

The Interactive Engineer



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■ Editorial

We still don't know who put that article about the human brain on our desk, but after reading, this question was not an issue anymore. The article described the effects of feeding the brain with very regular signals. The brain reacted with an avalanche of triggers resulting in a nervous breakdown. It seems thus that the brain prefers to process chaotic signals instead of regularly ones.

In order to maintain the editorial staff complete, we decided to stop publishing *Interactive Engineer* at regular intervals until someone can prove the contrary of the brain story.

As expected, the interest for DVD products is steadily increasing. Most professional magazines — independent of the fact they are dedicate to professional video, audio or computer — have articles on DVD and related applications. Consumer gear is already available and professional DVD products will be in the market first half of next year at pricepoints competitive to CD-i. This evolution will certainly trigger a number of studios to invest in the new DVD technology. Even so, Philips Disc Systems will release an interesting authoring tool package for DVD by the end of this year. To anticipate this trend, we planned an IE with only DVD-Video, professional DVD-Video products and DVD-video authoring as theme.

We sense that the transition from CD-i towards DVD will certainly start in the beginning of next year. Do we spend our energy in bewailing the dead of 'King CD-i' or do we welcome 'Emperor DVD'?

IE editorial staff

■ New CD-i Utilities

This article has some news on CD-i utilities, which make life easier or boost production. For more information on the utilities described in this article please contact Cambridge Multimedia on email cd-i@cmgroup.co.uk who offer support for CD-I and Video-CD authoring outside of the Americas.

CD-i Picture Viewer:

This is a 32-bit Windows utility for viewing CD-i picture files without the need of any special hardware. It supports file association and 'drag 'n' drop'. Very useful for quickly looking at the contents of obscure named files like 'pic0423.d'. A demo version is available from the website <http://freespace.virgin.net/robin.burrows/cdiutil.htm>.

When using a PC, remember that 2 and 4 byte data is 'byteswapped'. For example: the number 0x12345678 on a Motorola processor would be read as 0x78563412 on an Intel. The following C-code does the job pretty well:

```
unsigned long int byteswapl (unsigned
    long int i)
{
    unsigned long int j;
    j = i&0xFF; j <=<= 8; i >>= 8; j |=
    i&0xFF; j <=<= 8; i >>= 8;
    j |= i&0xFF; j <=<= 8; i >>= 8; j |=
    i&0xFF; return j;
}

unsigned short int byteswaps (unsigned
    short int i)
{
    unsigned short int j;
    j = i&0xFF; j <=<= 8; i >>= 8; j |=
    i&0xFF; return j;
}
```

CLUT7 and CLUT8 files were very easy to support because they just consist of a header, a colour palette, and some uncompressed data containing the actual picture. For the RL7 format, it took longer to work out the file compression as it uses 'run length' encoding to remove pixels that are the same as the previous. DYUV used 16 'magic numbers' and had to be converted from YUV to RGB.

The images are loaded into memory, decoded to a 24 bit device independent format and then blitted into the display window.

On a fast machine, the time gap between dropping the picture on the window and its appearing is very small, although a lot of processing is done on DYUV images. For the moment, this utility doesn't convert QHY images as these images don't appear to have a header in the file. As these are dyuv images with rl overlays, the converting process involved would be similar. The DYUV images look a bit 'washed out' and had a few wrong colour pixels, probably due to the YUV->RGB conversion.

Database converter:

This utility originates from an application that had to display information at the command of the user. The starting point for the development was a database containing the required information.

The CD-i application had to display a range of products, matching criteria the user selected. The user would select age range, price, type and category. The application then displays the first matching product, while the rest of the matching items were accessible by clicking the forward or back hotspots.

Since MediaMogul was to be used and because of the huge amount of data, some C programs were written to convert the original database (a spreadsheet delivered as a comma separated file) into mogul scripts and menus. The programmes were written on a PC for a standard 32bit C compiler, although any platform would have done the job. The first step in concept was to take the common parts of each script as shown in the first frame at the facing page:

The next step was to write code to 'fill in' the missing information according to the specifications the program works. A small code snippet is shown in the second frame (ok, it doesn't make much sense, but it gives an idea):

For clarity, it would probably be better to use `sprintf` to fill in the data (see your compilers helpfile).

