

Tomislav Mikulić - DAI PERSONAL COMPUTER 1981 - 1988

LOW RESOLUTION GRAPHICS AND ANIMATION - U-matic VIDEO - ZAGREB



Tomislav Mikulić

DAI
PERSONAL COMPUTER
1981 - 1988

LOW RESOLUTION GRAPHICS AND ANIMATION - U-matic VIDEO - ZAGREB

A compilation of the artist's work
created with DAI (Data Application International, Belgium) Personal Computer,
Houston Instrument HIPAD tablet, DIY video digitizer, Seikosha GP-100 printer,
Sony VO-2630 U-matic VCR, colour video camera and video switcher
at his home in Zagreb, Croatia.

Published by HR Design Studio Pty. Ltd.
Melbourne, Australia.

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DAI REVIEWED

A truly European computer, the DAI seems to offer exceptional features in a tidy package. We take the lid off to bring you an in-depth report on its performance.



If a computer was produced which most closely meets the ideal that people ask us to recommend, then not unlike the DAI Personal Computer, it would probably be a system that is a true European machine.

The computer is produced by a number of European countries by a company called Data Applications (UK) Ltd. It is marketed in a number of European countries by subsidiaries of the company.

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faces socketed at the rear and a full power switch is at the back but there is an LED at the front which indicates that the system is powered up. One rather nice touch is the power switch which can only be operated by a pointed instrument such as a pencil. This means that it is difficult to accidentally reset the system, but the manual does give a last minute routine if you then decide that you didn't really want to kill it after all!

The case is one of the few areas open to criticism, in my opinion. It is simply too deep to fit on a normal desk with the TV behind it and you can't sit the TV on top because that would block the ventilation slots. If the keyboard was made separately to the main PCB it could be mounted on top and this would shorten the case to a more reasonable size. Only a minor niggle, but space is often at a premium especially when justifying it to the 'other half'!

Three leads are supplied: power, cassette and video together with a manual — of which more later. To avoid any possibility of faulting the graphics by moving a TV that was unsuitable I also borrowed a model. Experimentation proved that the graphics work just fine on any modern TV and they also produce a true grey scale on a black and white set.

DAI supplied a cassette with a number of demonstration programs but I encountered a slight problem with loading them. A cassette machine with this type of work, I didn't bother with it because I possess one specifically for this type of work. Whether the cassette is at fault, or whether there is a problem with the machine on which the programs were recorded, I don't know — but there were considerable struggles at times. One definite fault did show up, however. The cassette interfaces are relay controlled

and the devices used are not up to the job. Cassette recorders with heavy duty motors, like mine, generate a large back EMF when the field current is broken and this can, and did, weld the contacts shut. The problem can be solved by fitting a diode across the track plug terminals but you will need to experiment to find the correct polarity.

Overall the package contains everything that one is likely to need to begin with. It would be nice to supply several demo programs as standard but the manual itself contains two sections: up-and-running, and the second part tries to be a complete reference work — a file document that explains things in greater detail than the first but in less technical language than the second. When this arrives the system should have some decent documentation, as it is, the quality is well below that of the hardware.

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The DAI Personal Computer is High Performance High Value

Standard Features

- High-Speed Basic
- Resolution Graphics (255 x 335)
- Editor
- Programs for Music Generation
- Hardware Maths Option
- Parallel Ports
- Interface via Aerial Socket
- and Dual Cassette Interfaces

Available from:

Data Applications (UK) Ltd.

Personal Computer Division
16b Dyer Street
Cirencester, Glos GL7 2PF

complete and post to:
Data Applications (UK) Ltd., Cirencester, Glos GL7 2PF

computing today

FOR THE BUSINESS OF MICROCOMPUTING

AUGUST 1981
ISSN 0142-7210
ONLY 70p

Brighten up your programming with DAI's personal, colour graphics computer

Unravelling the mysteries of Rubik's Cube with a full-screen simulation on an 8080

Sounds Unlimited from Computing Today's latest 'Microlink' project

Let our Buyer's Guide lead you through the systems jungle

only £595.00
Disc unit + VAT extra

Model 1980

more software for more machines

Table 1. The vital statistics of the DAI.

CPU	8080A (2 MHz)
RAM	48K
ROM	24K
IO	Bi-directional RS232, DCE parallel bus. Two 500 baud cassettes. Two games paddles. Stereo sound
Graphics	Three resolution, four modes with up to 16 colours. Animate facility
BASIC	Extended, semi-compiling type
Sound	Four channels output in mono via TV or stereo to hi-fi
Monitor	Simple machine code monitor
Options	Range of DCE based interfaces. Maths chip (£149 + VAT). Floppy discs in the autumn (£1600 + VAT approx)
Price	£595 + VAT

What You Get

The DAI is housed in a neat desktop case with all the connections for inter-

2. 24K ROM-based software that includes a fast BASIC interpreter, code utility program, twin cassette file handling, and disc support.
3. A full duplex RS232 serial interface allowing direct connection of a printer (with resident software support) and other peripherals.
4. A parallel interface for connection of the CP/M compatible DAI disc unit and other user devices.
5. Superb 16-colour high resolution graphics (256 x 336).

Data Applications (UK) Ltd.

16B DYER STREET, CIRENCESTER, GLOUCESTERSHIRE GL7 2PF

TELEPHONE: (0285) 61828 or 2588

CIRENCESTER, GLOS BECHAM G

TELEX: 43605

Please send me further details about the DAI Personal Computer in the following areas:

Please send me a list of dealers

NAME: _____

ADDRESS: _____

Send to: _____



DAI PERSONAL COMPUTER

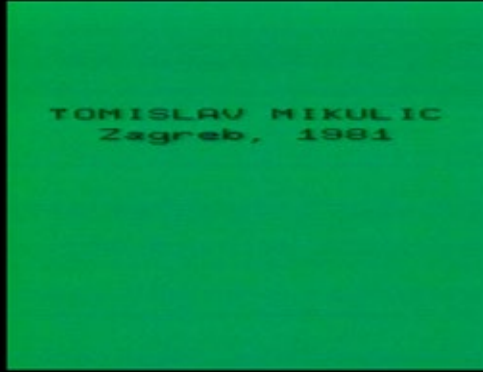
DAI PC was developed in Belgium for Texas Instruments. Unfortunately it was rejected and disappeared from the market despite its superior graphics and sound capabilities. You can search the Internet for more details of this rather sad story. In the photo is the first model (1980) which I bought in 1981. I later bought the 1983 model (Indata) just before the DAI company bankrupted.



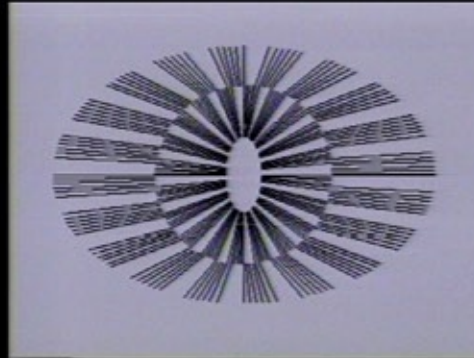
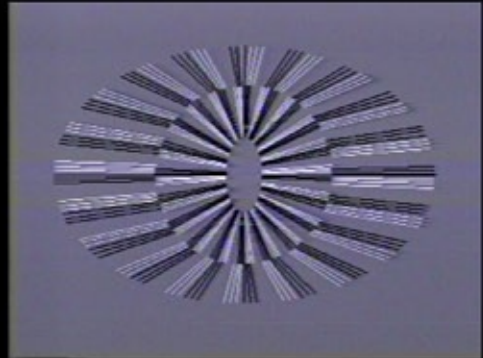
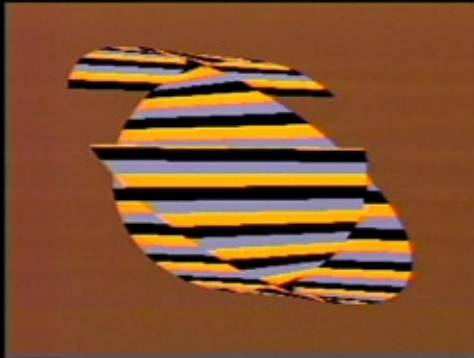
Video output modification - Model 1980



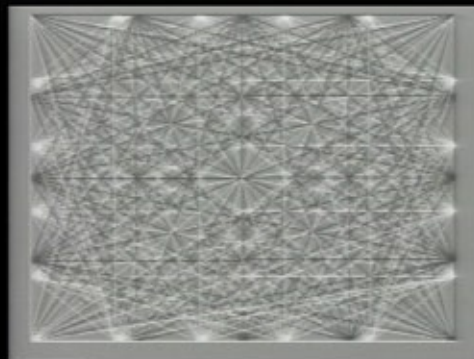
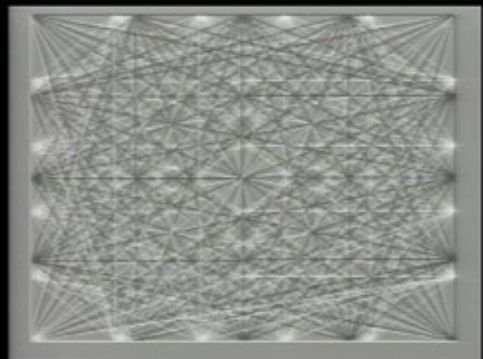
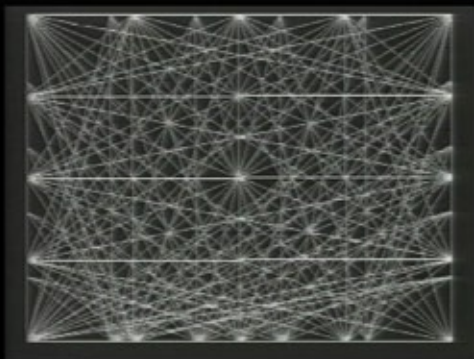
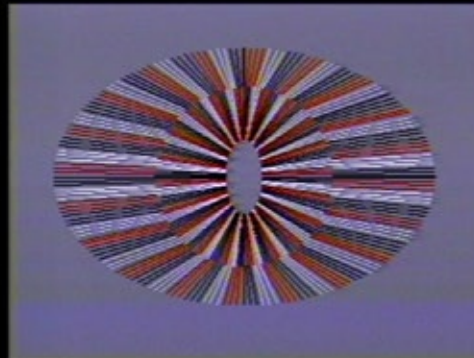
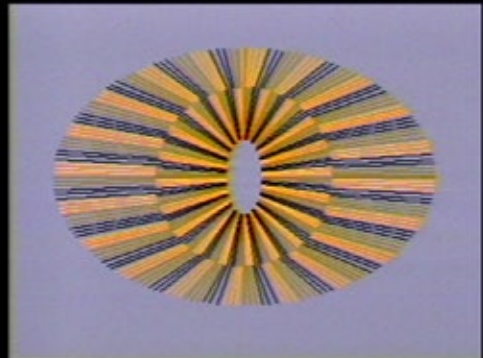
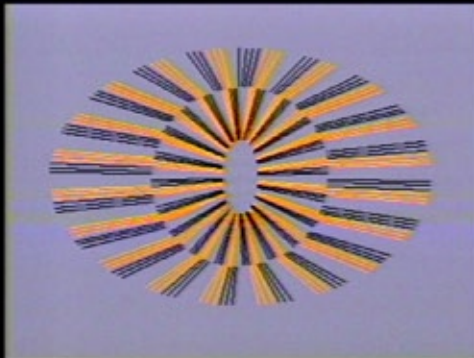
1983, Studio in Zagreb



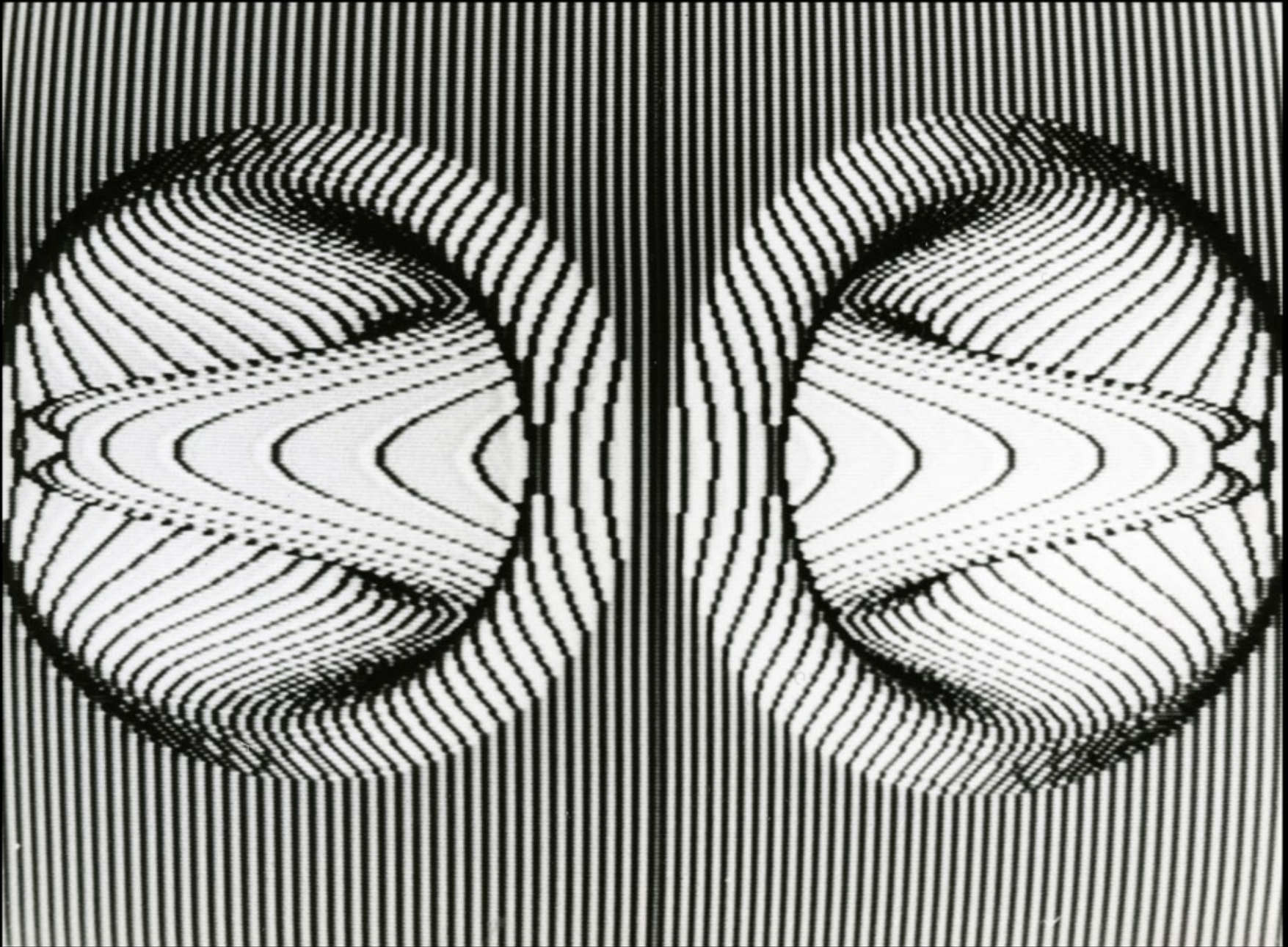
First hack - The customized start up splash screen.



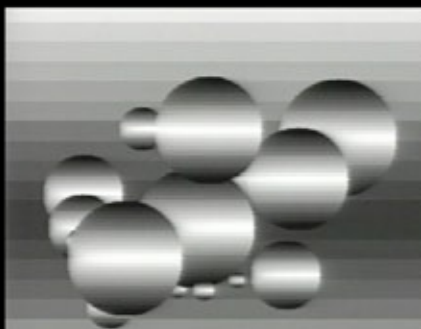
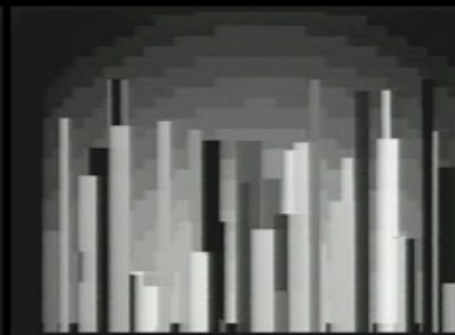
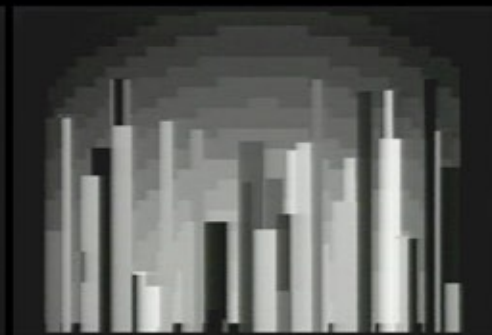
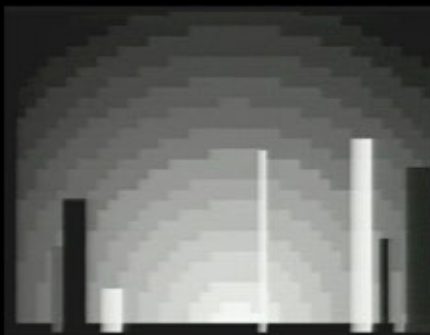
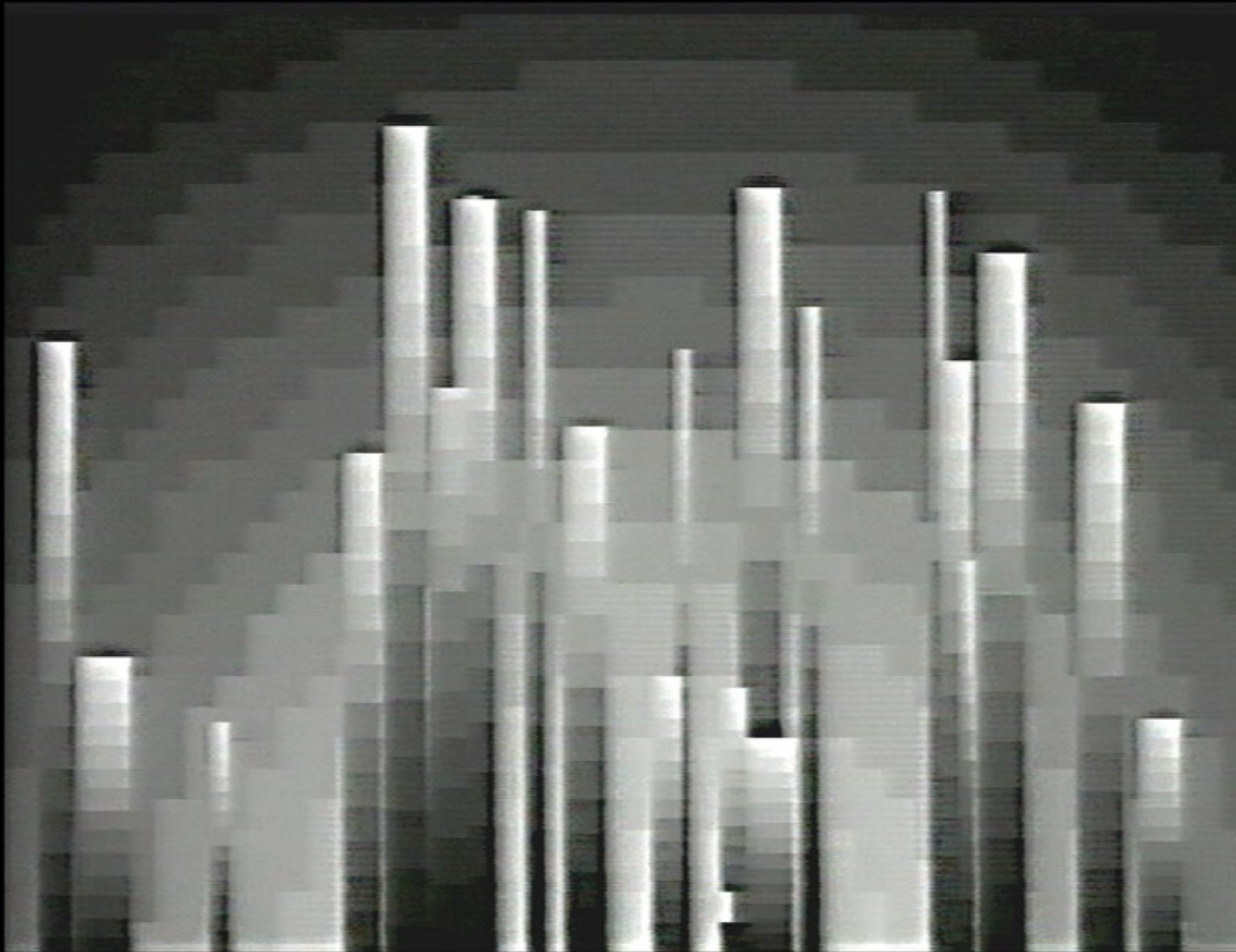
Getting familiar with DAI. Simple animation - Two rings rotating in real time in opposite direction by changing colors in LUT (Look Up Table).



