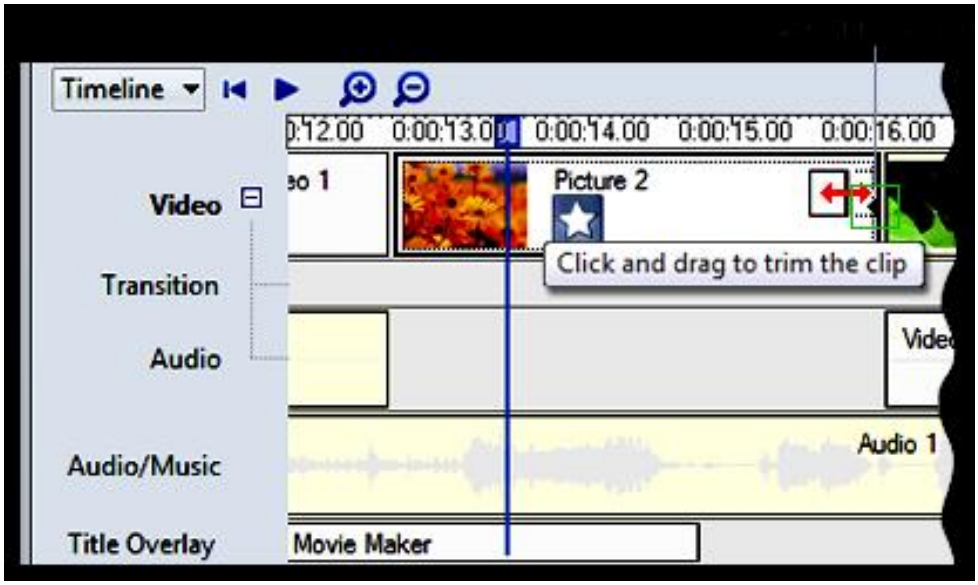
Select an effect to improve your video – drag these onto your clip



How to split a clip – getting rid of footage you don't want in your film

- Using the timeline view, play the video or audio clip that you want to split.
- When the clip reaches a point near the place you want to split the clip, click Pause.
- Under the preview monitor (the viewing box), use the playback controls to find the point where you want to split the clip.
- Notice under the preview monitor the Split button is highlighted – click on this and your video or audio clip will be cut.
- You will need to make sure the video or audio track is highlighted for the SPLIT button to appear and a cut will be made according to which is highlighted – if it's the video track, the video footage will be split, if the audio track is highlighted, the split will appear in the audio track.

Trimming a clip:



You can drag 'trim handles' on a clip to set the start and end points.
Trim handles appear as small black triangles at the beginning and end of a clip after you click the clip on the timeline. When you hold your mouse pointer over a trim handle, the pointer changes to a red double-headed arrow. Drag these handles to set a new start or end point of your clip.

Just because you've effectively deleted some of your video footage you haven't lost it altogether – it still exists as part of the footage which is stored as the source file (original footage).

Adding Audio:

Music can be an excellent way to embellish your movie, and adding music is easy in Windows Movie Maker.

- Click File, and then click Import Media / audio

- Browse to the file you want to add, and then click 'import' which will be highlighted. You can import audio files with the following file name extensions into Windows Movie Maker: .aif, .aifc, .aiff .asf, .au, .mp2, .mp3, wav and wma.

- Drag the music file to the Audio/Music track of the timeline.

PLUG-INS FOR WINDOWS MOVIE MAKER:

This will amaze you, but you can add plug ins to Movie Maker 0.6 to enable it to have quite amazing extra effects and transitions… yes really!
You have to pay for these but as you get the editor for free, it's a small price to pay for a not too terrible editor (which it was previously without these).

Pixelan: http://www.pixelan.com/ for effects and transitions download

Blainesville: http://movies.blainesville.com/p/movie-maker-add-ons.html for lots of effects and transitions

Rehan: http://www.rehanfx.org/shader.htm download effects and transitions – TFX shader download also makes it possible for Blaines additions to work – must be paid for but extremely cheap – includes chroma key effect so green screen can be created using movie maker.

Windows Live Editor:.

If you do use a PC, avoid Windows Live editor – it is rubbish and you will do best, even though Movie Maker 0.6 is so limited, to learn editing using this which has a timeline - this will make progression to other more complex editors an easier process as they all work from timeline view.

Going beyond movie maker (or iMovie): Once you have mastered simpler editing programmes you may wish to progress to more advanced editing. On PC I'm relatively happy with Serif Movie Plus x6 – it has increased functionality – you can add multiple audio and video tracks and it has the standard functions that are included on all more sophisticated editors – such as chroma key, overlay, reverse, picture in picture etc. etc. (too numerous to mention). Sony Vegas is likewise, good and easy to master once you are familiar with the basics of editing. Final Cut Pro is the industry standard for editing on Mac, but this is costly.

Sound effects and music for your films:

There are many excellent websites that contain royalty free (which means you pay a small amount to use them, but then you are free to use them in the public domain) or free sound effects that include musical tracks and loops that will bring your animation to life. One source is **www.partnersinrhyme.com/pir/PIRsfx.shtml** but there are many, many more. It has to be said that much of the music isn't necessarily of brilliant quality, but for short projects will usually suffice. Also for sound effects there is **www.soundbible.com** **or** **www.freefx.co.uk** which you have to register for.

Musopen! **www.musopen.org** provides classical pieces played by youth orchestras and the like – the quality is variable but can be very good.

There is also masses of free music on: **http://www.freemusicarchive.org/**

Everyone turns to Kevin McLeod as he is so prolific in his output and very kindly allows use of all of his compositions – he does have a donation button on his website and it's only fair to click this every now and again - his tracks cover all genres including silent movies and you can find his music here **www.imcompetech.com**

http://eng.universal-soundbank.com/ Universal Sound bank is constantly being added to so is a good go-to site for all manner of sounds.

- Once you start amassing your free sound files you will quickly build up a collection but I have 100's and still download new sounds and music according to each new film edited. It's also fun to try to

create your own sound bank so try not to rely on only downloaded files – have a go at making your own!

Creating your own music for film:

Garage Band is music-making software that enables tracks to be created on your computer but is only for MACs.

For windows try Sony's creative ACID music making software (current programme is ACID pro 10): **http://www.sonycreativesoftware.com/**

Finally:

Downloads to make your life easier:

It's always best to have the following on your machines (or equivalent) as once you start making video's there may be an occasion when you need them:

Video converter – to convert video files to more useable options – particularly if you do end up using movie maker: **http://www.freemake.com/free_video_converter/**

Youtube downloader – for overlays, free video stock footage, sound effects etc. etc.
http://www.freemake.com/free_video_downloader/

Audio converter: http://www.freemake.com/free_audio_converter

Increase audio levels: http://www.mp3volumer.com

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Do get in touch if you would like any further help or advice.

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