My article in this book is a dried reprint of my article for ACTT mag 1971

computers

Are computers taking over from artists? William Collins reviews a new book — *Computer Animation* — that explains how computers take some of the sweat out of draughtsmanship. Tom and Jerry may never be the same

"Within the next ten years, 90 per cent of animated films may be computer aided with the remainder based on conventional methods."

That is the confident prediction of John Halas, managing director of the Educational Film Centre, London, who gives the forecast in a new book called *Computer Animation*, of which he is the editor.

Coming from the co-producer of the classic animated film *Animal Farm*, made by Halas and Batchelor, his words warrant consideration by creative heads of advertising agencies, artists and film producers.

The book contains contributions from 26 American, British and Canadian experts, mainly on computer film-making and, on reading it, one feels, to use old-fashioned movie parlance, that one is on to "sump'n bigg".

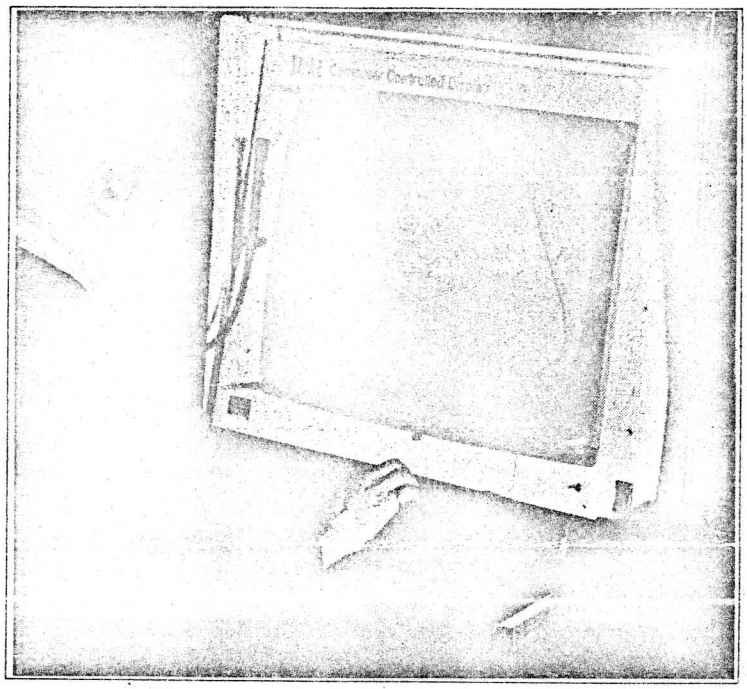
The art is only about ten years old but, in the United States, has already been extended to include computer-made animated television serials. In Britain, BBC TV has used computer-made films for its Open University programmes.

Halas realises that to many artists the use of gadgetry to convey their creative efforts is anathema. So one of the purposes of the book is to encourage them to try working at a computer centre where computer time can be purchased because, he says, the development of the form lies largely in the hands of artists.

Computers have several languages of their own which are used by the programmer to carry out the art work handed to him. Artists who may be surprised by the ease with which a computer can reproduce their most intricate designs, and even add a new perspective to their work, might wish to learn one of the symbolic languages themselves. To do so would take them about three months, but it isn't necessary.

All they need to do is submit the first or last frame to a programmer and give him or her the storyboard. After translation into a language it understands, the computer will complete the animation and have it ready for viewing by a client within hours, or even minutes in some cases.

Alternatively, an artist can use a device known as a mouse, which can be moved about freely on a keyboard as a pencil in conventional drawing, and see his creation appear on a cathode ray tube in 3D. The drawing can then be pulled and pushed into any shape from an assortment of distortion functions available to him on the computer.



Computers . . . few agencies have tried them

Colour is also available through filters on the machine, although some computer film-makers prefer to colour their artwork by hand after the film has been completed, or have it colour processed in the conventional way. The film itself is photographed by a 16mm camera set into the machine which takes its images from a cathode ray tube. The sound track can be recorded on the spot and the images already created can then be manipulated to fit in with the track or it can be added later.