Playing with colors in LUT (Look Up Table).

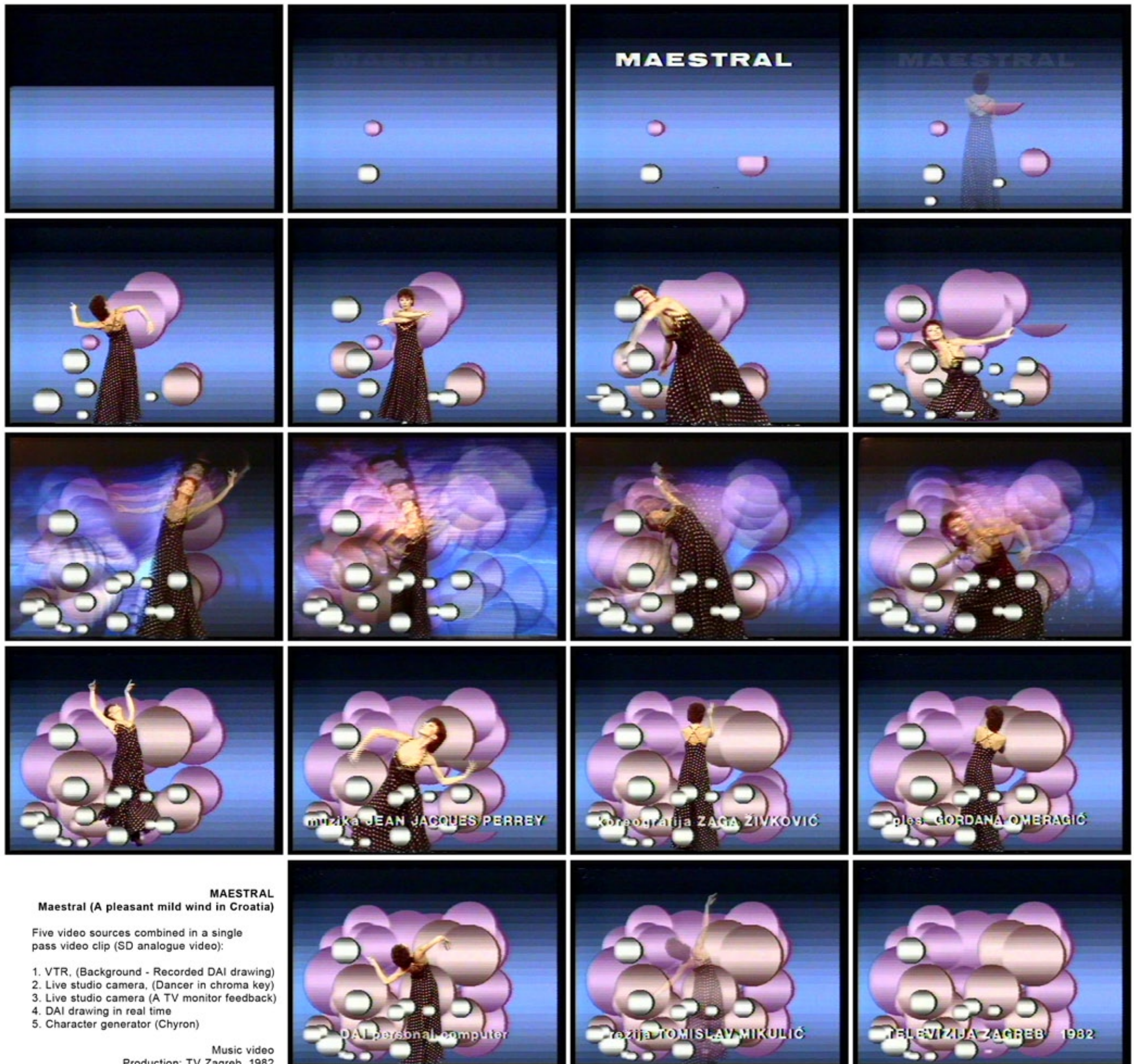


The "Hidden-Lines" algorithm was a challenge for every computer graphics programmer.
This is a screen shot of my attempt to code it using a DAI computer in 1981.



**Oživljena pozornica za ples.
Dynamic virtual stage
for a dance TV program.**

Study in black and white.
1981



MAESTRAL

Maestral (A pleasant mild wind in Croatia)

Five video sources combined in a single pass video clip (SD analogue video):

1. VTR, (Background - Recorded DAI drawing)
2. Live studio camera, (Dancer in chroma key)
3. Live studio camera (A TV monitor feedback)
4. DAI drawing in real time
5. Character generator (Chyron)

Music video
Production: TV Zagreb, 1982

Muzika JEAN JACQUES PERREY

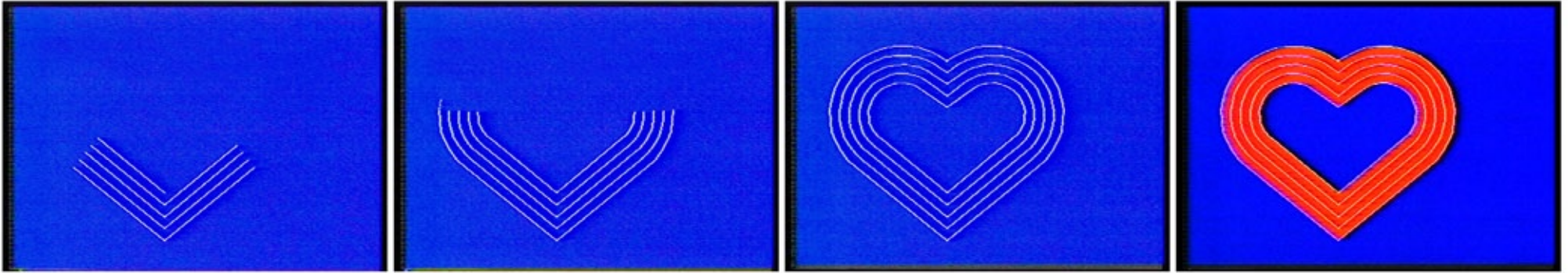
Koreografija ZAGA ŽIVKOVIĆ

Ples GORDANA OMERAGIĆ

DAI personal computer

Režija TOMISLAV MIKULIĆ

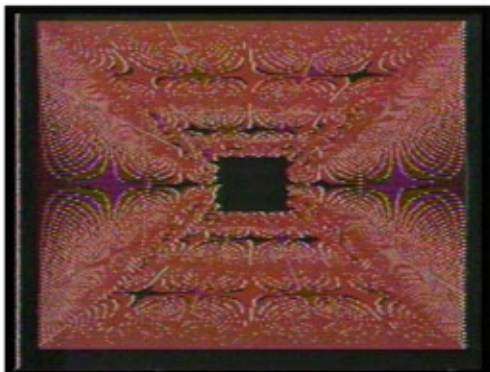
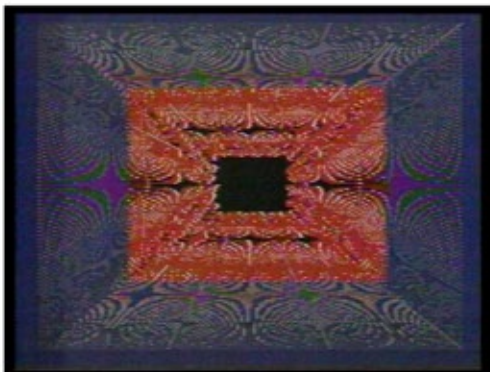
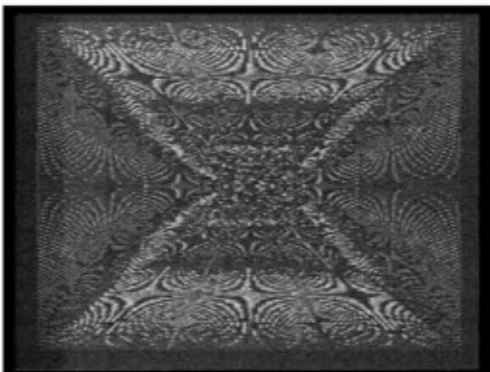
TELEVIZIJA ZAGREB 1982



**AKE '81, Zagreb (Atletski kup Europe)
European Cup in Athletics, 1981, Zagreb, Croatia**

DAI drawing in real time
Program in Basic language

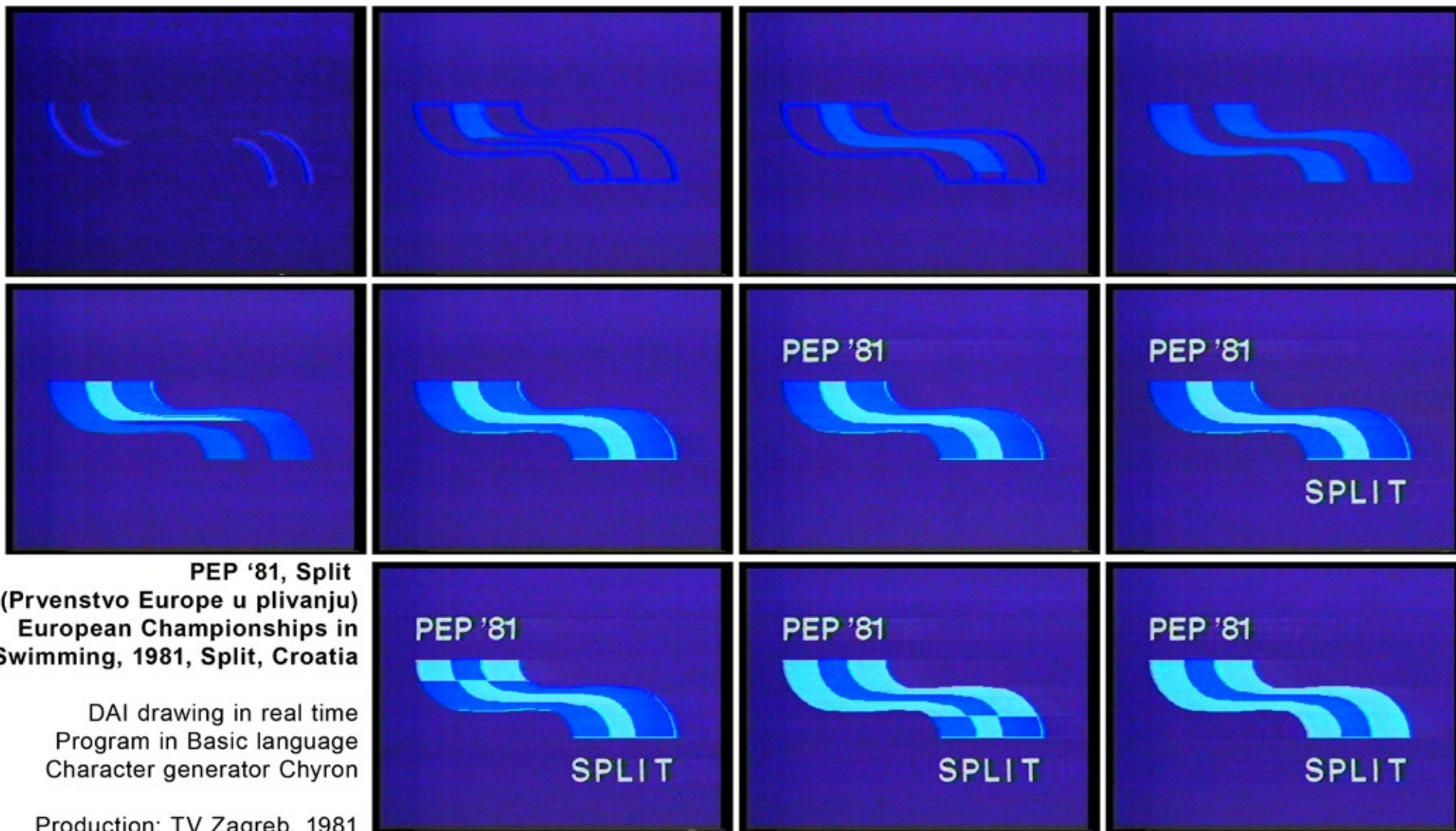
1981
Production: TV Zagreb



**Muzička pozornica
Music stage**

DAI drawing in real time
Program in Basic language

1981
Production: TV Zagreb



PEP '81, Split
(Prvenstvo Europe u plivanju)
European Championships in
Swimming, 1981, Split, Croatia

DAI drawing in real time
 Program in Basic language
 Character generator Chyron

Production: TV Zagreb, 1981

Najava programa
TV slides

35 mm slide. Text created using
 letter transfer (Letraset) on a photo of
 the screen shot of DAI drawing.

1981

Production: TV Zagreb



Znanstveni razgovori
The Science Talks,
Animated opener

DAI drawing in real time

1981

Production: TV Zagreb
 Editor: Stanko Govedić

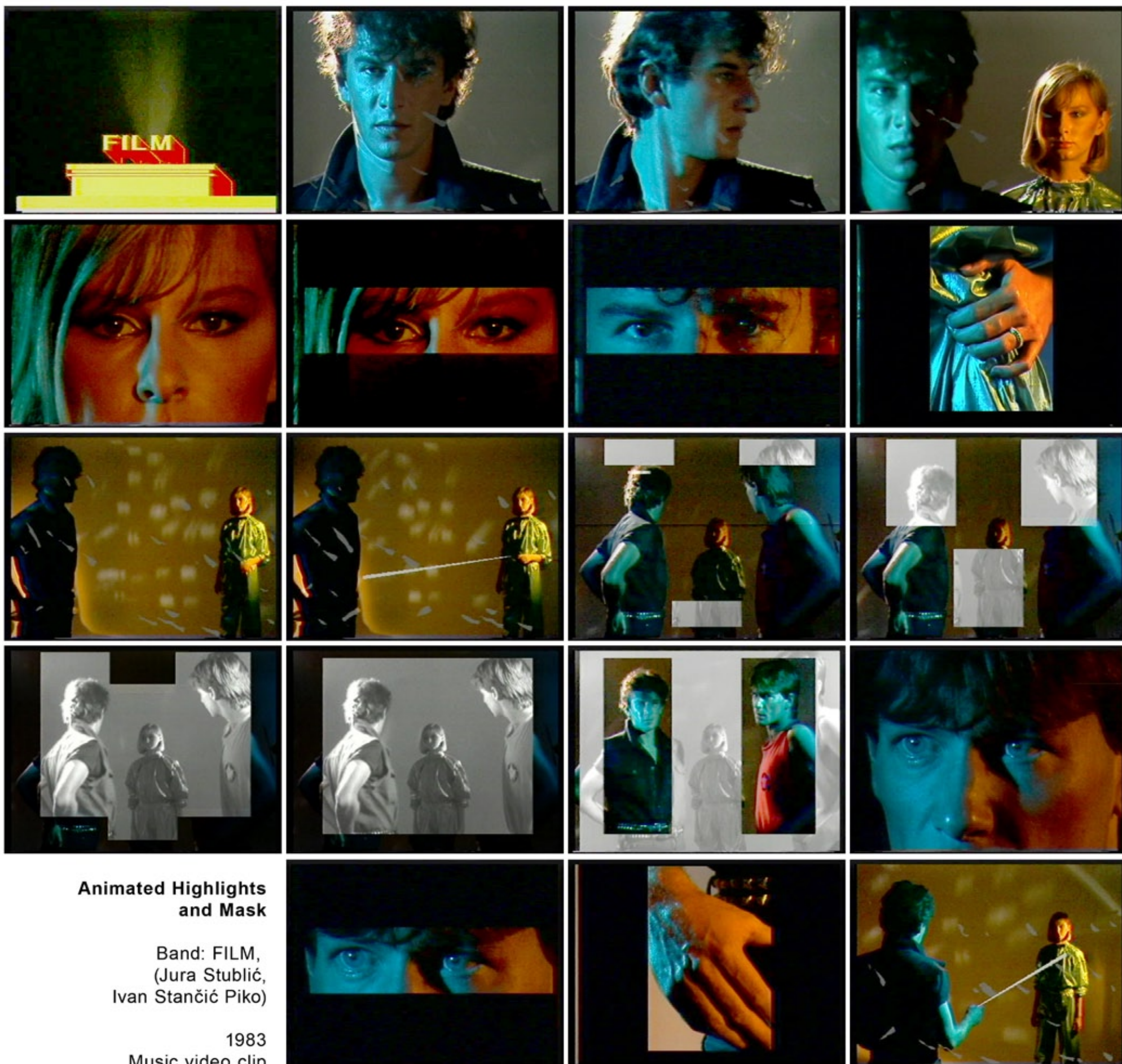




**Animated Highlight
and Mask**

Talent: Moni Kovačić

1983
Music video clip



**Animated Highlights
and Mask**

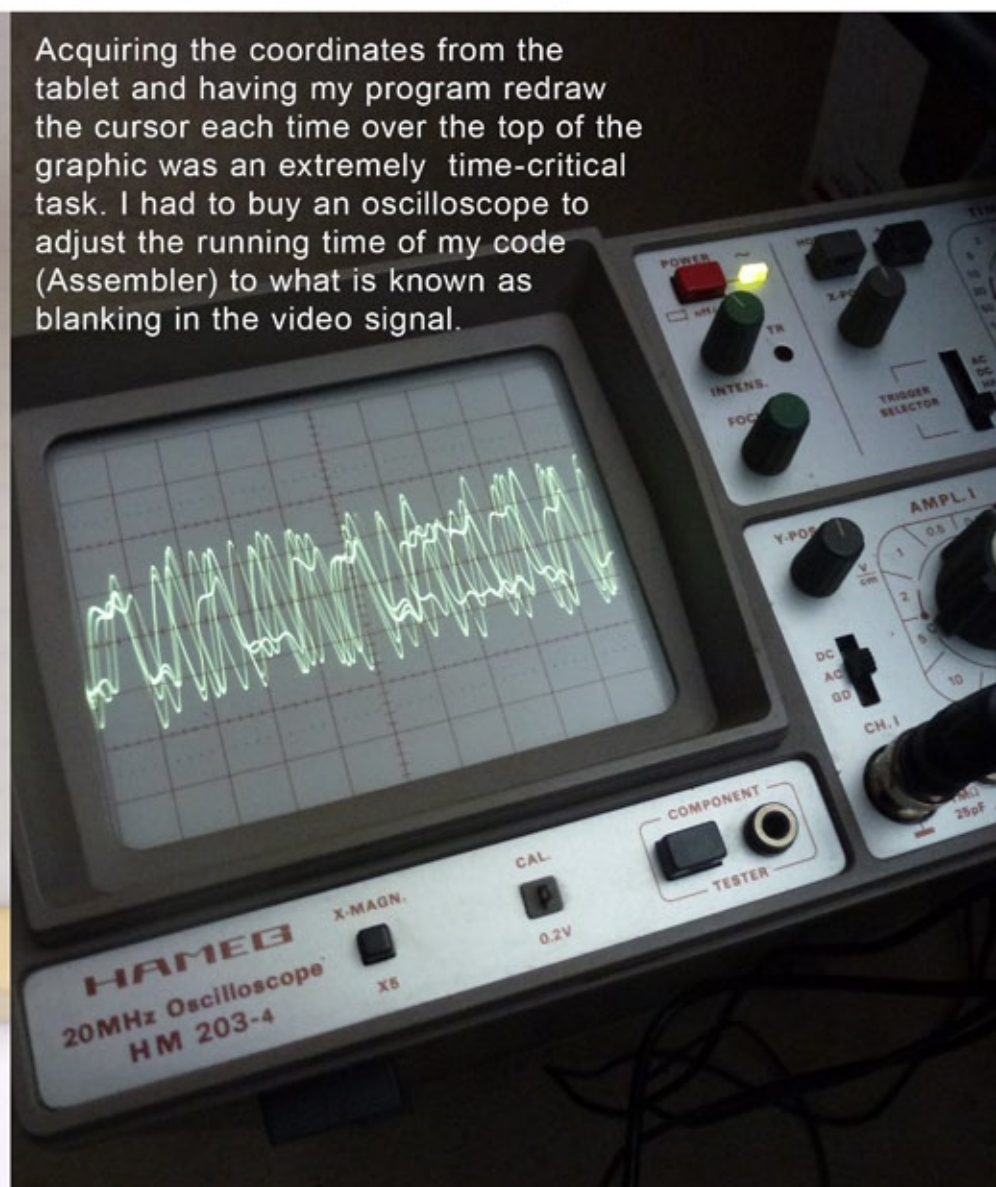
Band: FILM,
(Jura Stublić,
Ivan Stančić Piko)

1983
Music video clip

Besides generating graphics by programming I also wanted to draw by hand using a DAI computer. I bought a Houston Instrument HIPAD graphics tablet and developed my own driver and Paint software. There was no mouse available in those times.