An example of a produced script is shown in the last frame:

```

char brifline[] = "00:00          Br_ifeq_nr          /h0/PROJECT/SCRIPTS/";
char bralline[] = "00:00          Br_alwys_nr          /h0/PROJECT/SCRIPTS/";
char scr01[] = "00:00          Skip_off          ";
char scr01a[] = "00:00          Set_var          F 1";
char scr02[] = "00:01          Dissolve          /h0/PROJECT/VIDEO/";
char scr02a[] = " 00:20          ";
char scr03[] = "00:01          Cursor_pos          520 460";
char scr04[] = "00:21          Background          /h0/PROJECT/VIDEO/";
char scr05[] = "01:11          Menu          /h0/PROJECT/MENUS/";
char scr06[] = "05:01:11         Br_alwys_nr          /h0/PROJECT/SCRIPTS/end";
char menu01[] = "VIDEO /h0/PROJECT/VIDEO/";
char menu02[] = "TREGION /h0/PROJECT/SCRIPTS/";
char menu03[] = " NO_RETURN D_RECT 51 405 158 511 36";
char menu04[] = "TREGION /h0/PROJECT/SCRIPTS/pout";
char menu05[] = " NO_RETURN D_RECT 326 404 443 515 36";
char menu06[] = "TREGION /h0/PROJECT/SCRIPTS/";
char menu07[] = " NO_RETURN D_RECT 614 404 723 509 36";
char menu08[] = "TIMEOUT / NO_RETURN";

```

```

i = 0; j = 0; while (strcmp (origlist+i, "END"))
{
/* Category */
oldi = i;
strcpy (filename, ".\\SCRIPTS\\p");
origlist[i+3] = 0; strcat (filename, origlist+i); origlist[i+3] = ':';
strcat (filename, "a"); i += 4;
printf ("Creating file %s\n", filename);
filept = fopen (filename, "wb");
if (filept==NULL) { printf ("Can't open %s for writing\n", filename);
return 1; }
lastcat[0] = 0; j = 0; while (origlist[i]!=':') {
strcpy (scrline, brifline); strcat (scrline, filename+10);
scrline[strlen(scrline)-1] = 'b'; strcat (scrline, " C ");
scrline[strlen(scrline)+1]=0; scrline[strlen(scrline)+2]=0;
scrline[strlen(scrline)] = origlist[i]; i++;
if ((origlist[i]>='0') && (origlist[i]<='9'))
{ scrline[strlen(scrline)] = origlist[i]; i++; }
scrline[strlen(scrline)+1] = 0;
scrline[strlen(scrline)] = 0x0d;
if (strcmp (lastcat, scrline)) {
if (fwrite (scrline, 1, strlen(scrline), filept)!=strlen(scrline))
{ fclose (filept); return 1; } }
strcpy (lastcat, scrline);
if (origlist[i]=='\n') i++;
}
}
etc...

```

```

00:00          Skip_off
00:00          Set_var          F 1
00:01          Dissolve          /h0/PROJECT/VIDEO/21313f.d00:20
00:01          Cursor_pos          520 460
00:21          Background          /h0/PROJECT/VIDEO/21313b.d
01:11          Menu          /h0/PROJECT/MENUS/p001d
05:01:11         Br_alwys_nr          /h0/PROJECT/SCRIPTS/end

```

Remember that an end of line is 0x0d. When the program was run, it produced 337 scripts and 44 menus (some of which were used by multiple scripts) which could be loaded into Mogul or Script2Disc and then built. The advantages of this

approach was that results were obtained quicker, changes were easier to make and the conversion was less prone to errors.

Authoring assistant

The authoring assistant is a new project - still under development - that will allow you to make Mogul scripts and menus and play them back on your PC without using any additional hardware. Although, Mogul would be a useful tool to have while Script2Disc will still be necessary to build it. Further details available by mailing rburrows@bigfoot.com. Here is an early screenshot:



*Robin Burrows
Cambridge Multimedia*

The driver software may also be copied by placing the VCD disc in a PC-ROM drive on a PC and copying the file '/cd/CDI/CDI_TEXT.FNT' onto the PC hard disk. It may then be included on a CD-i disc together with the application when pre-mastering.

Note that the same descriptor is used for both SD-120 disks and floppy disks placed in the Imation drive.