One of the advantages computer film-making has over conventional methods is that it obviates the necessity for an artist to draw every single and often repetitive line of his creation. Another advantage is that it eliminates camera movements, editing and the planning of the film. So computer film making can be time and labour saving and it can also prove cheaper for diagrammatic work.

But it has the drawback of being unable to reflect the emotional performance of the artist himself in the creation, say, of a delicate or sensitive expression on a character's face, or a change of posture by which a mood could be instantly set.

One of the first advertising agencies to consider using a computer-made film in Britain was Hobson Bates, which handles the Tunes account. The work was carried out by film director Stan Hayward, one of the British contributors to the book, at Video Animation. He was able to produce for them, literally within minutes of receiving the artwork, a sequence showing tablets tumbling out of a Tunes package.

Metropolitan Radio, the Newcastle commercial station, also used Hayward and Video Animation to have its logo filmed by computer to announce the opening of the station in a television commercial.

Other British advertisers do not seem, so far, to have experimented with computer film-making. The book may encourage them to do so if they are not put off by the essentially technical nature of the text, and badly checked proofs which have allowed incomplete words to slip through into print, phrases containing the same words to be repeated, and passages of confused writing to appear. None of this reflects favourably on the subject matter which, after all, deals with precision and logicality. □

* *Focal Press, £5*

The art of taking chips to the flicks

Is there still life in animation? Stan Hayward argues that computers could take the slog out of drawing 24 frames for every second of film

WILL computers ever be able to make a film like Disney's Snow White? A good question. The answer is a very definite yes and no. It all depends on how one defines the computer's role in film making.

In principle, the production of an animated film has not changed in more than eighty years, still relying on thousands of drawings done by hand, matched frame by frame to the sound, and shot one frame at a time (one frame is 1-24th of a second). It is a labour intensive, slow, and costly business, which is why animated shorts have all but disappeared from cinemas.

But hope, in the form of the computer, is about to come charging over the hill. Techniques applied to computer graphics, simulation, image processing, microfilm, and the like, are gradually making inroads into the animation studio.

One application is microfilm, involving a camera that records the graphic information on a computer display. The information is mainly mathematical, modelling anything from how galaxies form to how atomic particles split up. As the computer takes time to produce each frame, these are recorded one at a time and then played back at a speed that shows the sequence moving. A series of weather maps presented in this way gives more information than seeing the pictures as stills.

Another system using Computer Aided Design (CAD) techniques has developed from applications to engineering and architecture. Here the computer is used in two ways. First in the field of simulation — such as test how a bridge will withstand the stresses put on it and secondly, as a draughtsman's aid for drawing blueprints. It is this application that helps the artist.

Libraries of drawings can be stored in the computer and called up in any sequence. The computer can then produce all the in-between drawings from one to the other in a given number of frames. The artist has only to provide the key drawings of the first and last movement, and leave the rest to the computer, which can also scale the drawings, reverse, rotate, duplicate any drawing on the screen as well as a whole range of effects transformations such as squashing, stretching, or twisting.

This can extend even further into 3D, so that a drawing of a building can be viewed from any angle once the initial views have been drawn. It is an area that will one day produce moving blueprints so you will get an animated film of your car reference manual.

The computer can draw. It can also colour. The drawings can be called up on the display and any area assigned a colour. This colour will automatically be retained through the sequence for that area. The image can also be shaded by making one side have a dark line and the other a light one and letting the computer work out the intervening stages.

It can also control the brightness, hue, grading, and opacity of the colour. Lines can be drawn in any thickness, colour, or type (dotted, wavy, sawtooth). Airbrush effects can be achieved, and textures placed as easily as colours.

Quite often computer animation has to be matched up and overlaid on actual photos of live-action sequences. In this case it is necessary to have the computer draw directly on to the clear acetate animators normally use, which means the sequence has to be reshot with the added artwork.

The computer takes on a new role by operating the rostrum camera so that all the complex movements of panning, tilting, zooming, and focusing are programmed before the shooting starts. The numerical control of cameras has opened up an entirely new area of animation, most noticeably in films like Star Wars where the cameras were "flown" around the model spaceships. The models and even the background can be operated by computers to get the feeling of depth for these effects.