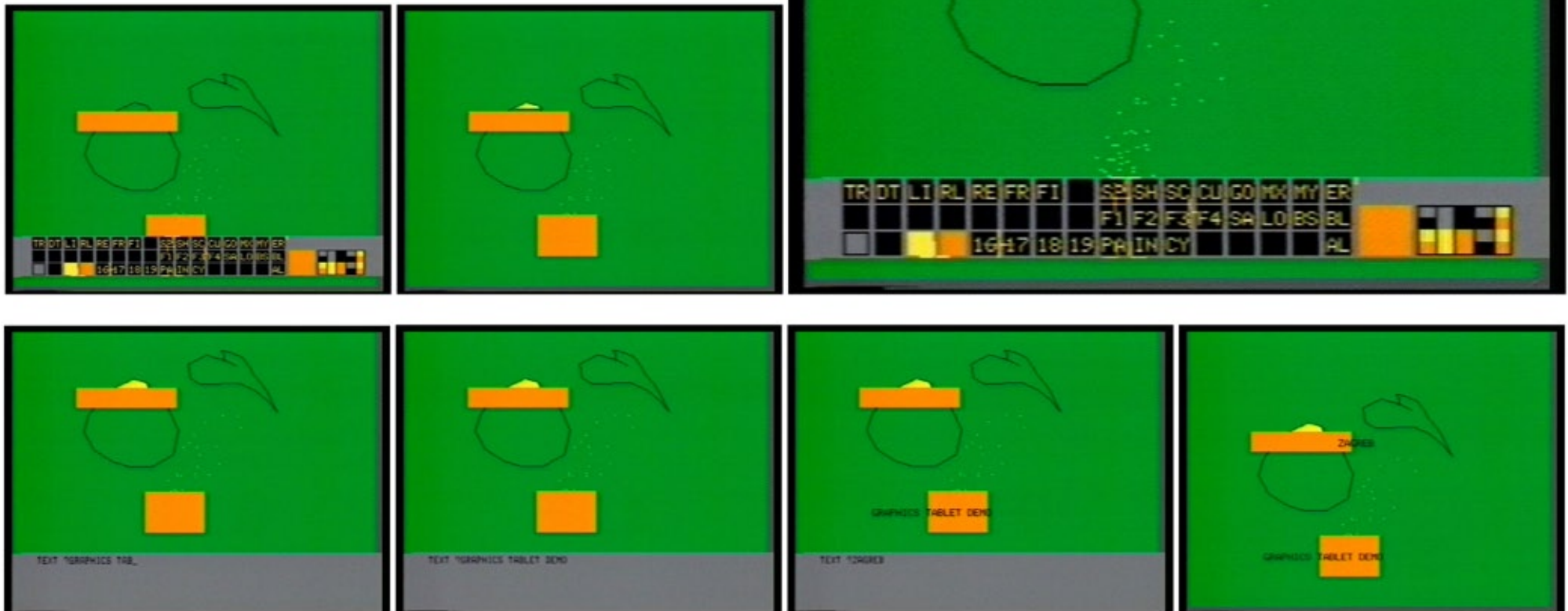


Acquiring the coordinates from the tablet and having my program redraw the cursor each time over the top of the graphic was an extremely time-critical task. I had to buy an oscilloscope to adjust the running time of my code (Assembler) to what is known as blanking in the video signal.

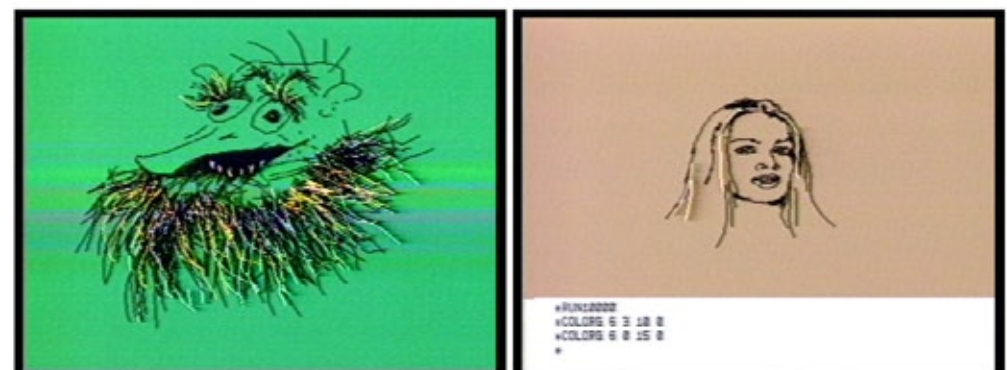


Modifications and interfacing with other equipment allowed me to use my DAI computer for:

- Generating programmable graphics,
- Creating freehand drawings,
- Capturing images from video and
- Mixing graphics with a broadcast video signal.

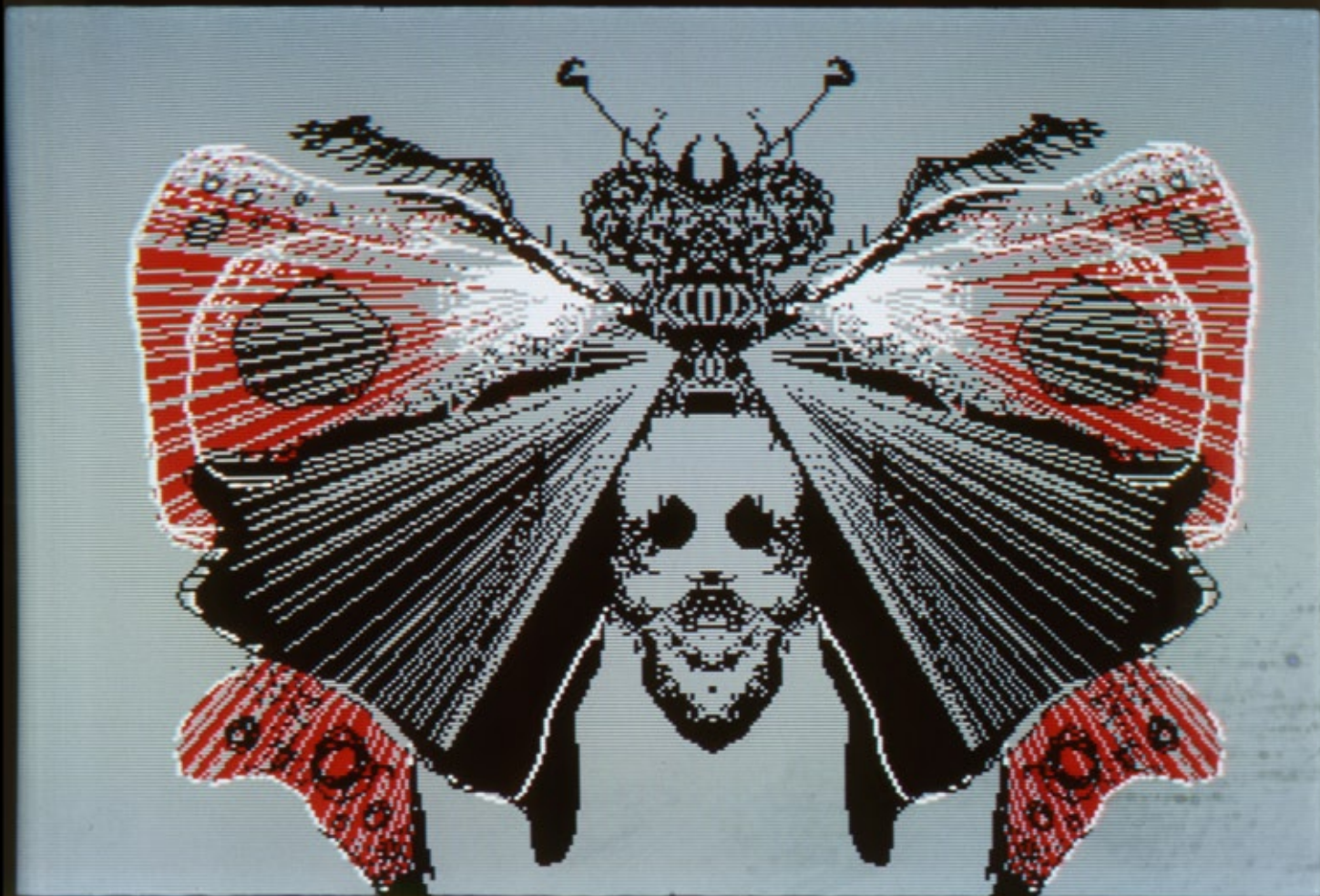
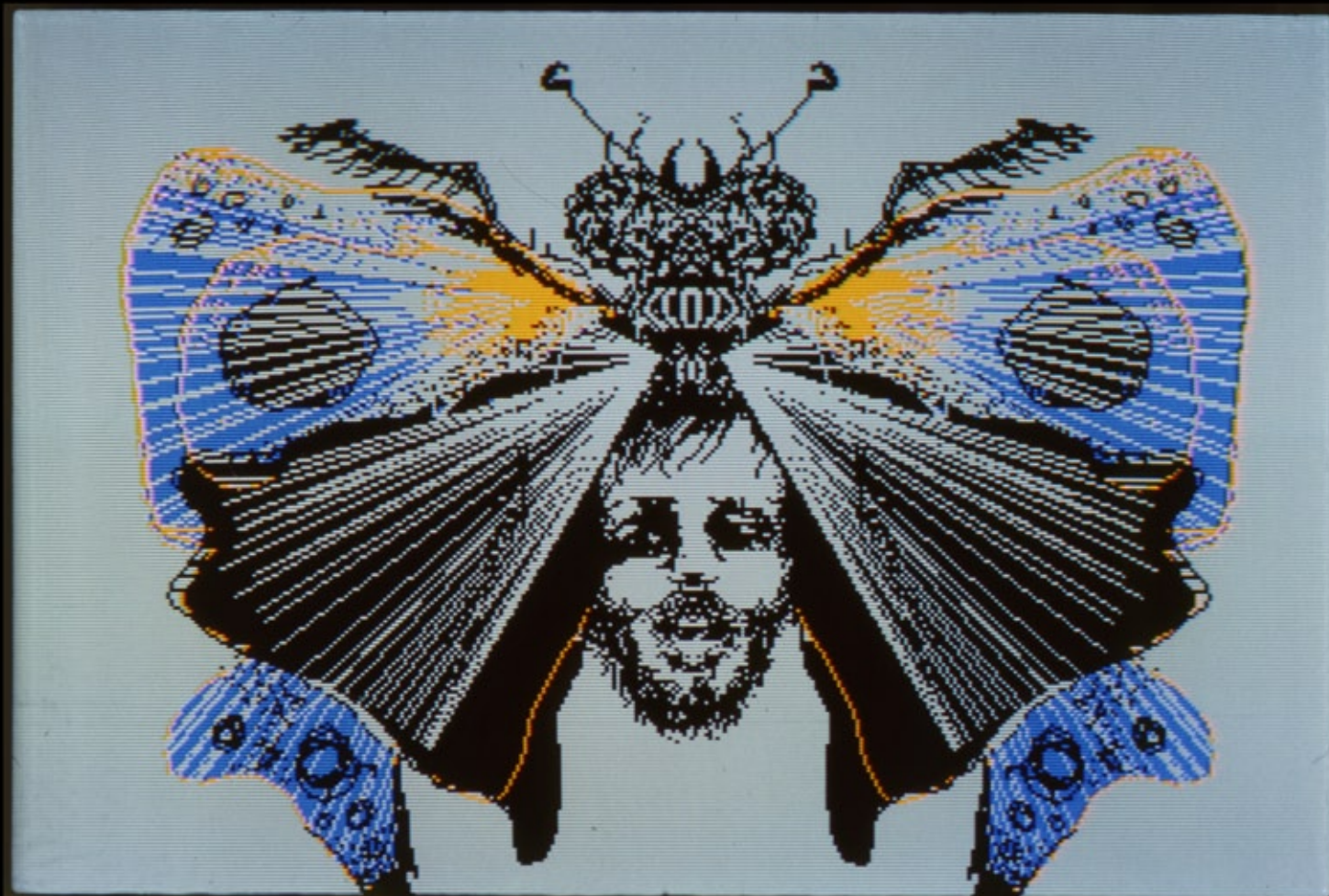


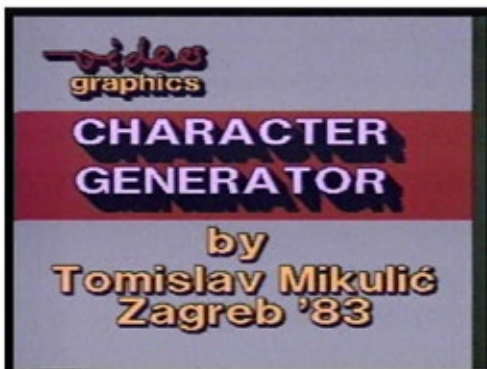
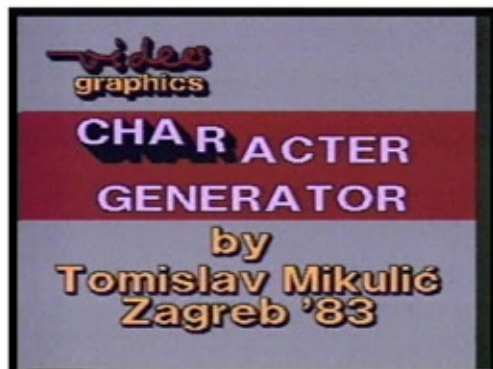
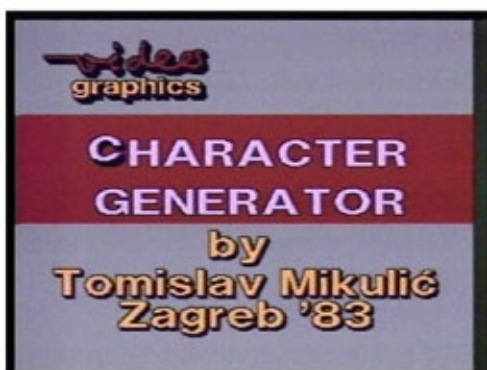
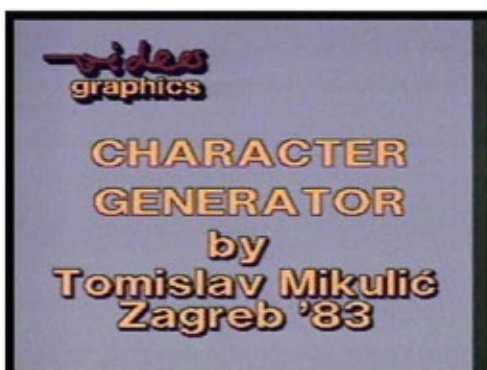
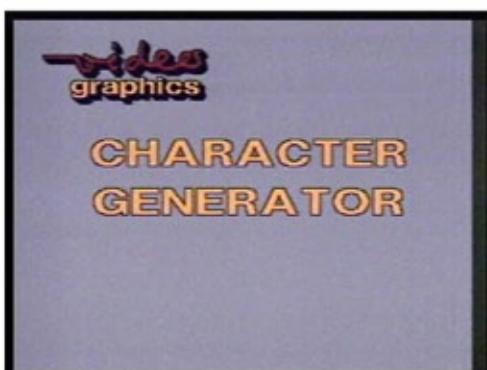
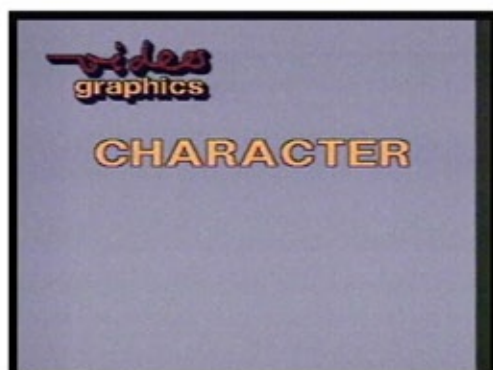
The following drawing features were implemented in my Paint program: Trace, Dot, Line, Rubber Line, Rectangle, Frame and Fill. Images could be Saved, Loaded, Binary saved, Binary loaded, Erased and text inserted (AL). Colors were selectable from the color swatches. User defined shapes and presets were stored as functions (F1 to F4). The memory address of a pixel was readable (MX, MY). A block of video RAM could be copied, pasted or saved as a "Picture character" in a font. I designed several types of fonts and symbols for drawing text over graphics.





Leonard Cohen, freehand drawing using a puck attached to a HIPAD graphics tablet.





Character generator

This program works using a font with a fixed size and weight. Four fonts were available. Custom character adding.

1983
Promotional video



Subtitles for movies

Size of the font was compliant with the 45 characters per line standard. The outline and drop shadow added readability.

1984

CHARACTER

ABCDEFGHIJKLMNO
PQRSTUVWXYZ123
4567890!°£\$%&'()*:
:-šš+;ć,č.°?/.....
abcdefghijklmnopq
rstuvwxyz

HELVETICA 12 OUTLINE

ABCDEFGHIJ
KLMNOPQRS
TUVWXY Z123
BOLD
4567890!°£\$
%&'()*°=-:/?.,ćć
+;šš!