Using the Zip-100 and Imation drives:

- The CDi-670 playershell software is only set up to recognize a connected and powered Zip-100 drive. It will not interface to a SD-120 drive.
- For a Zip-100 drive, a type 60 entry in the csd is only present if the drive is connected and powered when the CDi-player is powered up or reset. For a SD-120 drive, a type 60 entry will always be present after the driver s/w has been installed in NV-RAM, also if it is not powered or not connected.
- If a Zip-100 drive has been connected previously, then SD-120 drive software is installed on the system, the csd file will be updated accordingly when the CD-I player is restarted.

Teit Uldal

■ Imation Drive

The CDi-670 player is supplied with i/f software for the Iomega ZIP-100 drive as described in the user guide. This device does not allow the use of standard 1.44MB floppy disks. The Imation SD-120 drive, however, can use standard 1.44MB floppy disks.

The SD-120 drive software for the CDi-670 was unfortunately not available at the time for being included in the production ROMs, demanding for another approach when installing the software in the CD-i player.

For installing the software a CD-i installer program is available as a VCD disc. This application, when run on a CDi-670 player, will install the device driver in a special file in player NV-RAM. This file is loaded by the system at startup and allows access to the drive by an application through entry 60 in the csd file.

■ Mpeg Audio Driver

Recently, a problem surfaced with the MPEG audio driver. Especially long-playing MPEG applications made with Media Mogul using keyboard input suffer of the problem. The symptom is a system reset once every 100 playing hours.

The solution consists of an updated MPEG audio driver that should be loaded together with the CD-i application. It effectively replaces the MPEG audio driver located in ROM.

For MediaMogul users, this replacement is slightly more complicated:

The MediaMogul engine should be merged with a small CD-i application and the new 'madriv' driver. The small CD-i application installs the driver, then starts the MediaMogul engine.

This software is available on request.

Teit Uldal

■ YAY2K

In less than 500 days the most computerized cataclysm will strike the world. Possibly, nothing happens and everything goes on as before. Although, credit cards expiring in 2000 or beyond caused some cash registers to crash. The devil is thus already among us. That computers will stop running, crash or will not reboot after the 1st January 2000 (enthusiasts like to call it Y2k nowadays) is likely. Worse would be that they simply run their calculations on the year 1900 and come up with nothing else than wrong answers, resulting in a massive data processing breakdown. Don't think about what would happen with air traffic control systems, medical networks, communication systems,...

No, do not get discouraged yet. Recent investigations in the 'year 2000 problem' area for the CD-i platform make the picture far less terrifying for the CD-i community. A lot of new data can now be added to our previous article (IE V6N1) resulting in a detailed description of the Y2K problems existing in CD-i players produced by Philips. When there is no direct solution to the problem, workarounds are suggested.

The details are split up per system module affected. Please note that system modules that are Year 2000 compliant are also described to give a complete view of the problem area.

File Managers

The file managers use the current system date to timestamp files when they are created. The timestamp is the date/time entry in the file descriptor. The year entry size is unfortunately only a single byte long. For most file managers the problem lies in the method they use to reduce the system year to a single byte value. This means that the application has to do some adjustments when doing date arithmetic.

CDFM

This file manager provides support for the CD device class, and is used in all CD-i players. According to the FFGB the CDFM file manager stores the file creation date in a 6 byte field all being unsigned chars. One byte is reserved for the year indication and contains the number of years elapsed since 1900. This file manager is capable of storing the date correctly up to the year 2155 and is thus Year 2000 compliant.

NRF

This file manager is used in all CD-i players produced and supports the NV-RAM type devices (8k or 32k).

System time is requested using the system call `FSTime`. The year information is copied to the file descriptor after calculating a modulo 100 ($\text{year \%} = 100$). This means, any files created after year 1999 - e.g. 2003 will get the value 03 as the creation year.

The playershell compensates for this by adding 100 to all year-values from the file descriptor when the year is less than 88. So sorting the list of files in NVRAM based on 'Date' will yield correct results.

Applications should use the same algorithm when comparing file dates on NV-RAM files.

RBF

This file manager is used in a limited number of CD-i player models:

- CDI-602 for interface to OS-9 formatted floppy disks.
- CDI-605 for interface to OS-9 formatted floppy disks and hard disks.
- CDI-615 for interface to OS-9 formatted floppy disks.

This file manager obtains the system date from the `FSTime` system call, it then stores the year as $\text{system_year \%} 100$ (modulo 100). This means that a file created in the year 2003 gets the value 3 in the file descriptor year field.