The camera itself can be replaced by a microchip, in this case a CCD (charge coupled device) chip a fraction of an inch square. It acts both as a TV camera — allowing the cameraman to see what he is shooting as he is doing it — and as an optical digitiser, which stores the picture in a computer so that it can be modified in shape, colour, or edited.

As film, video, and computer techniques converge towards a multimedia form it is worth looking at some of the ideas that have been proposed and tried out in animation. One project stored an alphabet of lip shapes that were coded to match their corresponding phoneme. When the voice track was fed into the computer it spoke with the correct lip shapes.

Ballet notation has been proposed for quickly producing animated films simply by typing in the notation and letting the computer fit the chosen image to all the positions. Tests have successfully been carried out where cameras are operated directly by spoken commands. Multi-screen projectors have banks of computer-operated slide projectors. Cinemas have been made where the image totally surrounds the viewer — rather like seeing Star Wars in the planetarium — where lasers have been used to project line drawings in the air. One day they will be used for 3D films.

You will also be able to live inside a screen made up of flat displays covering your wall and ceiling. Animation will also be available on pocket calculators to show the graphic result of your calculation, or a picture of the word you want translated.

The question still to be answered is whether computers can produce a film like Snow White. Such a production required millions of drawings, hundreds of artists and staff, and took several years to make. The biggest problem by far was the organisation. A computer could simulate the film production by working out all the schedules, costs, bottlenecks, and markets for a film.

Given that, a producer would be in a far better position to optimise his resources and approach the distributors before a frame had been shot. So computers can produce, and one day will produce such films at a fraction of the cost and time now taken.

A final thought. Philosophers have long pondered on the ultimate language — one that comes close to reflecting our thoughts and reality on all levels instead of having the many notations we now have for handling words, numbers, music, chemical symbols, etc. Computers and animation between them can handle any form of information, linear or spacial.

It might well be the penultimate language before we rely on telepathy. Such applications come close in the use of aircraft simulation. The pilot really believes he is in a plane because the information is present accurately. If computers and animation can do that for instructional films, just think what it could do for pornography.

Stan Hayward is an animator and filmmaker.

Lady Falkender,
House of Lords,
London,
SW1A 1AA

26th April, 1978

Dear Lady Falkender,

COMPUTER AIDED FILM PRODUCTION

Over the last few years the Imperial College has carried out ongoing research and development on the applications of computers to film production.

The projects have included the conference 'Computers behind the Screen', the Viewdata report on setting up a National Film Data bank, Computer animation, editing, and numerical control of film equipment.

The technical projects have been backed by the NRDC and DOI as these projects promote new markets for computers. It is evident that every stage of film production can be significantly aided by computer techniques, and the DOI has recently sponsored a survey on this for the animation industry.

The response from the industry to the Viewdata report has been very encouraging as there are a number of authorities and organisations which have film libraries and related material, and there seems a good case for networking these existing sources of information to form the basis for a data bank, which could later be extended to cover information for both film makers and users.

It has been proposed by Dr. John Jenkins - who initiated the above conference and Viewdata report - that the industry could be modelled mathematically to show its structure and weaknesses. The techniques for this are well established and have been successfully used in other industries.

The DOI is interested in sponsoring further developments in computer aided production techniques, but are limited to technical applications where there is an end client. This definition does not allow them to sponsor the Film data bank, or Modelling study, although they admit that both would be based upon computer methods and advance the film industry as a whole.

The DOI has asked if such studies could be done in collaboration with the Film industry, with some part of the expense being shared by a film authority. I am not sure who that could be, but feel it is directly in the area that the proposed British Film Authority would deal with.

I hope this is of interest to you.