HELVETICA 22

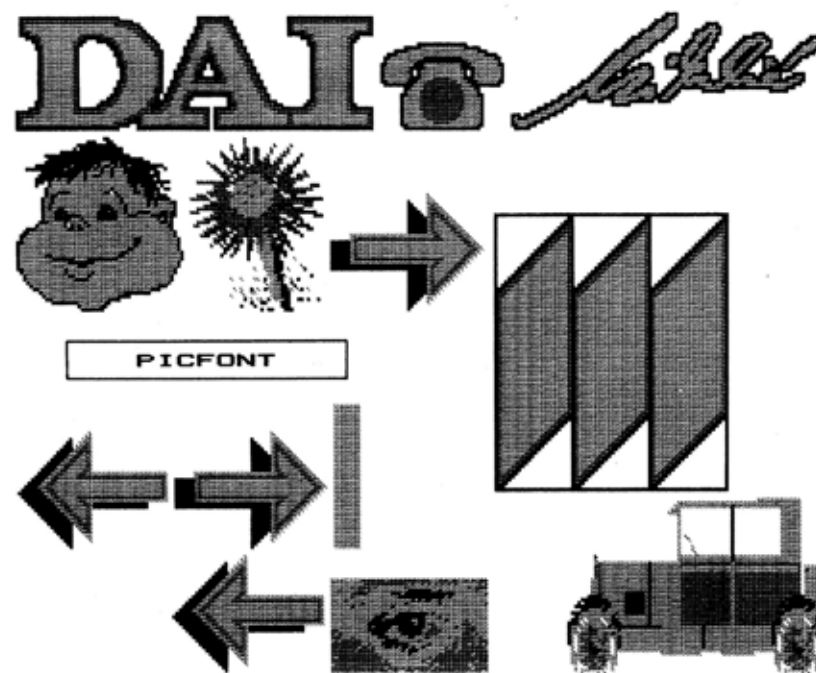
356 - DAInamic 83-19

GENERATOR

NEW SOFTWARE

ABCDEFGHIJKLMNO
PQRSTUVWXYZ123
4567890!°£\$%&'()*:
:-šš+;ć,č.°?/.....
abcdefghijklmnopq
rstuvwxyz

HELVETICA 12



357

1983 - DAInamic, the DAI User Group magazine, Number 19, Pages 356 and 357.

The face and eye symbols in Picfont show that I was already using a graphics tablet and video digitizer at that time.

When I developed Chargen, a character generator program in 1982 I also created two fonts based on Helvetica. Later I added other fonts. The smallest one was used mainly for subtitling movies.

Users could position text, define colors and attributes like outline and drop shadow. Scaling proved not to be an option because of low resolution. The same program was also used to add graphics or logos as additional characters.



**Animated Highlights
and Mask**

Talent: Mirna Berend

1984
TV Commercial



**Animated Highlights
and Mask**

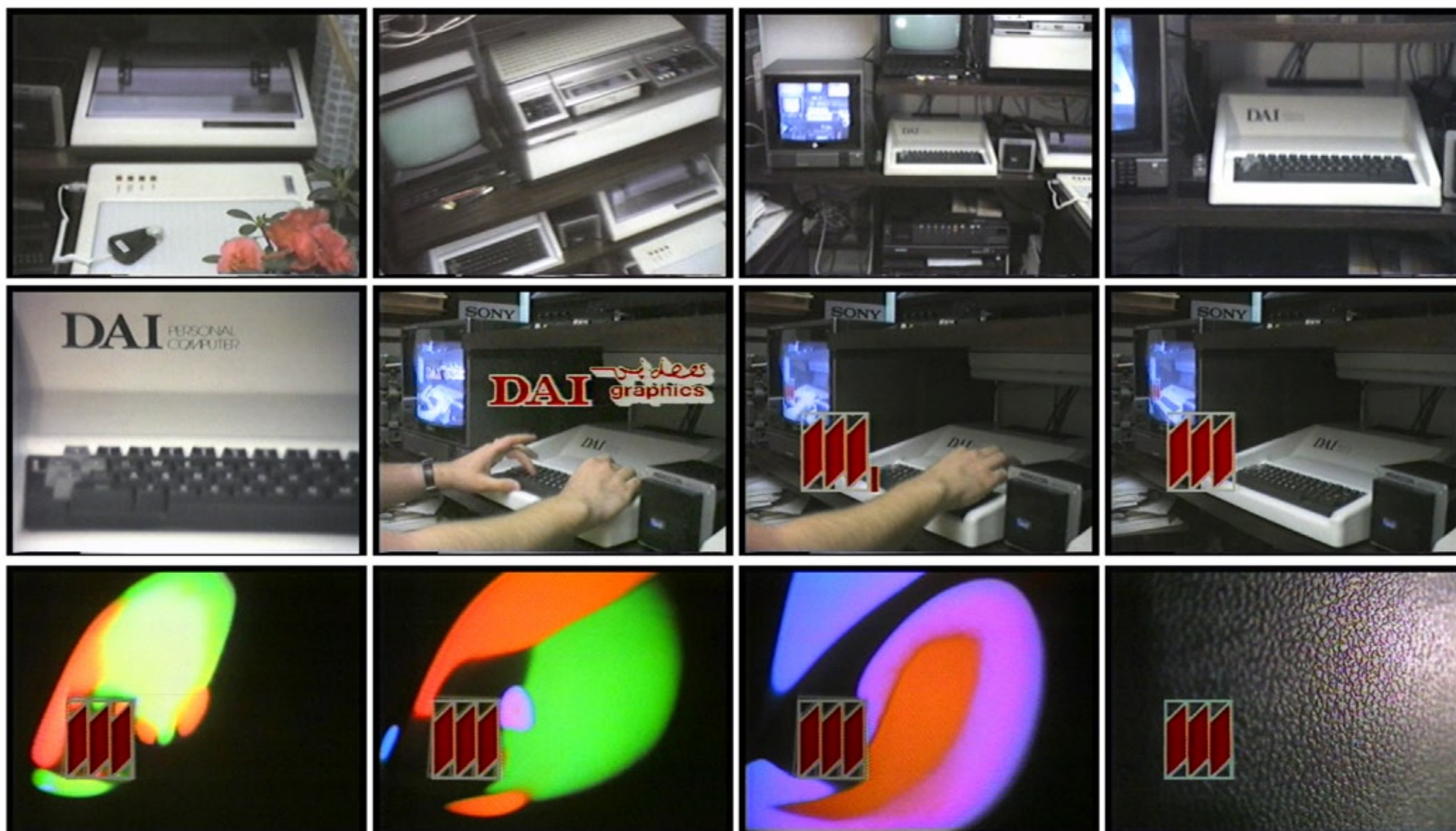
Talent: Jasna Zlokić

1984
Music video clip



**Animated Highlights
and Mask**

1984
TV Commercial

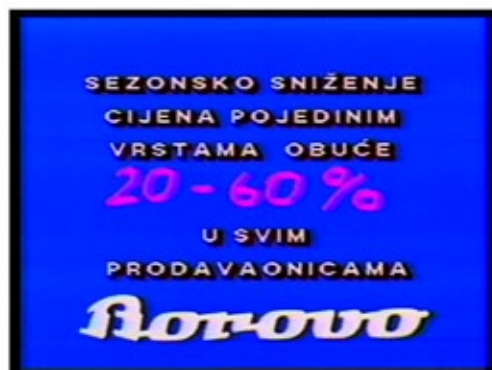


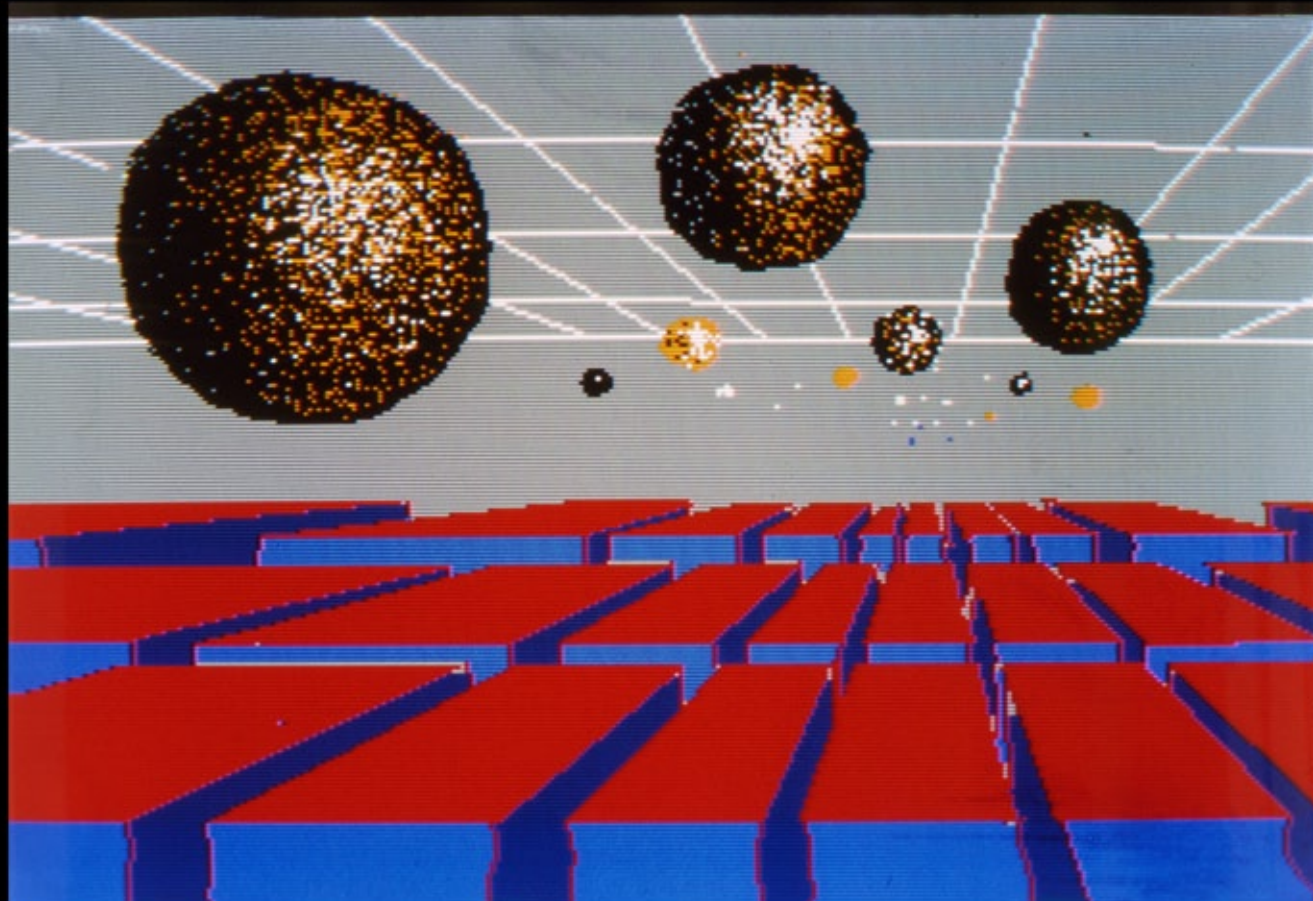
DAI graphics inserted in video

Antun Šernhorst developed a modification for genlock and video keyer. The key signal was digitally generated. It was independent of luminance or chrominance of the graphic.

1983, Promotional video

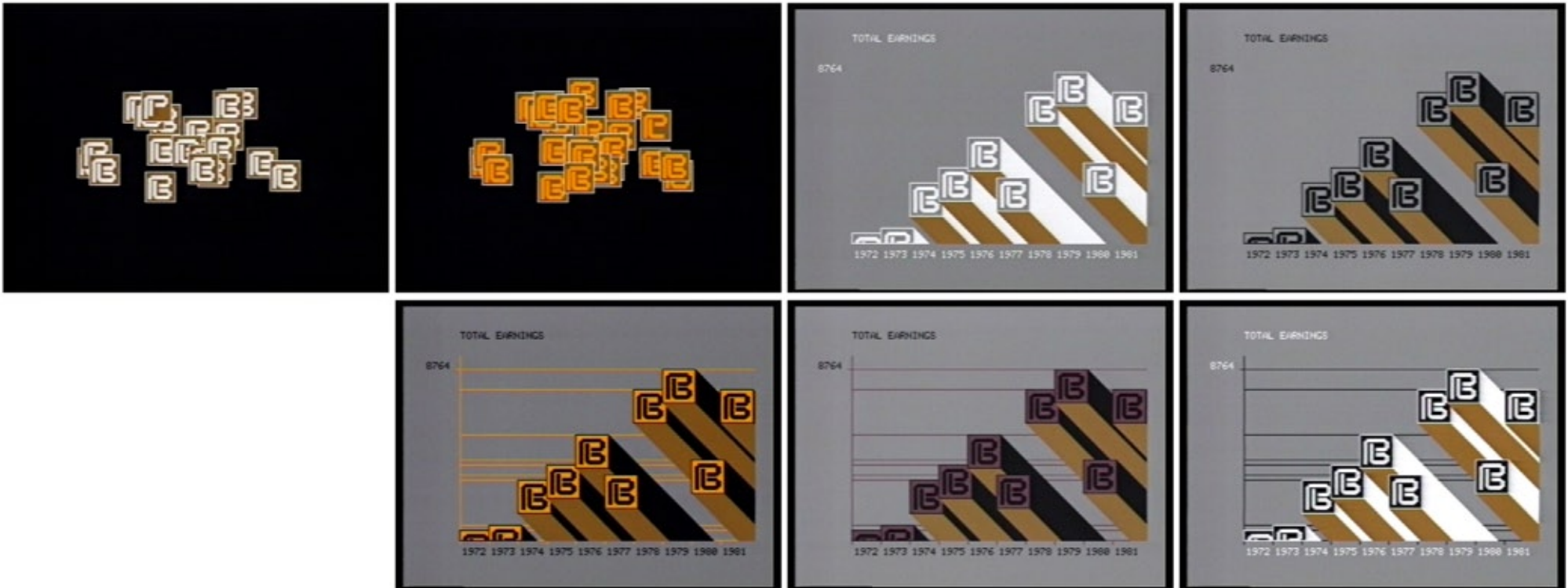
1984
Various TV Commercials





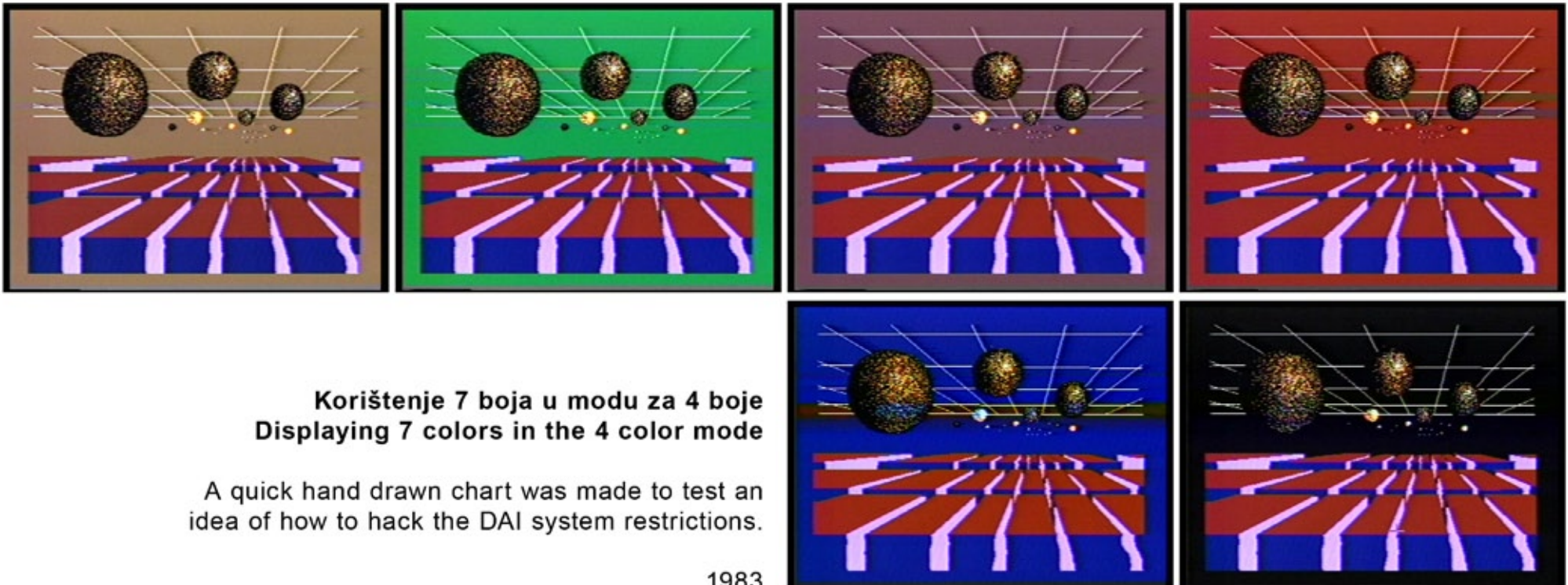
Programmer's Delight

Displaying 7 colors in
a 4 color graphic mode.



Iskaz za PB (Privredna banka)
A chart for the PB bank

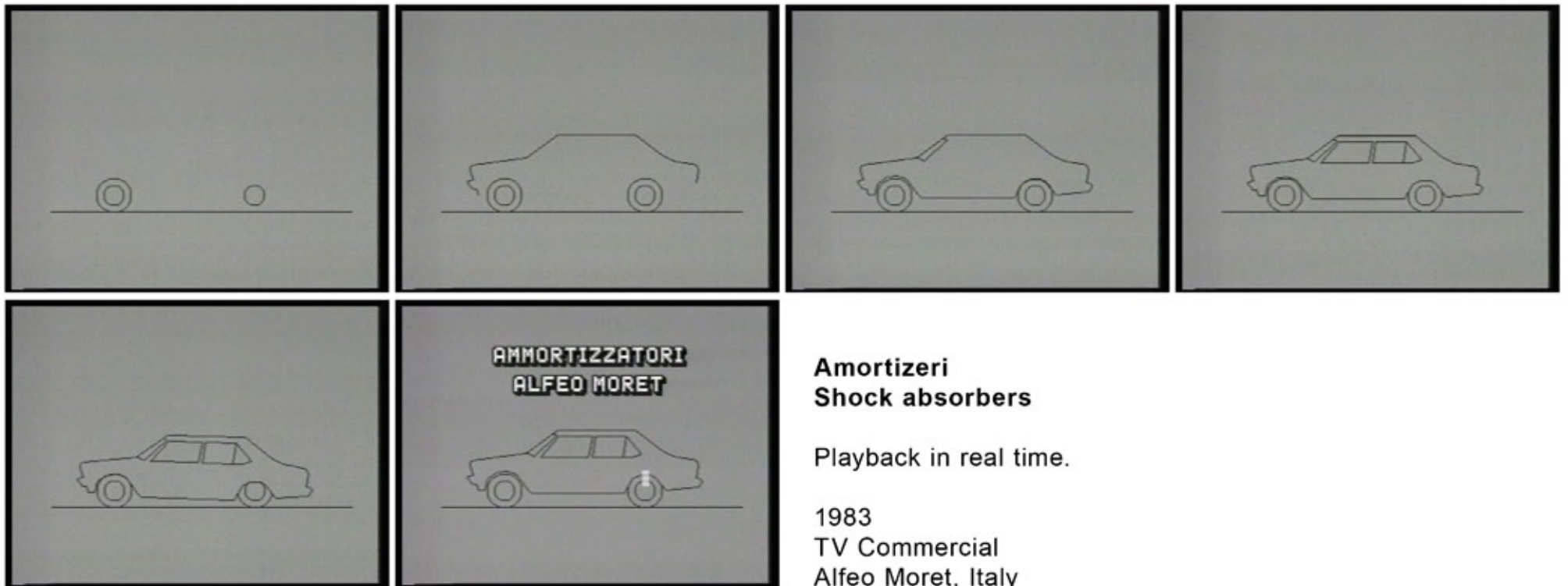
1983, The PB logo was added as a custom character to Pictorial font.



Korištenje 7 boja u modu za 4 boje
Displaying 7 colors in the 4 color mode

A quick hand drawn chart was made to test an idea of how to hack the DAI system restrictions.

1983



**Amortizeri
Shock absorbers**

Playback in real time.

