The Interactive Engineer

Volume 6, Number 3, September 1997

Editorial

If you are still in vacation we apologize to bother you. In all other cases we say "Hello".

A nice thing presented here is the new CD–i 490 player. It has a lot of new features that every application programmer certainly will appreciate. Especially the locking functions are worth to get a closer look. This is followed by a description of the locking disc used in combination with the new CD-i,

While snooping in the lab, we found a report a yet another pointing device. And as always, a very interesting one.

And then comes the website. This time we found an interesting thing making life easier when developing with MediaMogul. After reading this, you don't need the Mediamogul disc to start the program. However, this article has not the intention to promote 'multi workstations - one copy' approach. Keep it legal.

IE editorial staff

■ Loading modules

When loading a file -containing a module- into memory, the operating system creates a link to it and increments the 'link count' by one. The counter contains thus a 1 in case the file contains only one module.

The following commands illustrate this mechanism:

```
$ load -d appl
$ mdir -e appl
```

The result of the `mdir` command is shown as 'case 1' in the accompanying figure.

When the module is no longer required, an `unlink` command informs the system the module can be removed from memory. The operating system 'deallocates' the module from memory and decrement the link counter by one. With only one module loaded, the counter equals zero after the `unlink` command.

The following commands illustrate this:

```
$ unlink appl
$ mdir -e appl
```

The result of the `mdir` command is shown as 'case 2' in the accompanying figure.

When loading a file into memory that contains more than one module, a link is created to the first module in the file. The other modules, on the other hand, have their link count set to zero although they are in memory.

Suppose the file `cdi_all` contains two modules: `appl` and `mod01`. The following commands illustrate what happens when loading two module into memory:

```
$ ident cdi_all
Header for: appl
...
Header for: mod01
...
$ load -d cdi_all
$ mdir -e appl mod01
```

The result of the `mdir` command is shown as 'case 3' in the accompanying figure.

Observe the link count of the `appl` module, equal to one, while the link count for the `mod01` module is zero.

It is possible to increment the link count of a module manually with the `link` command:

```
$ link mod01
$ mdir -e appl mod01
```

The result of the `mdir` command is shown as 'case 4' in the accompanying figure.

The link count of the `appl` module is still 1 while the link count for the `mod01` module has increased by one.

The same way as to increment the link count of an individual module, the link count can be decremented with unlink command:

```
$ unlink appl
$ mdir -e appl mod01
```

The result of the `mdir` command is shown as 'case 5' in the accompanying figure.

	Addr	Size	Owner	Perm	Type	Revs	Ed #	Lnk	Module name
Case 1	00d7af50	14016	0.0	555	Prog	8001	123	1	appl
Case 2	<no appl module displayed -> no module available in memory>								
Case 3	00d69380	14016	0.0	555	Prog	8001	123	1	appl
	00d6ca40	28528	0.0	555	Prog	8001	123	0	mod01
Case 4	00d69380	14016	0.0	555	Prog	8001	123	1	appl
	00d6ca40	28528	0.0	555	Prog	8001	123	1	mod01
Case 5	00d69380	14016	0.0	555	Prog	8001	123	0	appl
	00d6ca40	28528	0.0	555	Prog	8001	123	1	mod01
Case 6	<no appl module displayed -> no module available in memory>								

As expected, the link count of the `appl` module has decrease by one and equal s zero. The link count for the `mod01` is still one. Contrary to what was expected, the `appl` module still resides in memory. The reason for this lies in the fact that the `appl` and the `mod01` module where loaded from the same file into memory. Because of this, the system allocates one segment of memory to store both modules and can't deallocate pieces — holding the individual modules— of the memory segment. Only when the link count of both modules is set to zero, the memory segment will be freed and the modules removed from memory:

```
$ unlink mod01
$ mdir -e appl mod01
```

The result of the `mdir` command is shown as 'case 6' in the accompanying figure.

Note that in a C program the `link` command corresponds to the `modlink()` function and the `unlink` command to the `munlink()` function.

A case study

When starting an application, the player shell loads the initial application from the CD-i disc in memory Bank B. When the application identifier file name contains a module, the module is loaded from disc into memory and linked. The application then starts, as expected. The same scenario repeats for each module the application needs. This approach of loading modules into memory slows down the loading time of the application as for each module that must be loaded a disc access is initiated.

By concatenating all modules into one file and loading this file in one disc access into memory, the startup time of the application has become faster as there is only one disc access to load all modules needed by the application.

The only inconvenience of this approach is that when the application no longer needs one or more modules it loaded from the concatenated file, it can't deallocate them and thus still use memory. As seen previously, memory is only released when all modules are deallocated at the same time.