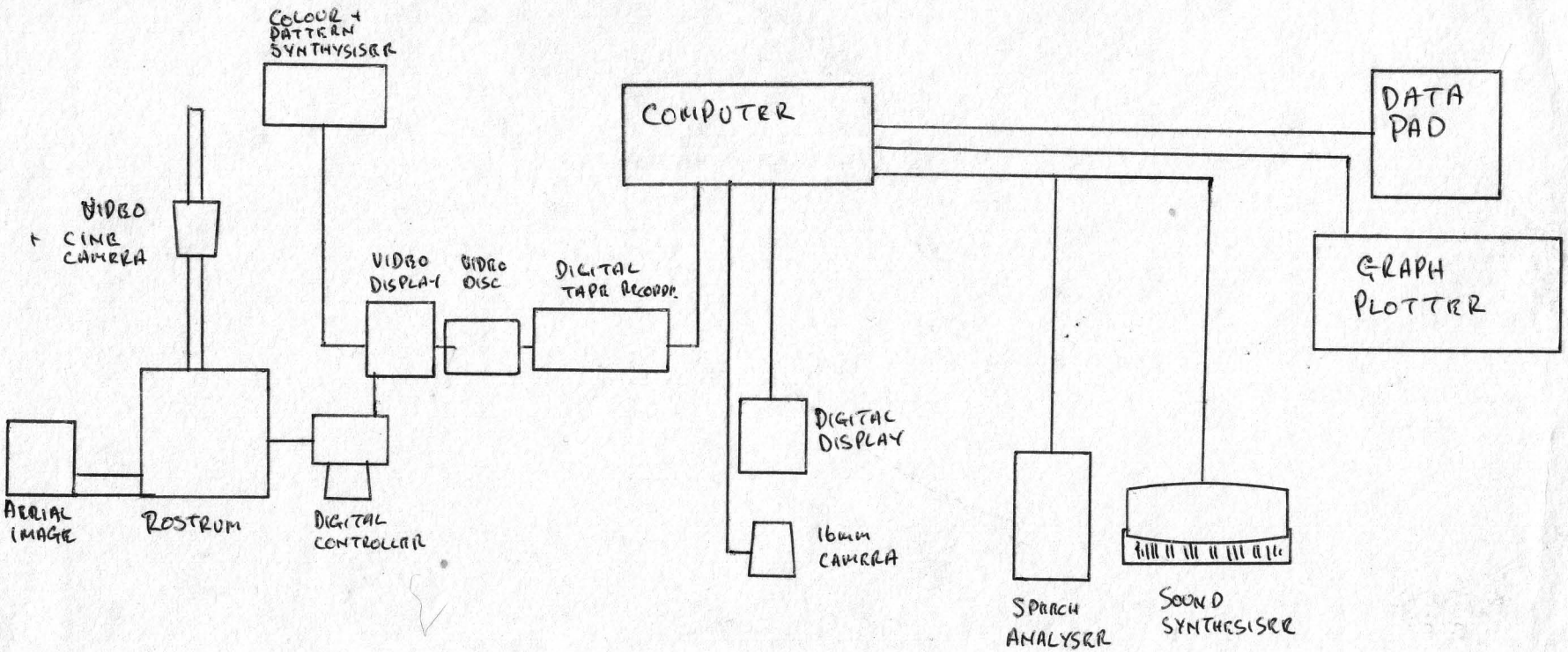
Yours sincerely,

Stan Hayward

Encs.

S. HAYWARD SEPT 10/76

COMPUTERISED ANIMATION STUDIO



8.12.75

BBC EXTERNAL SERVICES

CENTRAL TALKS AND FEATURES

Science, Industry &
Agriculture Unit
630 SE Bush
PABX 2471

No: Q130
(Please quote on P. as B. or P. as R.)

COMPUTER AID TO BOX-OFFICE SUCCESS

by William Collins(OC)

CUE IN: In Britain £200,000 a year is to be set aside each year from a levy on the sale of cinema tickets to assist the film industry. This has given rise to the intriguing question of whether computers could be used to ensure box-office success. William Collins reports.

Mr.Stan Hayward, a director of Video Animation Limited, a London firm which specialises in making cartoon films by computer, believes that the computer has many other uses for the film industry. It could be used for market guidance and planning.

The first step would be to list all known personnel and services available in the industry and all known outlets for films. The information would be stored in a computer memory bank. The next step would be for a panel of experienced film-makers to decide on the type of film to be made. It could be a comedy, drama, cartoon or documentary. From the data previously stored, the computer would then provide information on the number of markets available for the sort of film proposed and the degree of acceptability in each of those markets for that type of film. Giving a comedy as an example, Mr. Hayward said some markets would show a preference for low comedy, some for middle-brow and others for high or near-classical comedy.