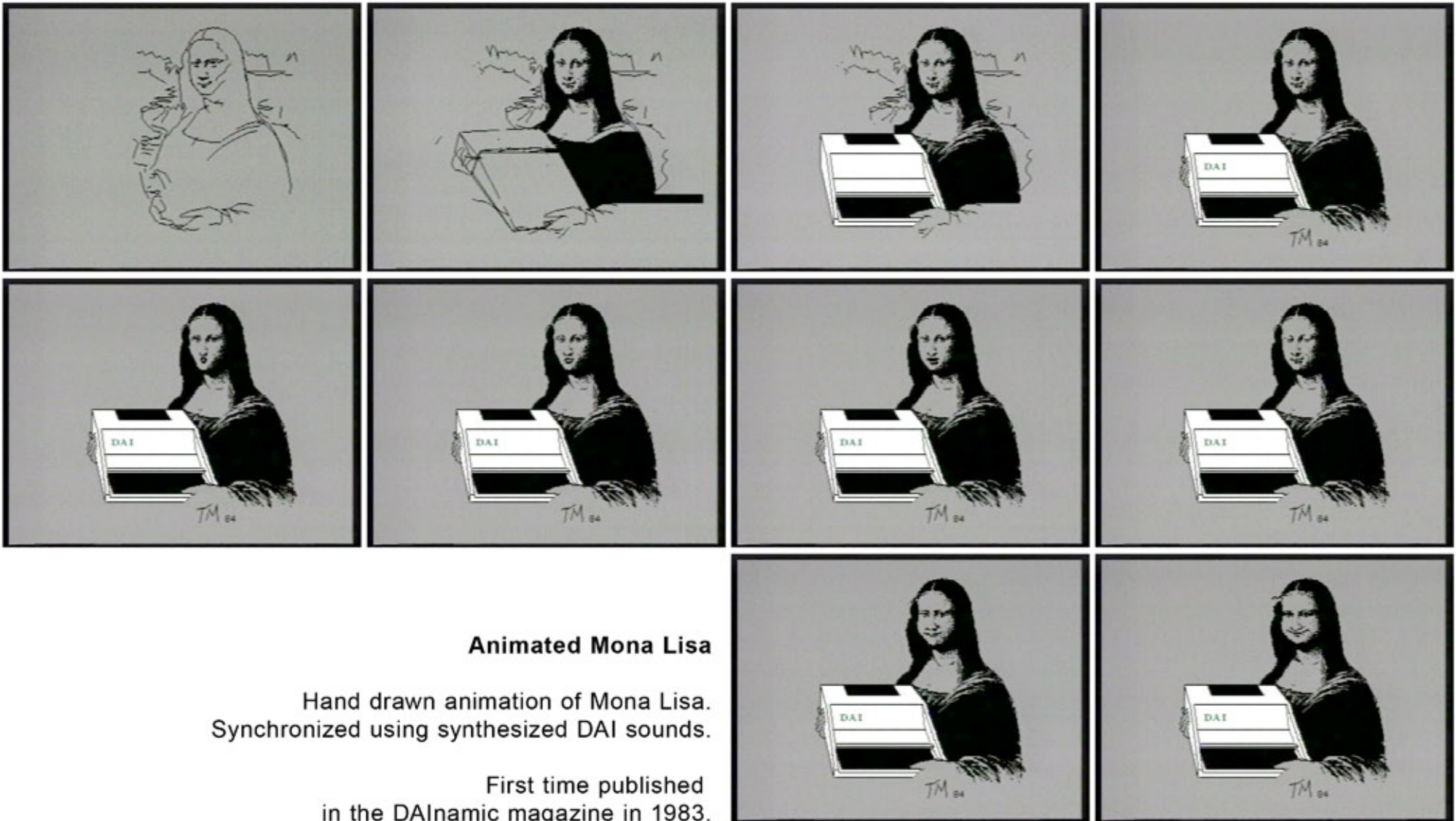
1983
TV Commercial
Alfeo Moret, Italy



Telebelluno

Playback in real time.

1983
TV Belluno, Italy



Animated Mona Lisa

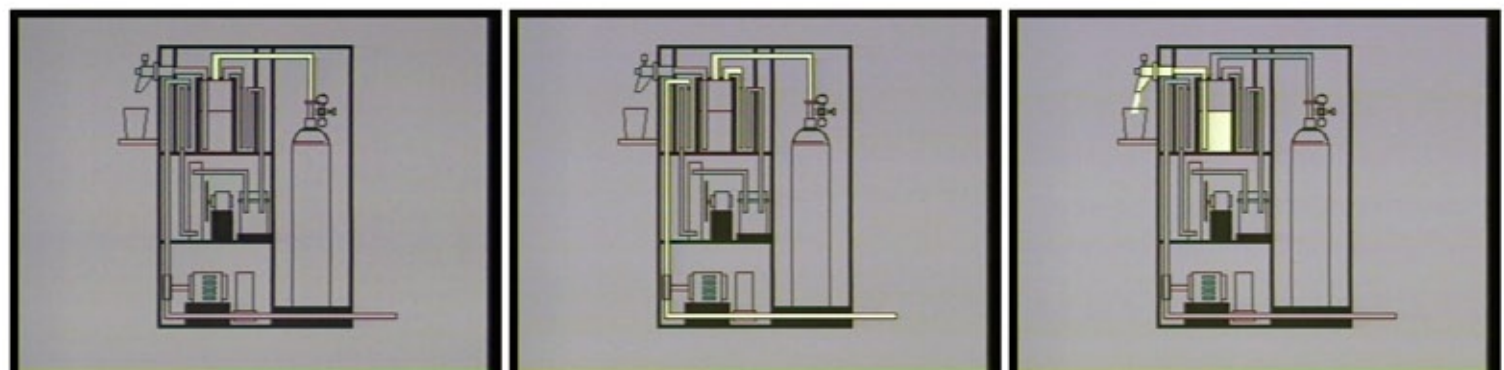
Hand drawn animation of Mona Lisa.
Synchronized using synthesized DAI sounds.

First time published
in the DAI namic magazine in 1983.

Soda Machine

Simple diagram of
technical process.

1983

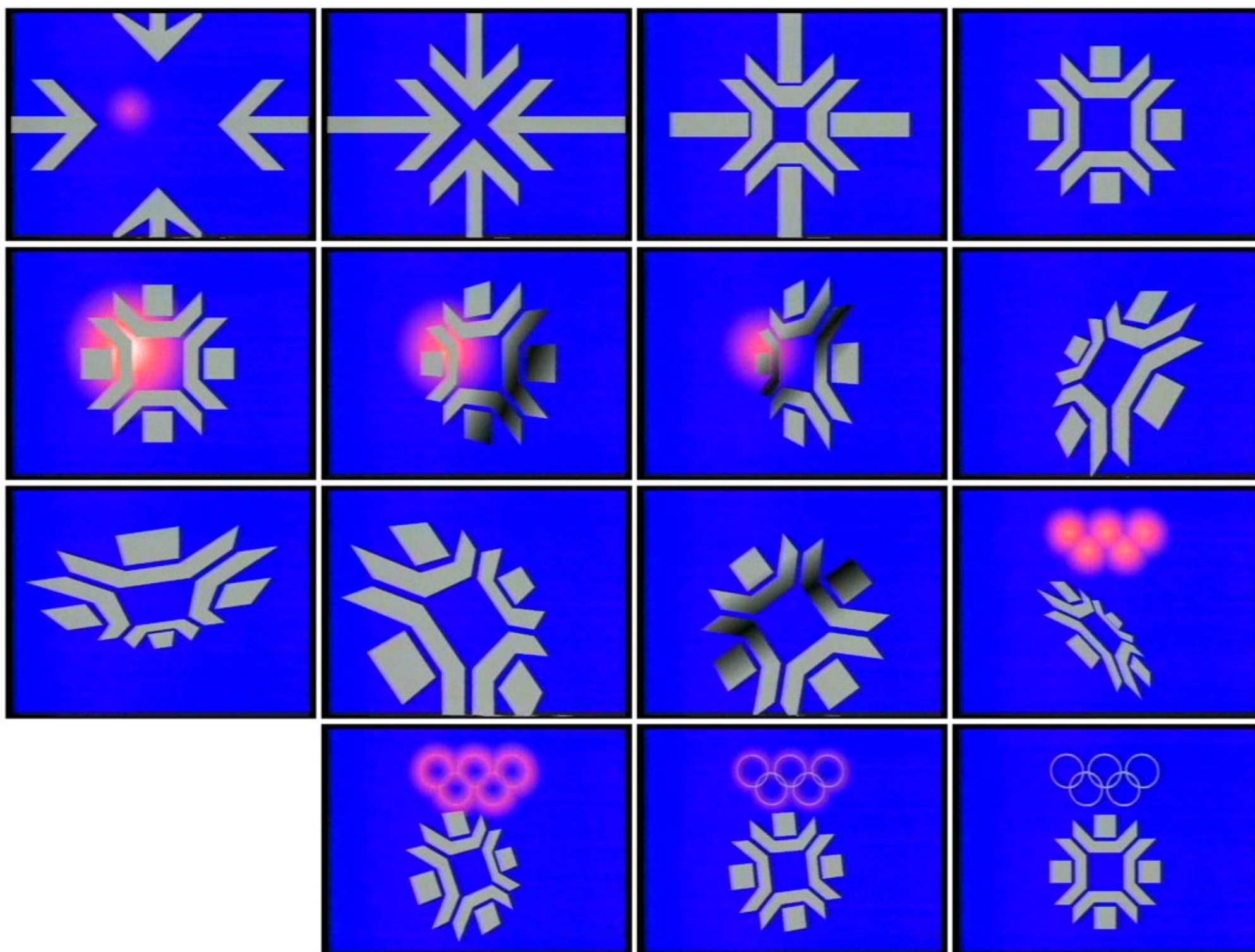




Zagreb `84, Svjetski festival animiranih filmova
Zagreb `84, World Festival of Animated Films
 Animated opener

I am the co-author of this opener.

The Oscar winning animator Dušan Vukotić created the cell animation and I created the computer animated part using the DAI computer. It was based on my morphing algorithm. The DAI graphics were shot directly off the TV screen by a 35 mm film camera by Enes Midžić. Character is designed by Dušan Petričić.



Sarajevo `84, Zimske olimpijske igre
Sarajevo `84, Winter Olympic Games
 Animated opener

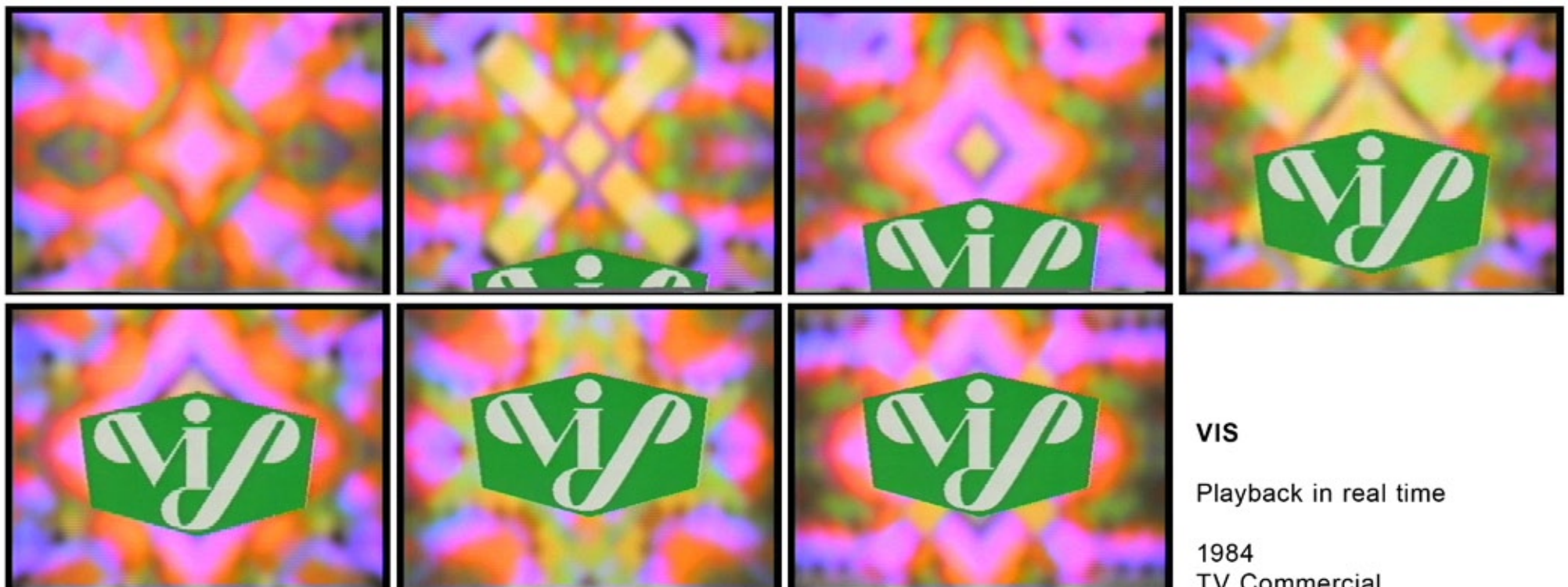
To create this animation I wrote 2 different programs using the DAI computer. I created a shading procedure for the graphic workstation 'Flair' (Logica, UK) and an algorithm for rotation in 3D. The DAI was connected to 'Flair' which was used merely as a high resolution graphic display for output to a 1" video tape.



Zagreb `84, Video bilten
Zagreb `84, Video bulletin

Playback in real time

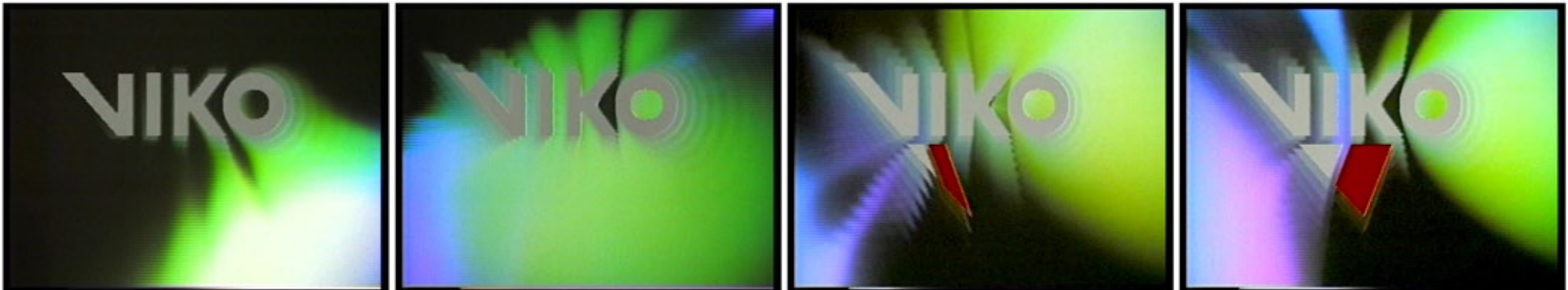
1984
Animated opener



VIS

Playback in real time

1984
TV Commercial

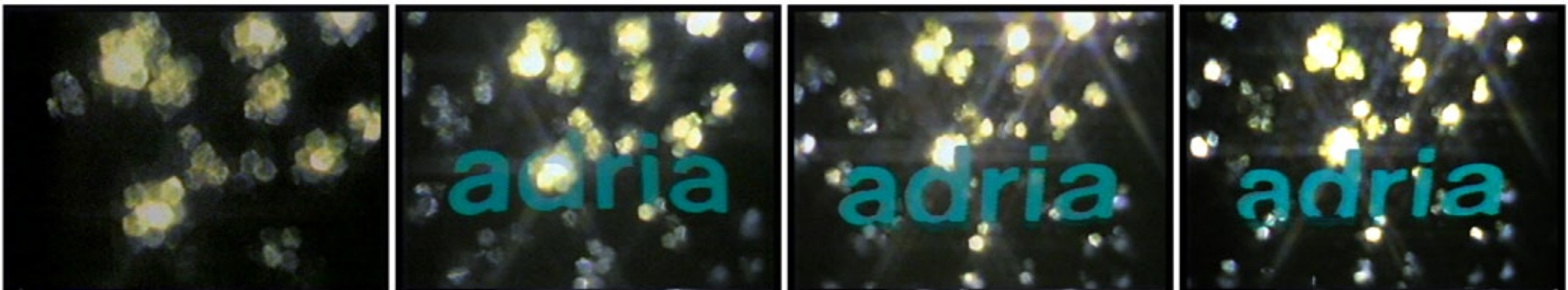
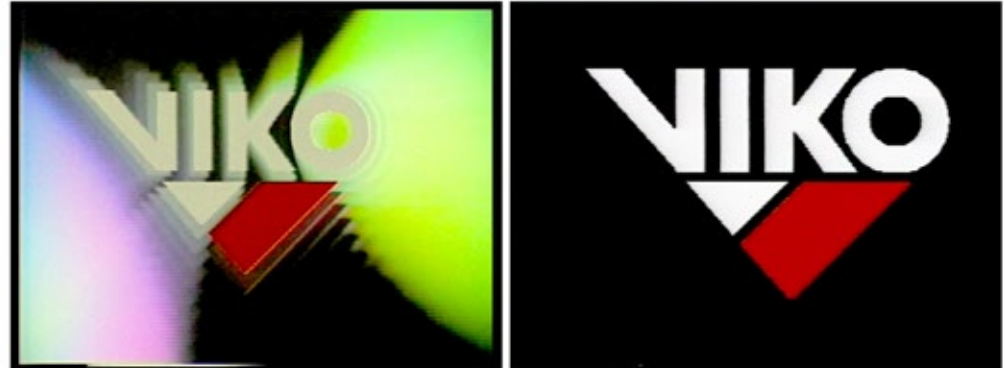


VIKO

Playback in real time

1983

TV Commercial



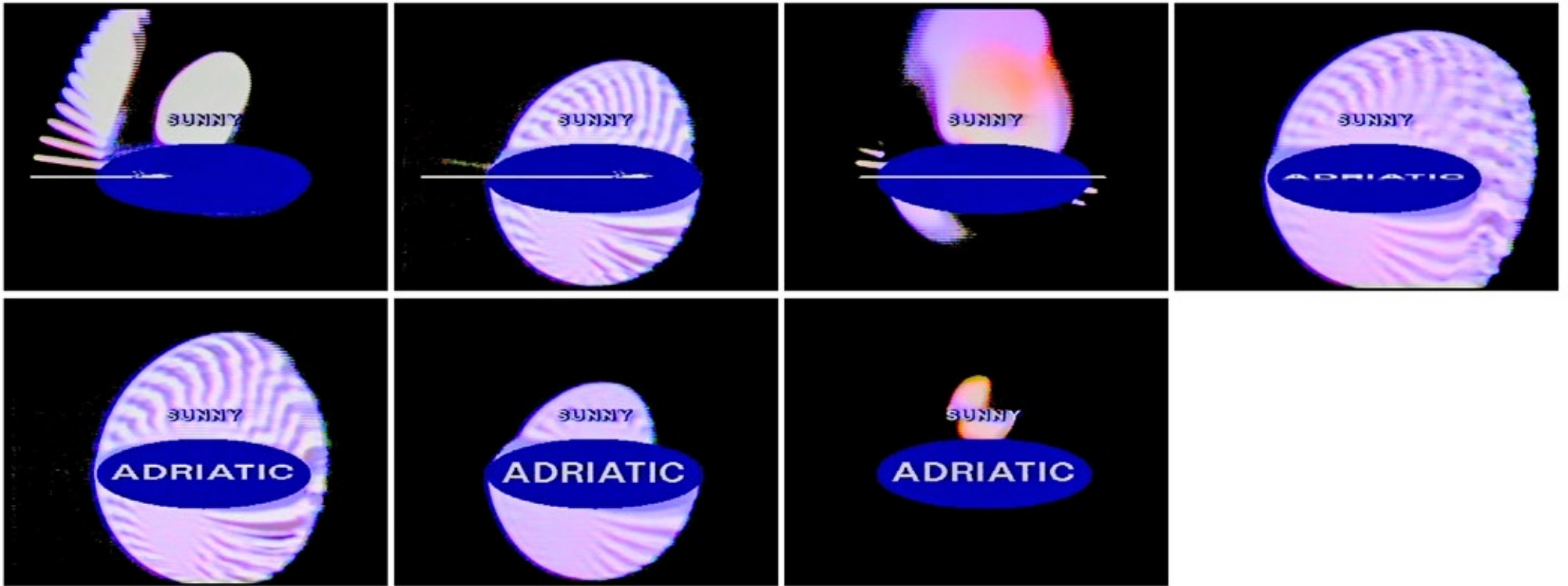
Adria Night Club

The distortion effect was achieved by filming reflections on water.