When comparing file dates on RBF files 100 should be added to the year-value if the year is less than 88 before making the comparison.

PCF

This file manager is used in the following CD-i player models:

- CDI-602 for interface to PC formatted floppy disks.
- CDI-605 for interface to PC formatted floppy disks and hard disks.
- CDI-615 for interface to PC formatted floppy disks.
- CDI-670 for interface to externally mounted

Zip-100 or Imation SD-120 disk drives using PC formatted removable disks and floppy disks (Imation only).

The older player models (CDI-602, CDI-605, CDI-615) use edition #777 and earlier of the PCF:

The year is obtained as the `System_year % 100`.

The MS-DOS year number is expressed as 'years since 1980' in a seven bit field. This is correctly derived as 'OS-9 year - 80' by the PCF. When however 'OS-9 year' < 80, this generates a carry and an effective 7-bit result of 'OS-9 year' + 48. When this date field is read back, either by PCF or by MS-DOS, it gets converted to:

'OS-9 year' + 48 + 1980 = 2028 + 'OS-9 Year'

(In practice, the bit is lost when shifting left, but the effect is the same: an advance of 128 years)

Example:

Suppose a system date of '11/05/2003'. When we create a file on a PC-formatted media, remove the media and place it in a PC, a 'dir' would reveal '05/11/31' as the file date!

The latest player model (CDI-670) uses edition #777 of the PCF:

For this version of PCF the date processing is identical to what has just been described, but the initial year is obtained as 'System_year - 1900'. In this case, no carry is generated when converting dates beyond 1999 to MS-DOS format, and the correct year value is retained. This edition of PCF is Year 2000 compliant until 2028.

A ROM upgrade, consisting of a new extension ROM containing edition #777 of PCF is available for the CDI-615 player. Contact LoB Disc for more information on this.

PIPE

This file manager is used in all CDI players produced. It provides support for named and unnamed pipes.

System time is requested using the system call `FSTime`. The year information is copied to the pipe descriptor after performing a modulo 100 (`year %= 100`). This means, any files created after year 1999 - e.g. 2003 will get the value 03 as the creation year.

It is recommended that applications use the same algorithm for comparing pipe creation dates

as for NRF and RBF files. That is, if the creation year is < 88 add 100 before comparing.

Backup Clock

All CDI players made by Philips contain a battery backup clock used to keep current system time, even if the player is switched off.

No problems are known with the following player model ranges:

CDI-605, CDI-210/40 and higher, CDI-220/60 and higher, CDI-450, CDI-550, CDI-470, CDI-490, CDI-615, CDI-660, CDI-670.

One known problem with the following player model ranges:

CDI-220/20, CDI-210/20, CDI-220/40

If the system time is allowed to run past 2000, there are no problems with the time-keeping, but in one special case, a problem may occur:

If current system time indicates a pre-2000 date, setting the date to a post year 2000 date will cause the system date to be set to 1900 plus the year count after 2000. The battery backup clock will be set correctly in this case, so when setting the system date past year 2000, the system should be switched OFF then ON to get the system clock updated properly.

Teit Uldal

■ Mtools for OS-9

Or everything about a PC Y2K-fix and Windows 95/NT long file name interchangeability for CD-RTOS

When the designers of the CD-i system created the specifications for a multimedia delivery system that would last at least until the next century, they took their job very seriously.

As the CD-i player's operating system CD-RTOS was based on release 2.4 of Microware's OS-9 system (unfortunately NOT y2k compliant), the designers created a fix for the OS to provide for a careless usage after the year 2000. Years later Microware released an interim release of the OS-9 system — release 2.9 — which also included a fix

for this problem.

As a user of a CD-i system or as CD-i developer you don't need to buy this upgrade from Microware and you do not need to worry about faulty operation after the year of digital doom.

CD-i's handling of Y2K works correctly for the internal clock and all applications that use it for displaying a date including the 1st and 2nd generation versions of the player shell. To check this, set the clock onto a date past the year 2000 and then create a FTS title for a CD-Audio disc. View the contents of Memory or Storage to see that the selection's date displays correctly, either as 2000 or as '00. In addition, file creation time and date are handled correctly. All CD-i discs created after the year 2000 that include OS-9 filenames with dates after the year 2000 will work.