Using the analysis provided by the computer, and computed figures of past takings in the cinemas, the panel would then relate the gross takings and the profit margin to the investment to be made. If gross takings and profit margins were high, the film-makers would make a generous investment, if low, a low one.

With the decision taken to shoot the film, the production budget would be analysed by the computer for maximum efficiency. It would then supply from its personnel data bank the names of directors, writers, artiestes and technicians best qualified to handle the sort of film required.

Marketing men would be similarly chosen by the computer for their knowledge of the specific market the film was to be aimed at but, assuming the film to be a comedy, instead of approaching the comedy market as a whole, they'd be directed to those sectors of it which the computer had shown were most receptive to the type of comedy envisaged. Peripheral markets would only be allocated as much time as the computer's response analysis chart had shown they warranted. In this way, Mr. Hayward said, time, energy and money which might otherwise have been spent on improbable markets would be saved and the saving would go to the credit side of the balance sheet which, he was convinced would show an overall profit in terms of box-office success.

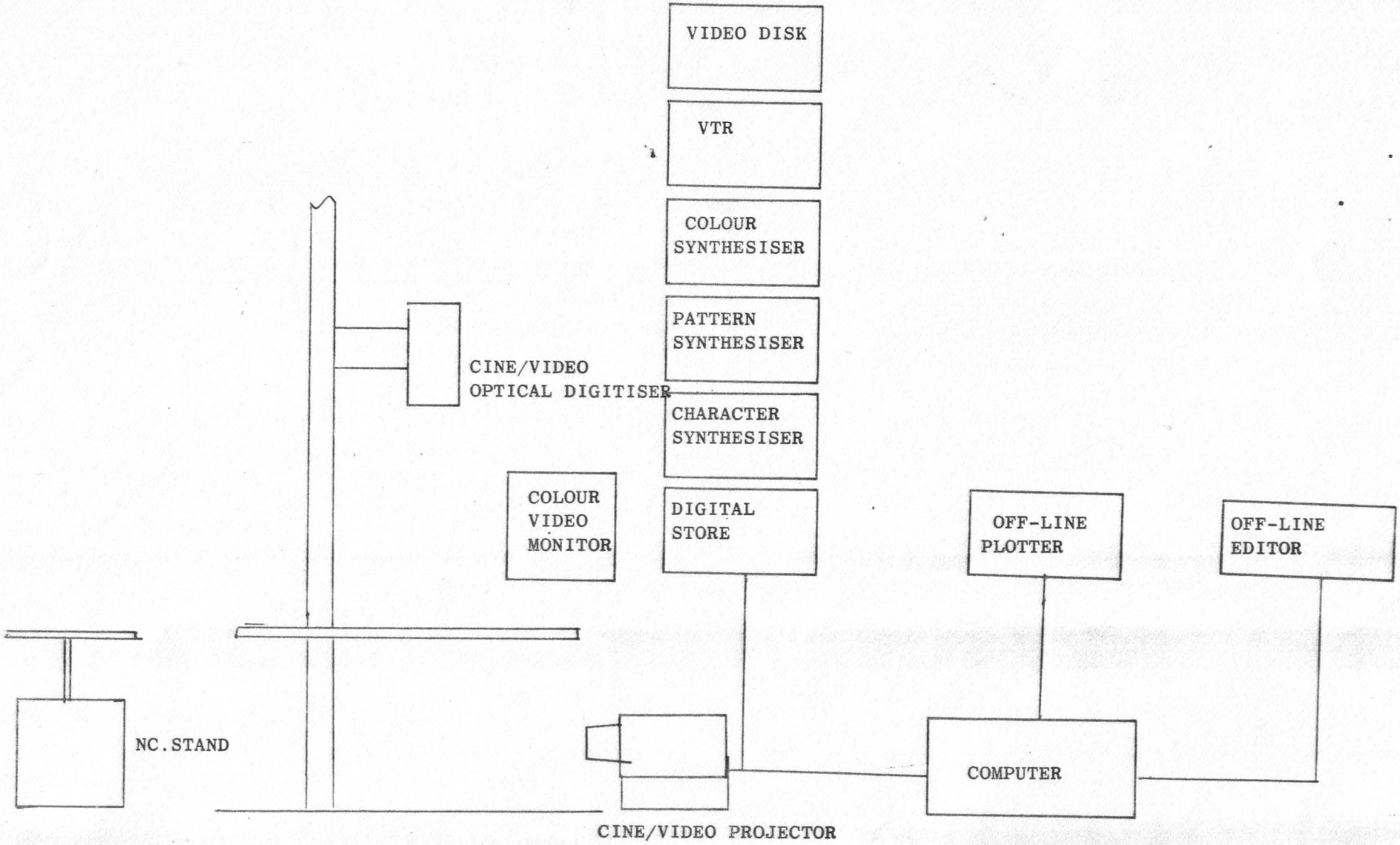
(His plan has already received support from the Screen Writers' Guild but its final outcome will depend on the findings of the Government's working party on the film industry.)