1984

Promotional video





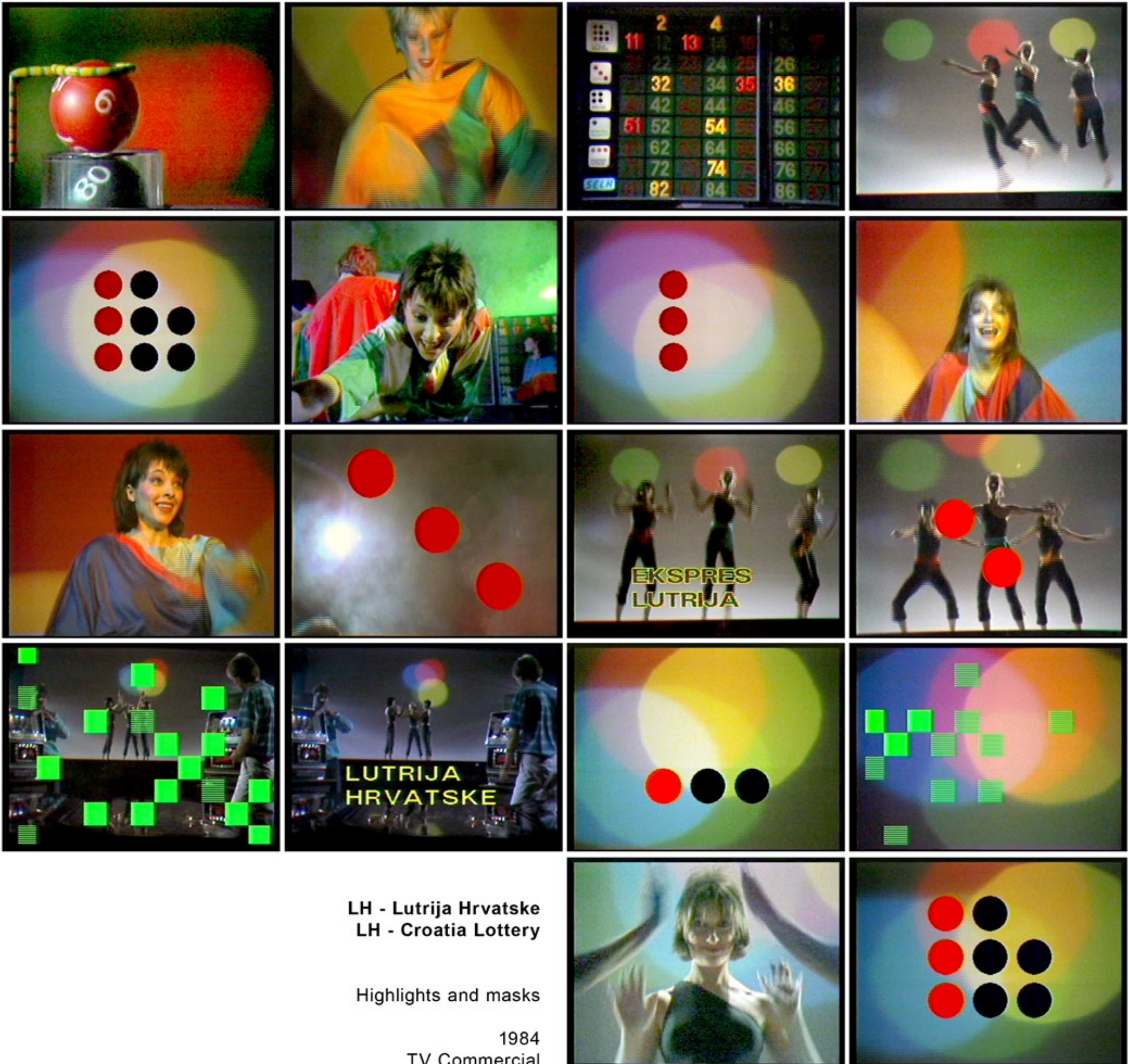
Sunny Adriatic

Playback in real time

1984

TV Commercial





LH - Lutrija Hrvatske
 LH - Croatia Lottery

Highlights and masks

1984
 TV Commercial

Lord
STYLE

Lord
STYLE

Lord
STYLE

Lord
STYLE

Lord
STYLE

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STYLE

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Lord
STYLE

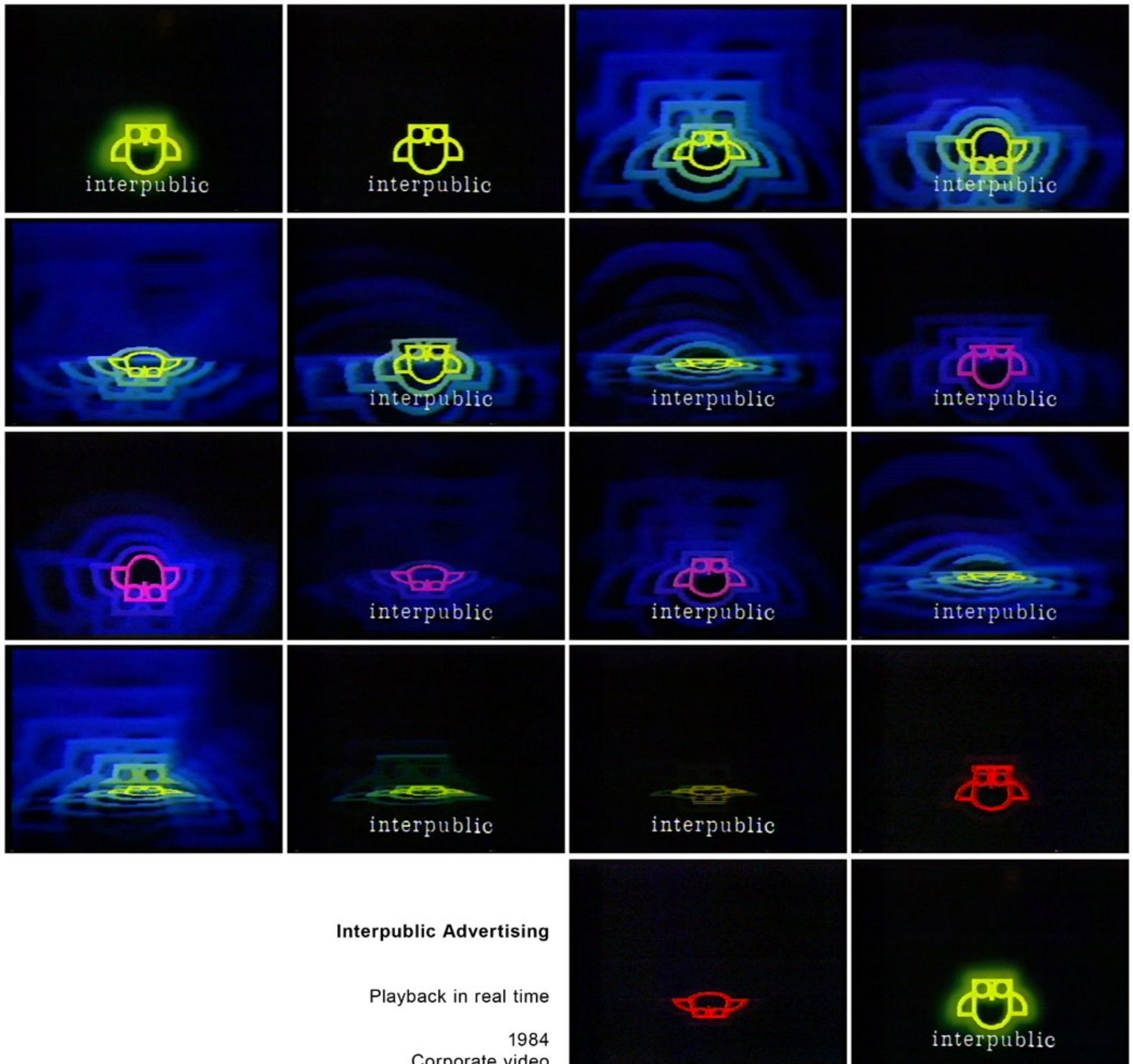
Lord
STYLE

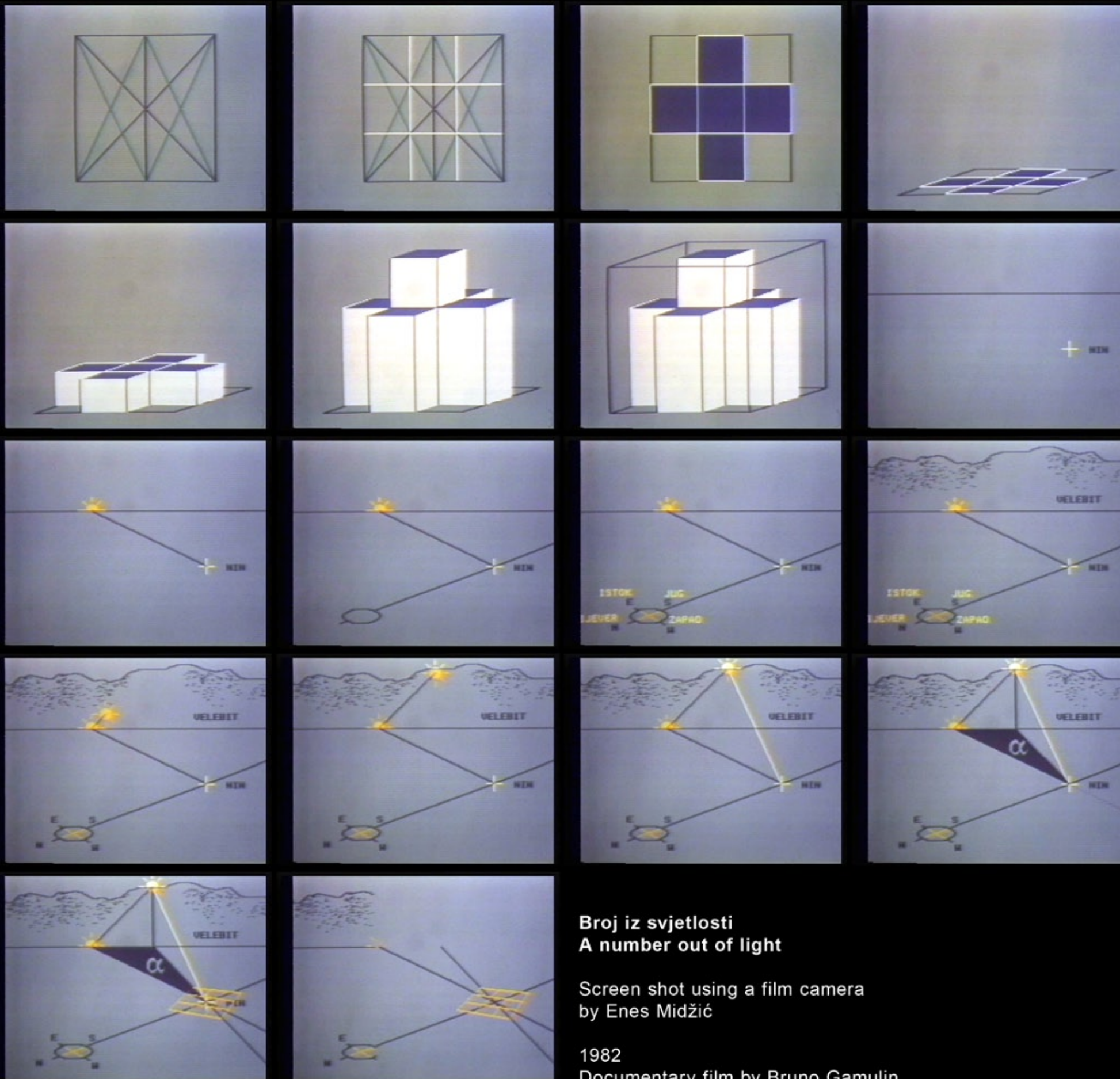
Lord
STYLE

Lord Style

Playback in real time
with a lot of tearing.

1984
TV Commercial for Lord Extra

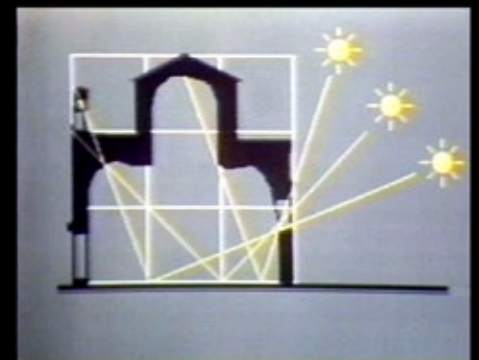
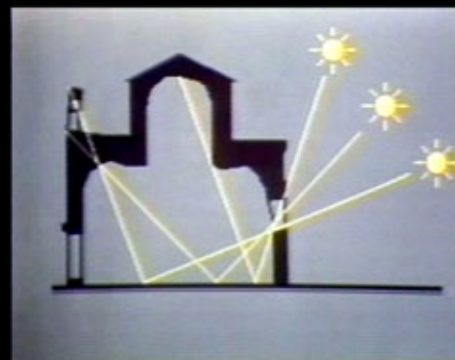
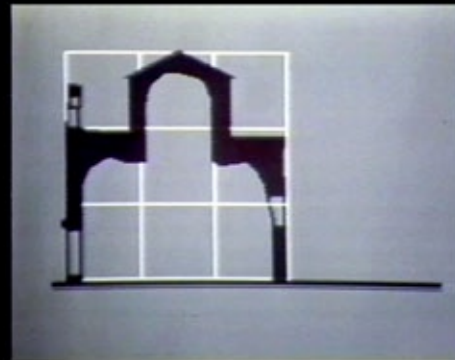
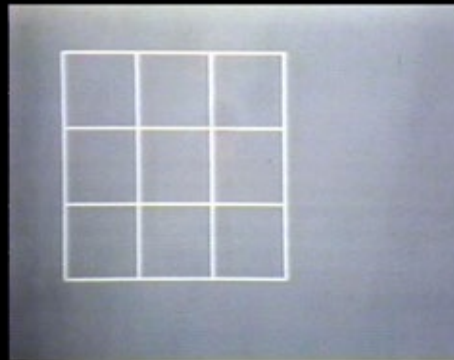
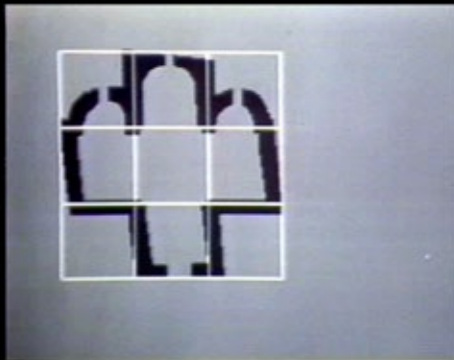
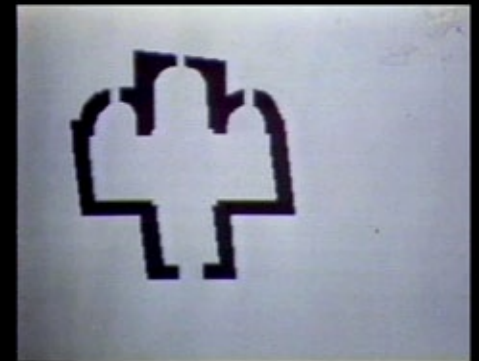
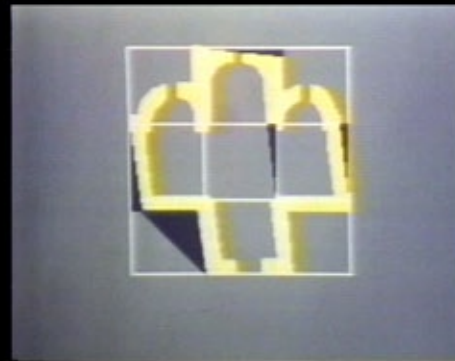
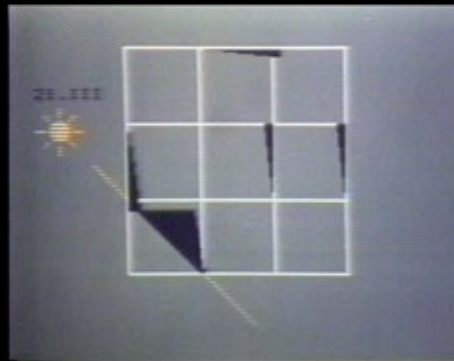
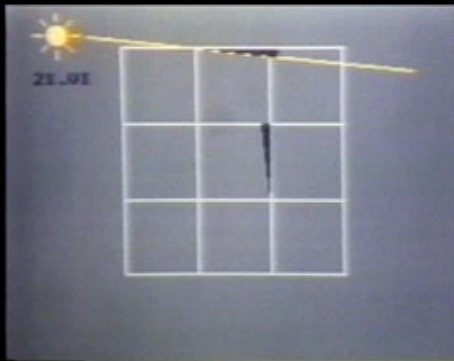