However, since only the parts of CD-RTOS that handle CDs and OS-9 type magnetic media — the so called CDFM and RBF — are fully compatible with the next millennium, the problem still occurs when using storage media that use the PC or DOS filesystems as they use a different filemanager — named PCF or PC Filemanager.

This problem only occurs on CD-i development players and POI/POS-models such as the Philips CDI-605 and the CDI-615, as they occasionally need access to PC media. These players behave a little strange when trying to use a post-2000 file from a PC-formatted disk. For example: copying a 2001-file from a DOS-disk onto an OS-9 harddisk, leaves this file with 101 as the creation year!

Luckily, Mtools, a utility package available in public domain, has a work-around for this particularly problem. Besides this, Mtools adds tremendous functionality to PC-OS-9 file interchangeability, including the recognition of Windows 95/98/NT long file names.

'Mtools', was originally developed for UNIX by Free Software Foundation and ported to OS-9 by Andrzej Kotanski in 1997.

Download the Mtools archives from the Nebula Media Web site at www.nebula.demon.nl. Select 'Multimedia' and then 'CD-i/OS-9 development support'. The package consists of three archives: one with all executable commands, one with all source-code and one with the full documentation. Thanks to the available source-code you can include the code (or parts of it) in your own projects or modify it to suit your needs.

In order to use the tools, all you have to do manually is adding a text file named `mtools.conf` in the `/SYS` directory of your default device (usually `/h0`) with the line: `drive a: file="/pcd0h@" 1.44m`.

Mtools consists of several DOS-style utility commands such as `dir`, `copy` and `format`, used from the OS-9 shell prompt on PC-formatted diskettes. The main advantage of Mtools over the current PCF in the CDI-605 and CDI-615 ROM is that it handles long file names correctly. Reading a disk with files created under Windows 95, 98 or NT using the standard PCF (`/pcd0` and `/pcd0h`) results in strange filenames and even errors. When using Mtools, long file names are read and copied with their full name. This also works the other way around: long OS-9 filenames are copied with their full name onto a PC diskette. It even creates a short (`..~1`) name on the diskette for backwards compatibility. Furthermore, Mtools assigns the current time and date onto a file copied from a PC-disk onto an OS-9 disk, thus eliminating the Y2K-problem as OS-9 files created on an OS-9 storage medium always bear a correct year-stamp on CD-i systems.

Please note that Mtools does not add an additional device descriptor to your system, it only works with the provided utilities. Therefore, you will not be able to read long file names on PC diskettes and copy them with a correct year stamp in for example MediaMogul. You can, of course, use Mtools from the CD-RTOS shell in MediaMogul, and then access the copied long file names on your OS-9 disk.

The recently announced Philips CDI-660 and the CDI-670 CD-i/DVD Multimedia Controller have an updated PCF built-in, and therefore do not suffer from the PC Y2K complaints as stated in this article. However, it is still worth to take a look at Mtools for its long file name compatibility.

If you should have comments and/or suggestions, feel free to contact us at jorg.cdi@nebula.demon.nl. In case you need support for Mtools, please contact the authors directly.

*Jorg Kennis
Nebula Media*

■ How to contact us

For support:

- **USA**

Rise International, Inc.
2501 Parkview Dr.
Suite 206
Fort Worth, TX 76102
Tel.: +1 817 336-0404
Fax.: +1 817 336-1430
www.riseintl.com

- **Other area's**

Cambridge Multimedia Systems
St Andrews, Northstreet
Burrwell, Cambridge CB5 0BB
United Kingdom
Tel.: +44 1638 743121
Fax.: +44 1638 743572
E-mail: CD-i@cmsisl.dungeon.com

For Authoring equipment distribution:

- **USA**

Rise International, Inc.
2501 Parkview Dr.
Suite 206
Fort Worth, TX 76102
Tel.: +1 817 336-0404
Fax.: +1 817 336-1430
www.riseintl.com

- **Other area's**

Cambridge Multimedia Systems
St Andrews, Northstreet
Burrwell, Cambridge CB5 0BB
United Kingdom
Tel.: +44 1638 743121
Fax.: +44 1638 743572
E-mail: cdi@cmsisl.dungeon.com

Philips Sound & Vision:

Business unit Disc Systems
www.philips.com/sv/cdiprof

Editorial:

hans.angus@skynet.be

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