GS/pmr /1030
Total lines: 45

Stan Hayward,
Video Animation,
Imperial College,
London.

(Paid by talks contract and free for use in External Services for 3 months from 8th December, 1975)

IMAGE PROCESSING ROSTRUM



FILM AND VIDEO

BY JOHN CHITTOCK

Art and the computer

A NEW tool for the film and television industries has been unobstrusively establishing itself over the past decade. The computer, spectacular and well-known in the industry as an aid to the animated film-maker, performs Trojan service in running unmanned regional TV transmitters throughout U.K., helping film libraries trace stock shots at the BBC and elsewhere, reprocessing old movies to improve their image quality, and even "stretching" recorded speech to make it run longer without altering its pitch.

This emerged at a conference held by Imperial College in London, surveying the range of applications for computers in film and television. The possibilities now seem endless, especially in building a bridge between traditional concepts of alphanumeric communication and the more intangible language of visual communication.

Assistance

The labour-intensive, time-consuming craft of the animated film-maker was one of the first to recognise the uses of the computer. The production of cartoon films involves the creation of thousands of drawings on celluloid (cels)—often only with fractional adjustments to each as the means of building up a sequence of movement. The drawing of cels between the start and end of a movement —called in-betweening—is a job that can now be done by computer. The tracing of the first drawing made by an artist can be fed, as X and Y co-ordinates, into a computer—likewise the last drawing—and the full range of steps in between can be retrieved as an output either on a television screen or a plotter which actually traces each drawing automatically.

Some idea of the potential assistance can be gathered from the statistics provided by Mr. John Halas, one of the speakers at the conference, who with his wife made the first British full-length cartoon feature film—*Animal Farm* — involving 250,000 individual drawings. Now the computer could ease the task, if still only as a servant of the artist.

Computer animation is also used to translate data into visual movement, yielding a new dimension to mathematical and technical information. Two striking examples seen at the conference showed a new method of calculating engineering stresses—turning design data into a photo-elastic display —and a moving picture of pollutant dispersal in the Solent, based entirely on parameters of tide, wind, pollutant, etc., all fed into a computer.

More conventional applications for the computer in the film and TV industries are, of course, concerned with data storage and retrieval, systems control and management operations. All of the ITV regional transmitters are, for example, computer controlled, and the BBC can search out library shots for producers by computer —even specifying the direction of subject movement. Other new television technologies rely on computers—such as the Ceefax and Oracle teletext systems and the NTSC/PAL colour TV standards converter which enables Britain to enjoy such high quality live broadcasts from the U.S. (not shared by countries which have failed to buy this British-pioneered equipment).

In the U.S., inconclusive attempts have been made to apply the computer to predicting potential box office successes at the cinema—searching out all the common denominators in past box office successes. Nonetheless, most Wardour Street pundits would say that this is one area where old-fashioned gut feeling is unchallengeable.

Surprises

For many delegates at the recent conference, there were surprises at the hard reality of some progress made. One certain show-stopper was the pocket calculator, used by a blind technician at the National Physical Laboratory, which produces a form of speech to identify numbers and functions when the different keys are pressed. Similar technologies are now making it possible for speech to be processed and yield a visual output from which animators can trace synchronised lip movements to match the speech.