Broj iz svjetlosti
A number out of light

Screen shot using a film camera
 by Enes Midžić

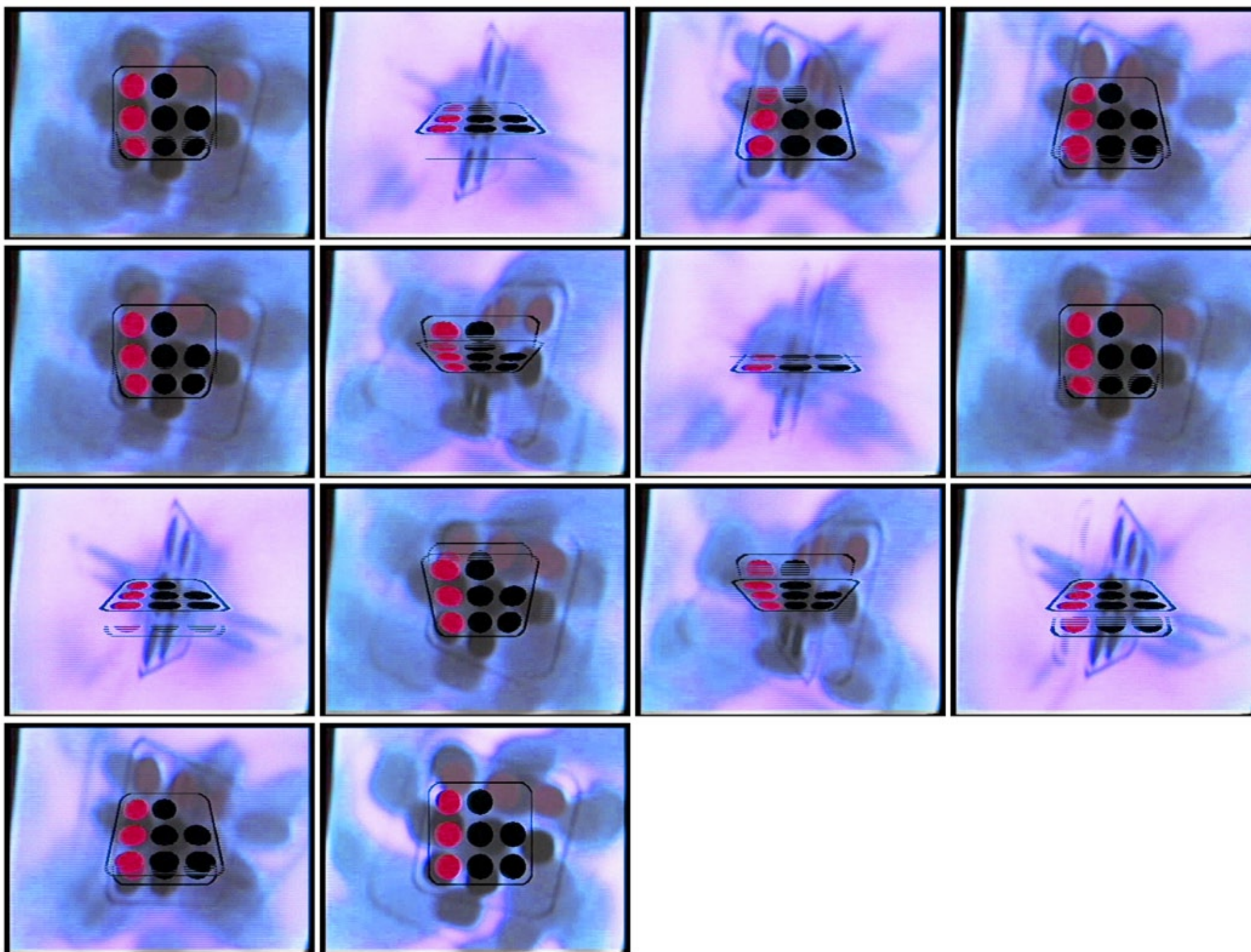
1982
 Documentary film by Bruno Gamulin



**Broj iz svjetlosti
A number out of light**

Screen shot using a film camera
by Enes Midžić

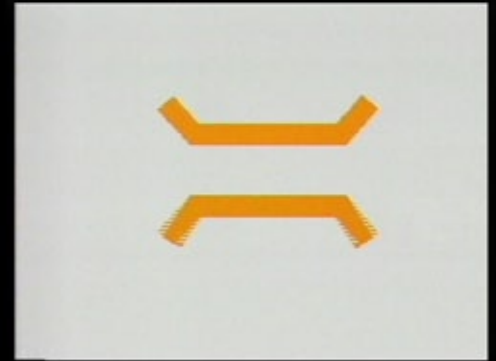
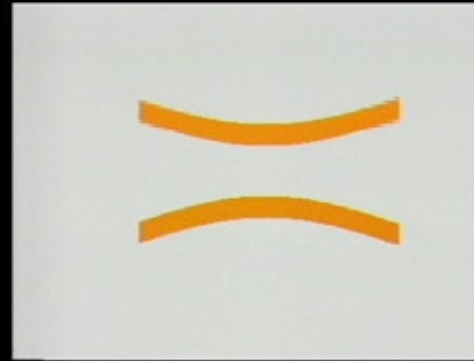
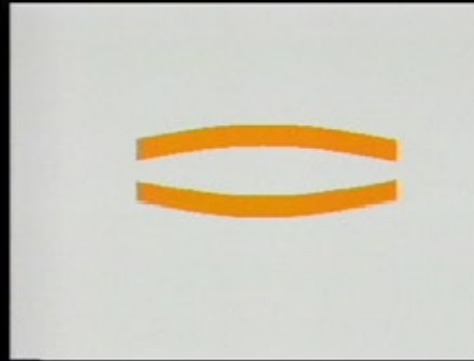
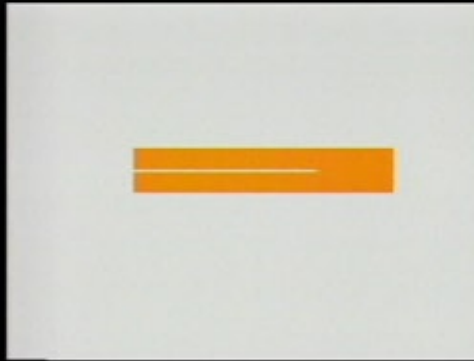
1982
Documentary film by Bruno Gamulin



HL Hrvatska lutrija logotip
HL Logo - Croatia Lottery

Playback in real time

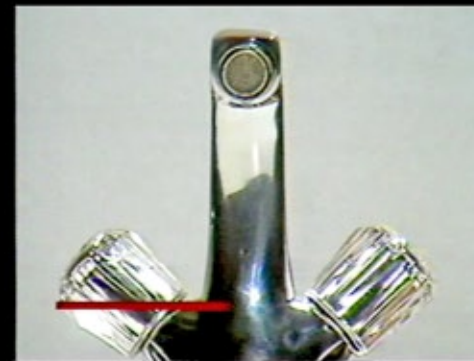
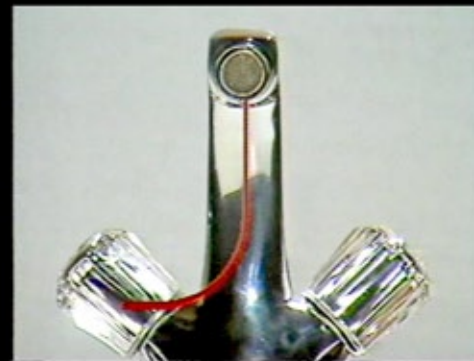
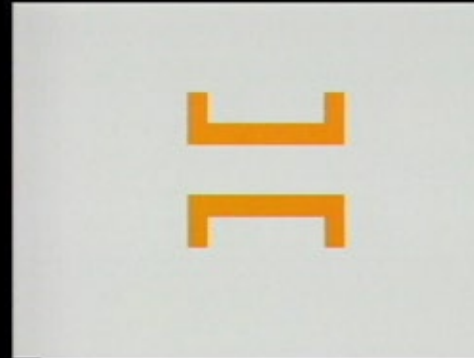
1984
Corporate video



Stol namještaj
Stol furniture

Playback in real time

1984
TV Commercial



Istra Kula

Playback in real time

1984
TV Commercial





RK Logo

Playback in real time

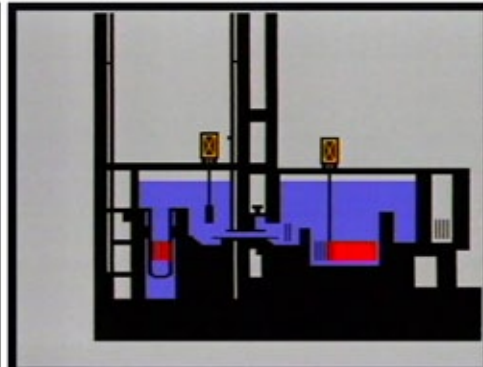
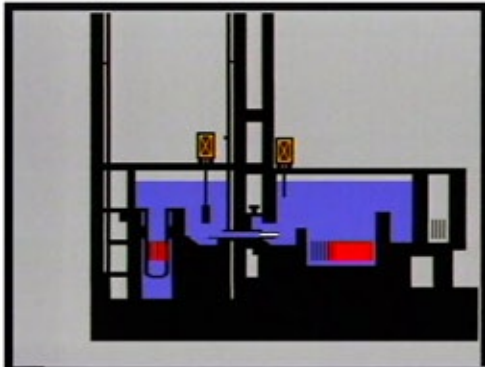
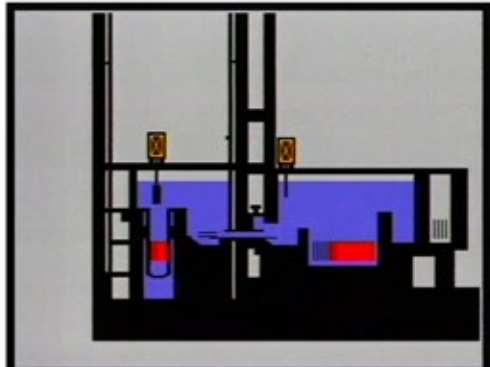
1986
TV Commercial



DTR Logo

Playback in real time

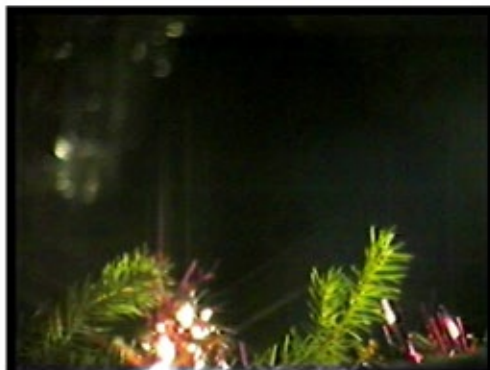
1986
TV Commercial



Nuclear Reactor

Playback in real time

1986
Corporate video



**Sretna nova godina
Happy New Year**

Playback in real time

1986
Promotional video



**Bioenergija
Bioenergy**

Playback in real time

1986
Animated opener

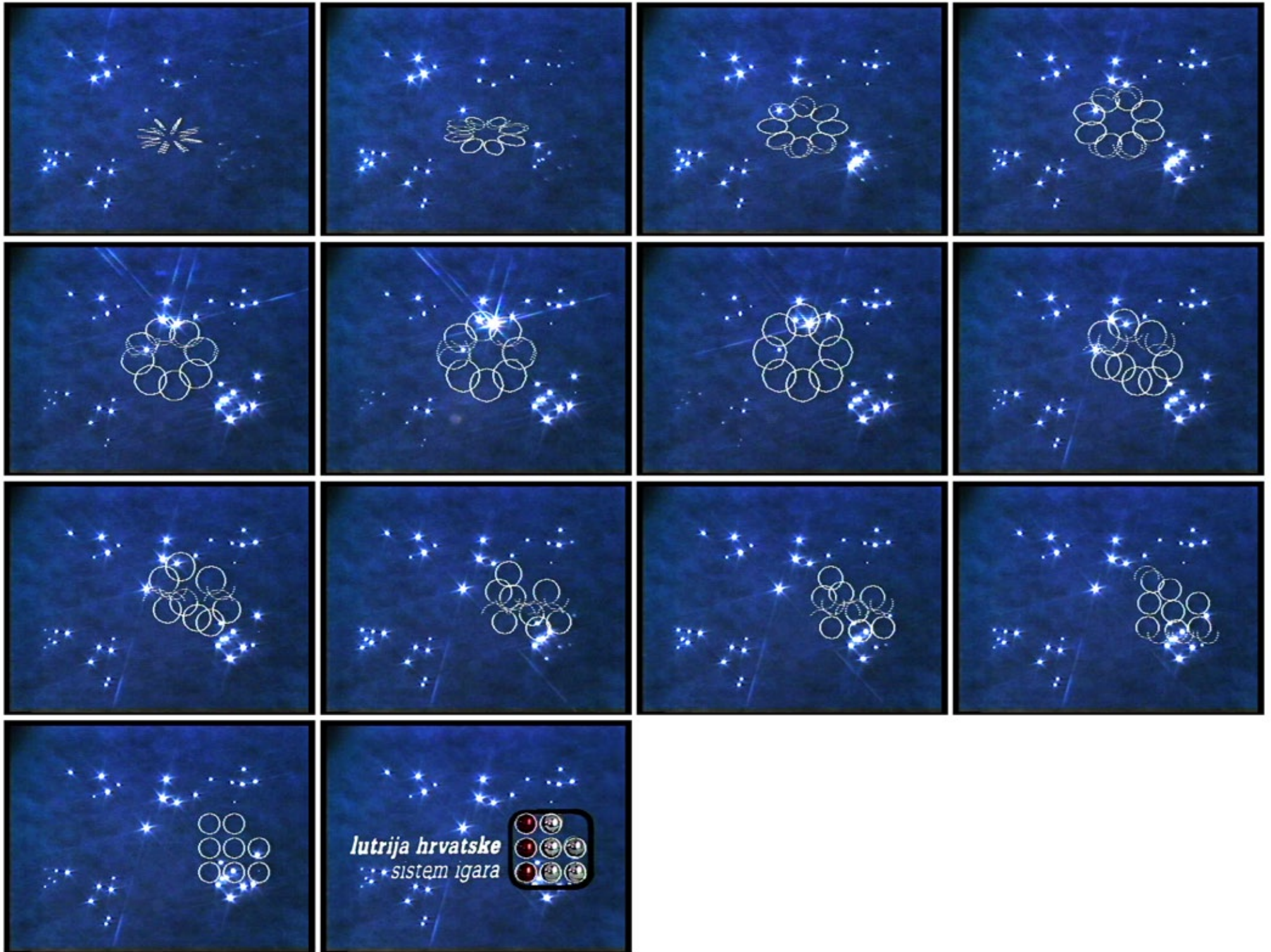


Atlas tours
 Playback in real time
 1984
 TV Commercial



TERA Computers
 Playback in real time
 1986
 TV Commercial





Lutrija Hrvatske
Croatia Lottery

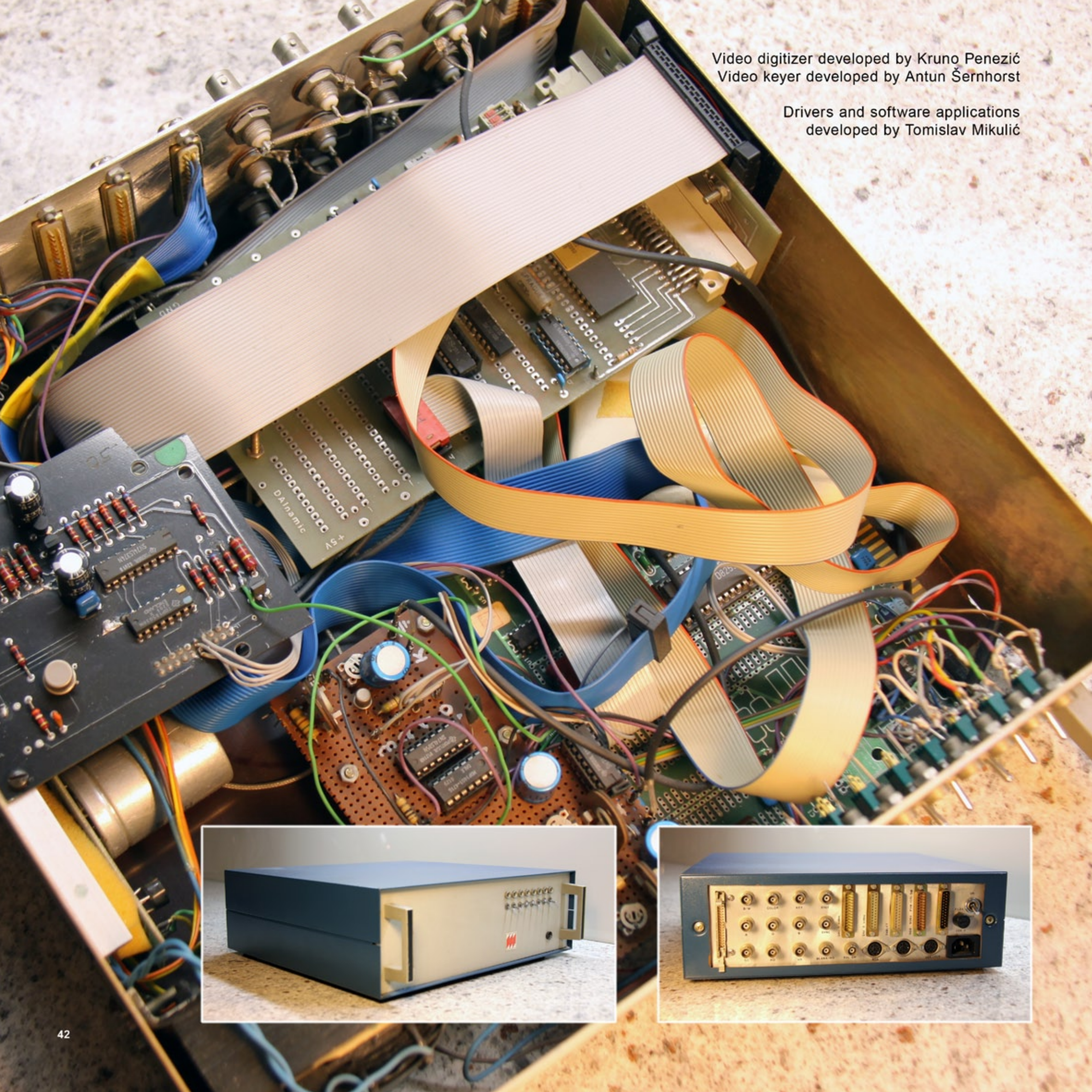
Playback in real time

1984
TV Commercial

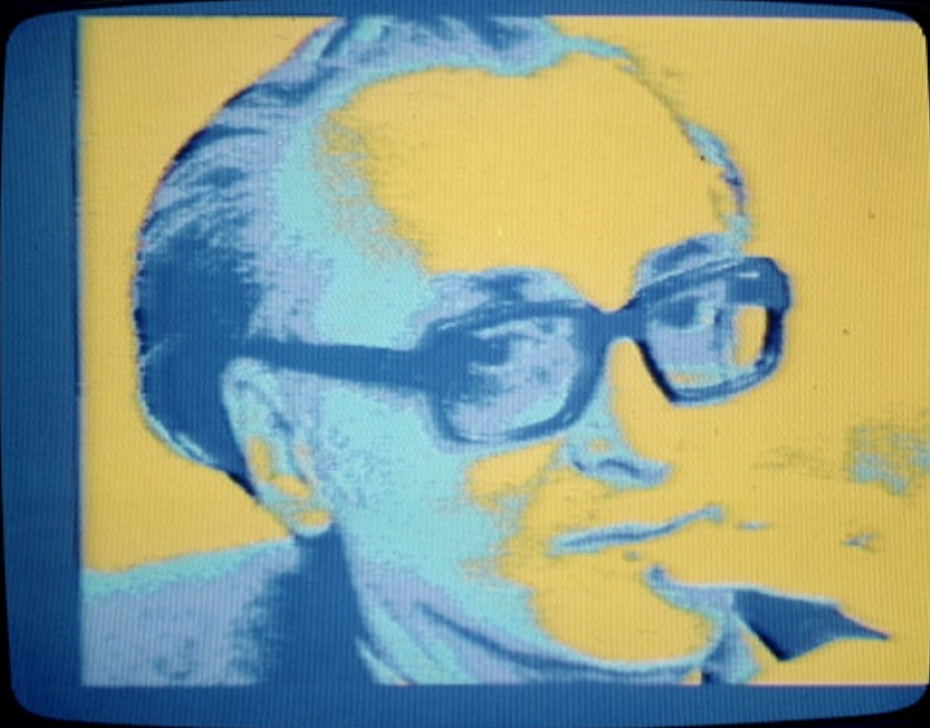


Video digitizer developed by Kruno Penezić
Video keyer developed by Antun Šernhorst

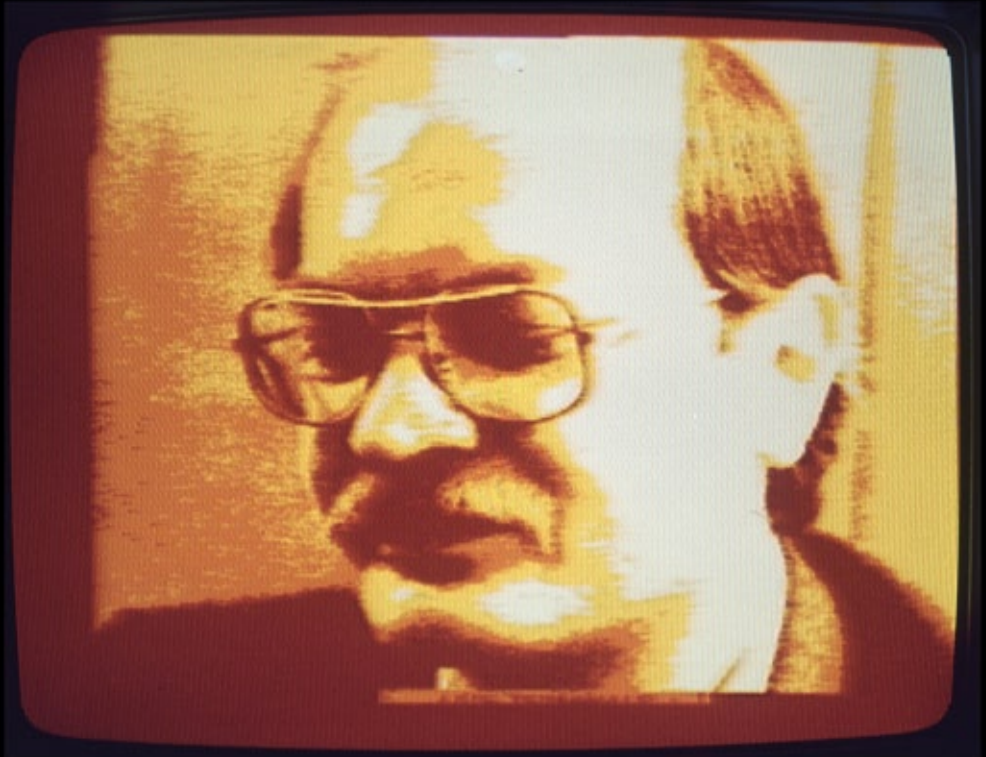
Drivers and software applications
developed by Tomislav Mikulić



Prof. Nikola Tanhofer (Another DAI user.)