Other instances where the computer does jobs unattainable by other means include the processing of images to improve their inherent quality. The prime example has been TV space pictures, especially from the moon and Mars; image sharpness, colour and interference defects are all cleaned up by computer processing. The American company involved in this, Image Transform, have recently subjected the film originals of *Gone with the Wind* to a similar process for television release—improving on the original quality and removing scratches.

Choreography

Another unusual application has been the work of Mr. John Lansdown in London using computers to write the choreography for a ballet, including camera movements. Videotape produced by this process was shown to delegates and was remarkably free of the usual rigidity of computer art—no doubt because human beings still had to dance the actual performance.

The is an over-riding point behind this current activity and interest. Stan Hayward, one of Britain's best known experts on animation — especially as a scriptwriter — is pressing hard for a co-ordinated project to be established in which computers can serve the film and television industries at a national level. Initially this would involve simple data — such as on the availability of technical and human resources, film and programme information, and access to budgeting and scheduling programmes for producers. In the longer term, it could help to rationalise British expertise in this field. Forty years ago last week, a similar thing happened with the start of high definition television broadcasting—the outcome of pressure from enthusiasts, in a development where rationalisation was needed, which put Britain ahead of the world.

Association Internationale du Film D'Animation

International Animated Film Association

Международная Ассоциация Мултипликационного Кино

3-7 Kean Street
London WC2
Tel: 01-240 3888
01-836 5108
Telex: 269496

From the office of
The President

President's Newsletter No. 9

TECHNOLOGY AND ANIMATION

One of the basic problems which besets the field of animation is the wide division in technology around the world.

It seems to be a paradox that in the developing nations only 35 mm rostrum cameras are available which are expensive in material and labour costs, when these nations cannot afford such luxuries. The richer nations, however, use 16 mm standards for their production with half of the expenditure of the former when they may afford more money for their operation.

Not only an exchange of equipment would be desirable, together with laboratory facilities, but a far deeper exchange of technical information between the film producing countries round the world.

How long to wait until the world's production is standardised? These are some of the questions to which we must give consideration, but of course we know that our influence may not be strong enough to force such a gigantic issue alone.

Through the "DEVELOPMENT AND RESEARCH COMMISSION" we constantly convey some news of certain developments in case it may assist some of our members.

One of them is concerned with the electronic adaptation of animated rostrum cameras in saving time and money. The latest development is a digital control system for the rostrum camera which transfers information from dope sheet through a typewriter device. Through the printer on a digital typewriter information is typed-in in response to questions. These are computed and fed through the rostrum camera which responds accordingly. All such programmes can be stored in the controller. It acts as follows:-

a) It initializes a break point data input and edits via the typewriter.

b) It interpolates calculating positions at each frame number.

c) It drives the motor control of camera and rostrum.

This tool is an aid to the animator and cameraman by eliminating the tedious task of calculating intermediate image positions, hand operating positions and camera winding, consequently it allows more time for more creative activities. The motorized movement of the image can be repeatable, adding new facilities to the rostrum and the aerial image system and making possible further experimentation with new effects.

It is naturally impossible to describe the complete working of the system in this letter, but if you require further information please write to:

Kins Applied Technology Limited
Woodcote Grove, Ashley Road,
Epsom, Surrey KT18 5BW, England.

The other new technique concerns line testing animation directly on videotape and playing back instantly without involving an optical process. This method has been developed by:

Lyon Lamb Video Animation System,
723 N. Broadway, Studio 'D',
Laguna Beach, California 92651, U.S.A.

Such equipment has now been installed in several Hollywood studios and I am sure that Mr Bruce Lyon would respond quickly to any enquiries.

The variety of methods to record movement concerns everyone in the field of animation. The evolution from expensive 35 mm optical systems to computer and to videotape recording will slowly but surely hit us all. Our colleagues working inside television stations use the latter system already and produce animation in a fraction of the time than studios working with 35 mm. The effect is of course not the same as hand drawn animation which is here for a very long time to come. Nevertheless we must study new methods and come to terms with the blessings of technology and to make an effort to up-date the old system with a less expensive and more effective type of operation if it does cut material and labour costs and can assist creativity.