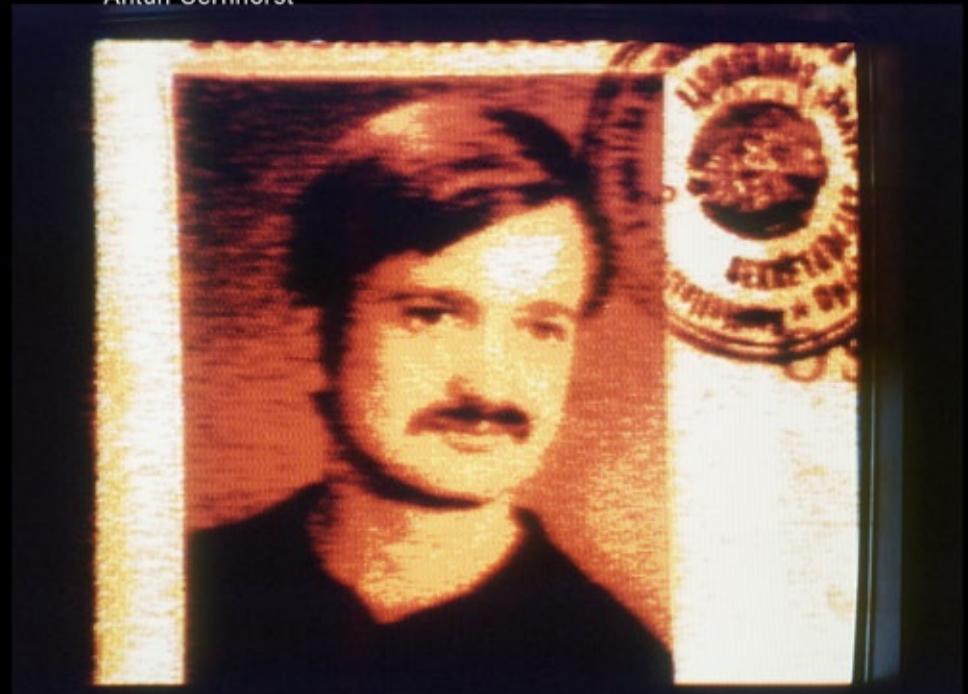
Anđelko from Kruno Penezić's team.



Vera



Antun Šernhorst



These stills were made by digitizing the video signal at 256 levels, 528 x 240 pixels.
DAI could only display 16 colors or 4 colors from a LUT.
16 colors could be displayed as 16 shades of gray on a monochrome video monitor.

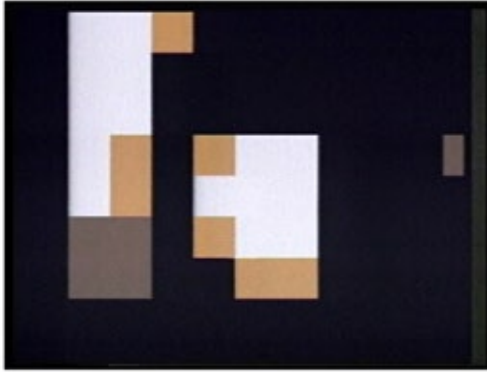
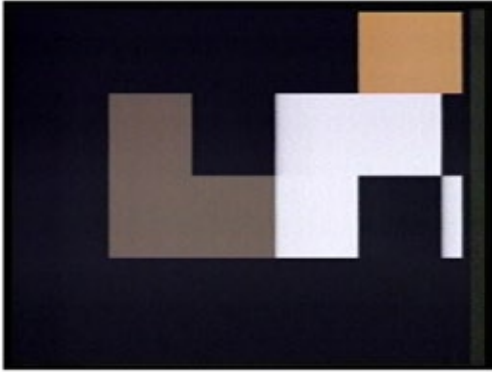


Image manipulation

- Rasterizing
- Mirroring

1983.

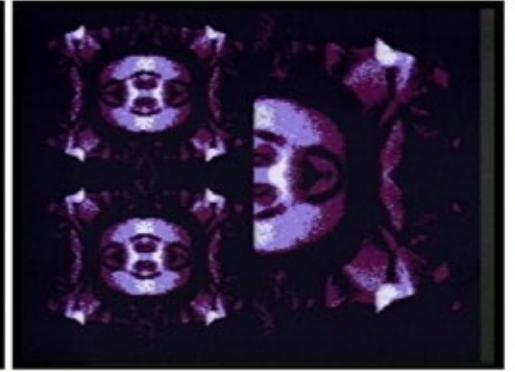


Image manipulation

- Posterizing

1983.

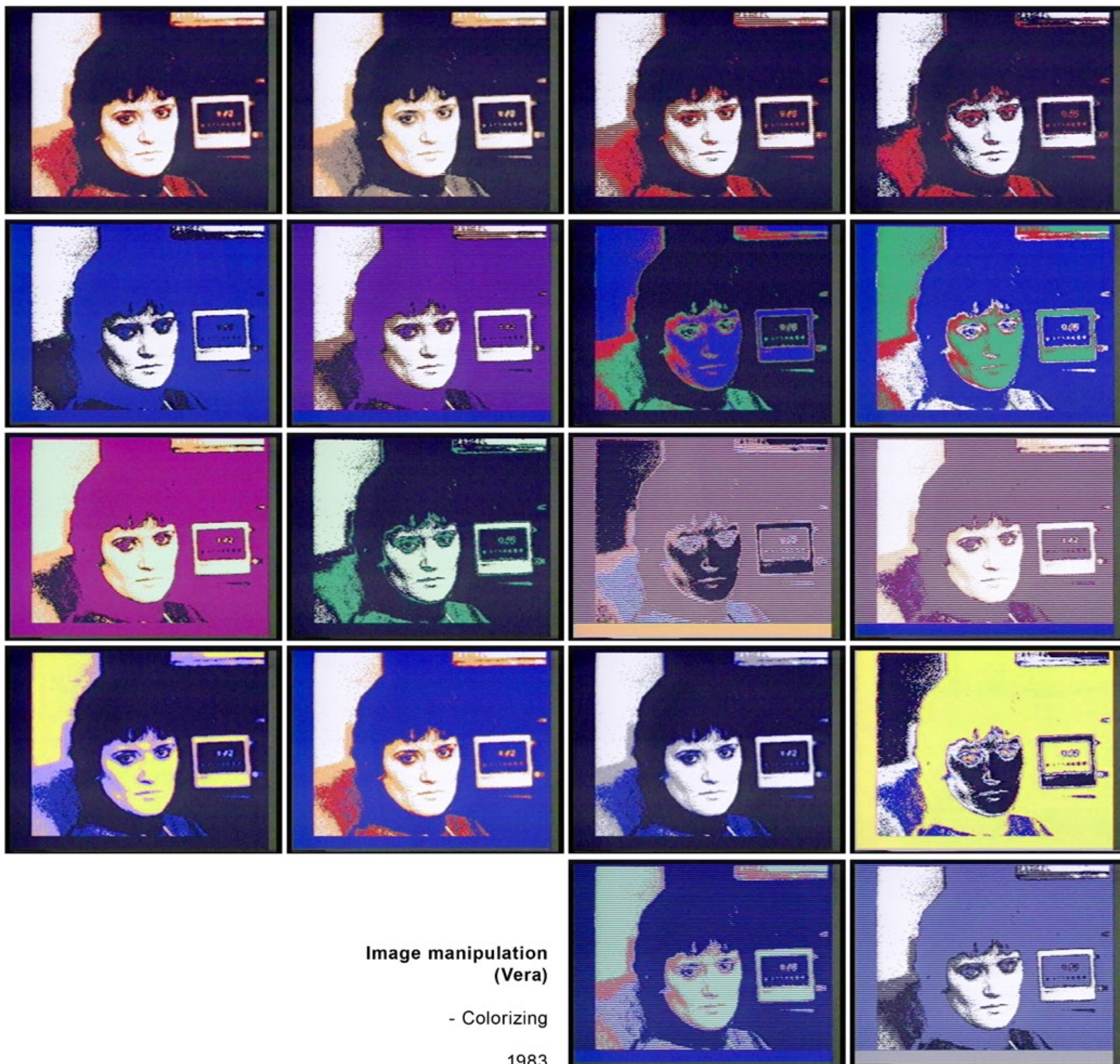
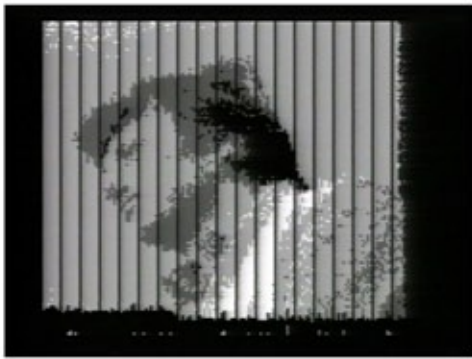


Image manipulation
(Vera)

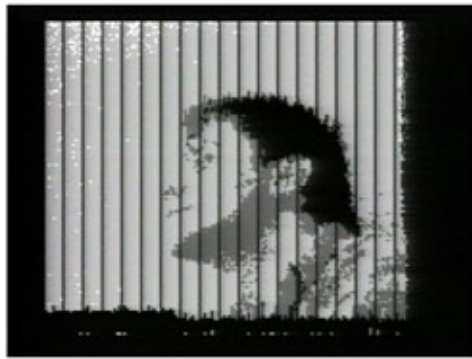
- Colorizing

1983



One bit missing

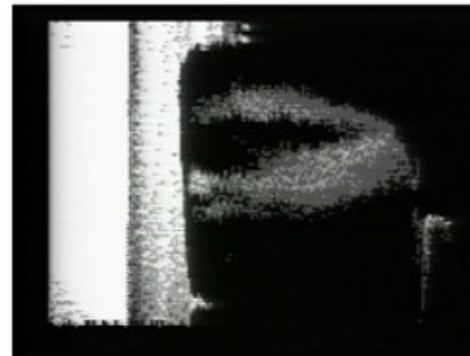
Kruno Penezić



Tom



Vera



Slow scan (Approx. 20 sec. per frame)



Smoothing algorithm



Dragan Cvetković



Ljupka



From a TV Commercial

Development of
video digitizing
software.

1983



Capturing video

Process of capturing,
 About 20 seconds,
 From left to the right,
 Over previous image in RAM.

1983



Bagat - šivači strojevi
 Bagat - Sewing machines

Digitized video

1984
 TV Commercial

I started to transfer DAI programs and graphics from MDCR cassettes to PC. I intend to publish the saved data so that DAI fans can play with it in an emulator.

Melbourne, 2012





Data transfer from DAI to PC
2012



Data transfer from DAI to PC
2012



The dearest toy
1984



Digitized Video

The same capture in 16 levels of B/W,
in 16 colors and on a video monitor
with amber phosphorus.

Digitized in 1983



A symbol from a pictorial font

Customized hand drawn character
Created in 1983

Photographed on a flat screen in 2012





Our pet DAI
XI 1989

US \$ (USA)			
DATUM	ULAZ-IZLAZ	STANJE	NAPOМЕНА
300982	3900-	100.0	TATI ZA KREDU
000982	400-	4000.0	S TOBINOG RACUNA
190982	3500.00+	3600.0	TATINO NA CUVANJU
200982	100.00+	100.0	VERINA DEVIZNA YNIZICA

Letg £ (GB)			
DATUM	ULAZ-IZLAZ	STANJE	NAPOМЕНА
140982	19.00-	0.709999	POVRAT DNEVNICA SL PUT
140982	19.71+	19.71	DONOS

DM (D)			
DATUM	ULAZ-IZLAZ	STANJE	NAPOМЕНА
161282	82.27-	105.24	HFI 88- - DAI ROM BOOK
161282	30.67-	167.51	Dfr 750 DAInamic PLETPLATA
161282	515.63-	206.10	Dfr 10000 RS232/RGB/PAL/MCRS
161282	500+	721.81	RS232 + 29.25 Letg VAT GP100
201082	90.49-	221.91	21.50 LSTG RGB MODULATOR
201082	102.19-	314.3	404 PLETPLATA CGH
201082	95-	416.49	DAI ROMU1
201082	500+	501.49	POVRAT 12 AMERIKE
001082	776.29-	1.49005	100 LSTG/GP100/KOST IM/LONDON
001082	500+	777.78	PUT U LONDON
300982	500-	277.70	TV HITACHI
300982	400-	777.78	VERI ZA KREDU
000982	1050-	1177.78	TOAST/PIPA/CIPE/MUNCHEN
000982	500+	3027.70	JAKOSA ZA PUT
190782	1050.00-	2527.78	KLIMA
130782	200.00-	3087.78	U-natic CASSETTE
170682	44.00-	3087.78	DAInamic SHEME
160682	97.35-	3952.30	DAInamic ASSEMBLER

Home budget records

Including some
equipment prices

1982



Animafest, Zagreb

I. Galeta i I. Paić
1984



Curious visitors in studio

Emil and Vera
1984



DAI dual floppy disk drive

160 KB capacity each
1987



Dad's equipment

Who would have thought he'd become a programmer!

1984



Whoa! It's a massive TV.

1984



Mirodrom concert in Split, Croatia

A digitized female face was stored on the DAI. It was converted to alphanumeric symbols and sent to the large stadium display.

1985



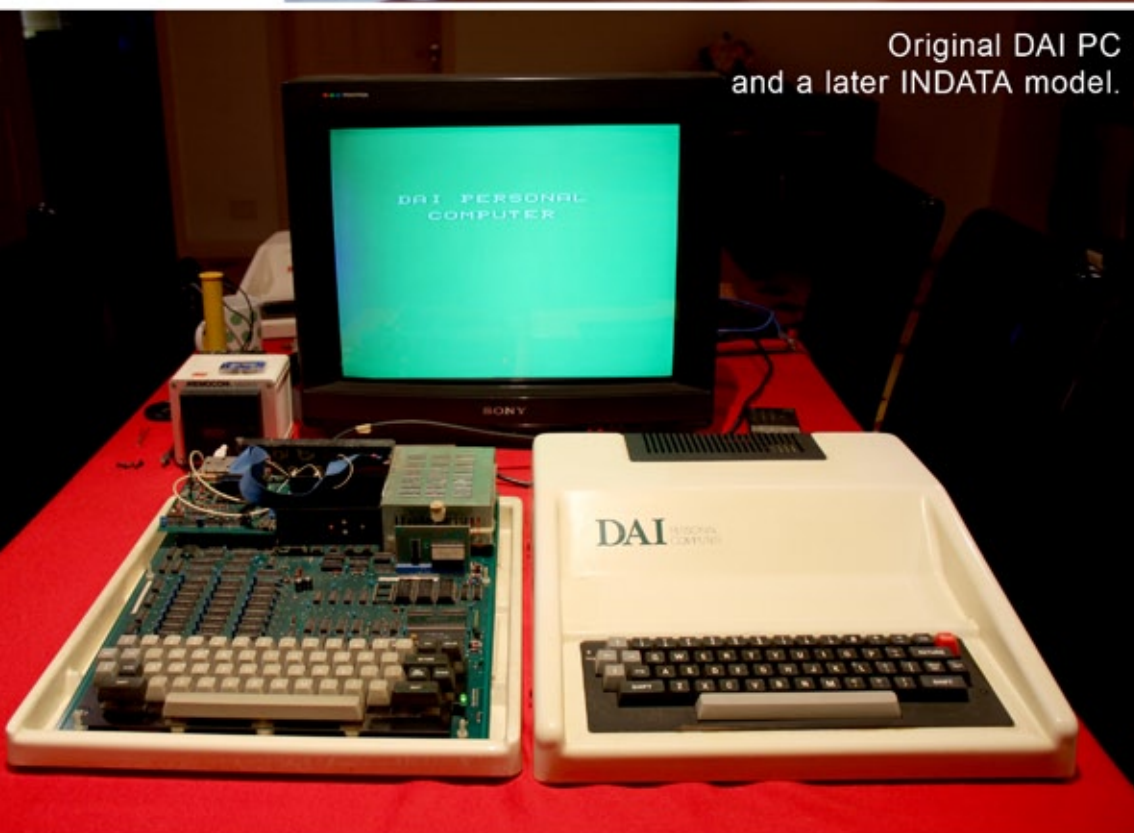


2012, Melbourne, Australia





Original DAI PC
and a later INDATA model.



Broadcast quality genlock and composite video output modifications were added to the existing RF modulator output by Antun Šernhorst.

Der Durchblicker.



72 K Byte (24 K Systemsoftware /
48 K dynamischer Arbeitsspeicher) · 16 Farben
· Hochauflösende Grafik (336x256 Punkte)
· Ton- und Rauschgeneratoren Frequenzbereich
30 Hz bis 1 MHz · Extrem schnelles, erweitertes Basic
mit halbcompilerendem Interpreter
· Umfangreiche Testhilfen
(Syntaxfehler werden
bei Programmdefinition entdeckt)
· Deutsches Handbuch
· Wartungsvertrag

PAL-UHF-Ausgang · Kassettenrekorder-Ausgänge ·
Stereo-Ausgänge · V 24 · RS 232 · Video Interface ·
RGB-Ausgang · DCE-Bus (über 100 DCE-Standard-
Europakarten) · IEC-Bus · Floppys ·
Festplatten-Laufwerke · Game Paddles · Drucker

DAI THE
MICROCOMPUTER
COMPANY
Data Applications International (Deutschland) GmbH
Schwanenmarkt 6, 4000 Düsseldorf, Tel. 0211/84381, Tx. 8587708

DAI Personal Computer – Der Durchblicker bei Ihrem Fachhändler:

1000 Berlin, kompatibel-data, Kalkreuthstr. 4-5, ☎ 030/2133150 · 2300 Kiel, Micro Computer Christ, Rathausstr. 4, ☎ 0431/96376
2800 Bremen, Hans Schröder, Föhrenstr. 51, ☎ 0421/459779 · 3000 Hannover, Computerstudio Springmann, Stockernerstr. 199, ☎ 0511/791111
3360 Osterode am Harz, Georg Ramisch Elektronik, Am Markt ☎ 05522/72555 · 4000 Düsseldorf, Semrau & Partner, Stressemannstr. 12, ☎ 0211/328384
4300 Essen, Hülsewig Computer Systeme GmbH, Am Wünnenberg 9, ☎ 0201/713904 · 4350 Recklinghausen, Computer Centrale, Dortmund Str./Ecke Douaistr., ☎ 02361/45708
4400 Münster, Norbert Hünstig, Olfersstr. 3-5, ☎ 0251/76348 · 4408 Dülmen, GMC, Ostdamm 30, ☎ 02592/33631
4440 Rheine/Mesum 11, Innovis Computer GmbH, Rheiner Str. 83, ☎ 05975/1777 · 4800 Bielefeld, Damm & Johanning, Sudbrackstr. 46/48, ☎ 0521/83036
5220 Waldbröl, Müller Elektronik, Bahnhofstr. 16, ☎ 02291/2288 · 5300 Bonn, Computer Shop, Kaiserstr. 16+20, ☎ 0228/637522
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