JOHN HALAS

Principal: Leonard Stoppani ARCA FSAE

WEST SURREY COLLEGE OF ART & DESIGN

Falkner Road, The Hart, Farnham, Surrey GU9 7DS

Telephone: Farnham 722441

Report of the first meeting of the ASIFA Action Group for the advancement and development of electronic media in Education.

19th November 1981.

The first meeting took five major items for its agenda:

1. The present situation in Art and Design Colleges.
2. Utilization in Universities.
3. Independent T.V. Companies, BBC and Open University.
4. Use in the Video Industries for Home Entertainment.
5. Attitude of Research Associations and Governmental Bodies.

Those in attendance were:

Eileen A. Baldwin
Joy Batchelor
Mic Claridge
David Curtis
John Halas
Stan Hayward
David Kirk
Roger Noake

The discussion which ensued ranged from the economic implications for the animation industry vis-a-vis the 4th Channel. The national and international developments in A.V. now taking place and how a cohesive effort might be made on a national level to ensure that the U.K. did not fall behind the current creative and technical developments.

Stan Hayward submitted an ASIFA outline proposal document which itemised the present situation in relation to ASIFA. It proposed that ASIFA should act as a clearing house for research and development, educational and economic elements within the field. The group's attention was drawn to the developments taking place in both the commercial and educational sectors.

A brief account of the joint efforts being made by West Surrey College of Art and Design and the University of Surrey to develop research facilities at WSCAD in the area of audio visual studies was given. The college was considered to be in an ideal situation given its three degree areas of study - Photography, Film and Video and Animation - to establish workshop facilities for students and professionals from within the industry. The possibility of short summer schools based upon the successful American Undergraduate Programme already operating at the college was suggested.

COMPUTER AIDS TO ANIMATED FILM PRODUCTION

S Hayward, Animation Equipment Engineering Ltd

In principle, animated film production has not changed much in over seventy years. It still requires thousands of drawings to be traced, painted, shot, processed, edited, and then registered with the sound-tracks of voice, music and effects. It is costly, time consuming, and requires expensive skills and equipment. Although the artform has no limits in terms of the imagination, it is strictly limited by practical considerations so that its potential is far from being realised. Computer techniques offer a means of overcoming most of the problems, but have yet to be adequately tested in the marketplace.

The related developments include:

COMPUTER-GENERATED ANIMATION where the artwork and movement are created by the machine. It is typical of technical animation beyond the skills of animators.

COMPUTER-AIDED ANIMATION where combined computer and video techniques offer ways to integrate advanced techniques with normal animation. It includes electronic colouring, testing timing and movement, editing, and the control of instant playback offered by computer and video techniques but lacking in film.

NUMERICALLY CONTROLLED EQUIPMENT where the operator is able to use tradional equipment such as rostrum cameras, editing machines, etc, far more efficiently, and in some cases to redesign the equipment to be more compatible with computers.

DIGITAL SOUND-TRACKS where voice, music, and effects can be created, controlled, and edited directly to the image.

PRODUCTION CONTROL where management methods are applied to the 'studio', which will often be freelance staff working in a service industry.

A research project is currently attempting to consolidate all these aspects into a 'Computer studio' where animated movies (films, tapes, disks) can be made quickly, cheaply, and in particular by people outside the animation industry who are interested in adding sound and movement to images.

S HAYWARD

Mr Hayward is a film writer/director specialising in animation. He was introduced to computers while working on a communications film for ITT New York in 1963. He won the New Scientist computer award in 1969 for a proposal to automate film production methods.

Mr Hayward started the computer animation company Video Animation Ltd with backing from NRDC, and he had Department of Industry backing for numerical control of film equipment. He writes, lectures and broadcasts on animation generally, and computer animation in particular.

Mr Hayward is currently working on The Computer Studio project in collaboration with West Surrey College of Art and Surrey University as the outcome of a MAPCON study for microprocessor applications to film equipment.