Patrick de Jong

■ The RISE Int'l lightpen

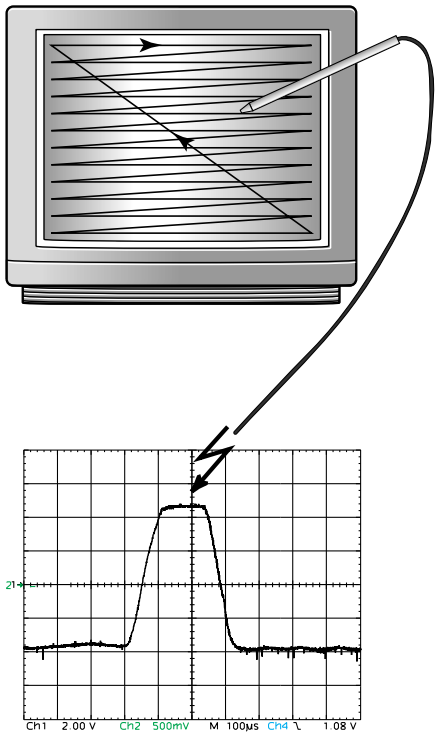
An interesting absolute pointing device, besides the tablet and the touch screen is the lichtpen. It has the advantage of a direct access of the user interface as there is no need to translate (physical) button positions to screen positions as is the case with the mouse or the tablet.

A little theory

The controller takes the video output of the player and the response signal of the pen to calculate the position on screen the pen is pointing to. The principles of operation behind the lightpen is fairly straight forward. The picture on the screen is 'written' by a beam traveling across the CRT. The beam starts at the top of the screen, goes from the left side of the screen to the right side and jumps back to the left side, just below the line just written.

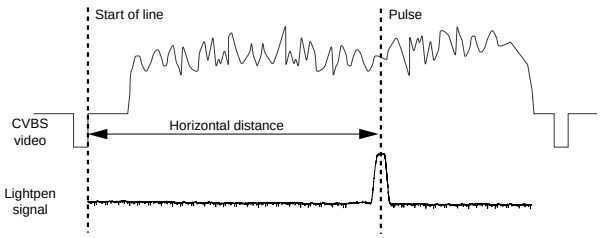
This repeats until the beam reaches the bottom of the CRT and thus has written one frame of the video stream. The beam then jumps back to the top and starts writing the next frame. The CVBS signal (composite video broadcasting signal) from the CD-i player not only contains the picture to display but also controls the movements of the beam. The control parameters embedded in the CVBS video signal are the number of lines to 'write', the length of a line —expressed in microseconds— and the time needed to fill the CRT with lines. All these parameters are fixed for a given video standard (PAL, NTSC or SECAM).

The lightpen, on the other hand, holds a light sensitive sensor and when held against the screen it generates a pulse when it 'sees' the beam passing by.



Except for some optics and leveling electronics, nothing special to tell about this device. The key of the pointing system is the controller. By tracing the number of lines the beam is writing on the CRT it knows the vertical position of the beam. The controller also knows when the beam starts writing a new line on the CRT.

When the controller receives a pulse from the lightpen, it calculates the 'distance' between the start of the line and the occurrence of the pulse. As the 'length' of the line is fixed for a given standard, the controller can easily calculate the horizontal position of the pulse on the line (read screen).



Once the controller has the horizontal and the vertical position of the pulse, it transforms this data to X-Y coordinates understood by the CD-i player.

In reality, the controller does more then counting lines, but explaining all this would be beyond the scope of this article.

The RISE Int'l CD-i lightpen

The lightpen set consists of a controller and a lightpen. The serial port and the video output of the CD-i player and the lightpen are connected to controller. The video output from the CD-i passes through the controller to the monitor/TV set input any noticeable loss in quality.

The controller has a switch for selecting the baud rate (1200 baud and 9600 baud) and a button to enable calibration. Keeping this button pressed disables cursor movement and enables calibration of the lightpen on the cursor hotspot. The PROM of tested controller was labeled CD-i P V1.8.

The lightpen identifies itself as an absolute pointing device: tested with the 'config' module it returns Device on port #2 is: S (53) = Absolute Screen Device while the entry in the CSD file reads 5:/gt12:="a":. The response speed of the lightpen is fairly good and all player functions are accessible with the pen without problems. The lightpen is, due to the principle of operation, insensitive for dark areas. CD-i developers should thus make bright hotspots and active regions when they want their application to support the lightpen.

The pen can cover an area of 767 pixels by 557 lines in PAL and 767 pixels by 479 lines in NTSC. The maximum reachable values are however dependent of the calibration. Once calibrated, the linearity and accuracy is perfect on a PAL system. While moving from the middle towards the top of the screen on a NTSC system, the distance between the actual touch position and the cursor increase. Probably the controller wasn't tuned to run on the NTSC standard.

Although the device supports both 1200 baud and 9600 baud, 9600 baud should not be used for 'absolute screen pointing devices'. The newer generation CD-i players (e.g. CD-i 450) does not support 9600 baud pointing devices.

Jan Mateyka

■ Introducing the CD-i 490

With the introduction of the USA version of the CDI490 Philips started with the implementations of a unique system to implement custom specific requirements such as start-up behavior, pointing device handling, disc protection, disc lock-out and access control of settings and intermediate results.

Customizing your player with the options screens A user-friendly aspect of all CDI470/490 models is that it allows you to customize player performance using the Options screens.

The following options are available from the options menu-screen:

General options

- General options, which provides "Preference" settings for Autoplay ON/Off and four Volume levels
- Audio options, which offers "Preference" settings for Auto shuffle On/Off, Auto FTS On/Off, Repeat of Disc/FTS or Track and Scan time of 5, 10 or 20 seconds.
- Time and date Options which lets you set the time in 12 or 24 hours format and the date in day-month-year or month-day-year format, and to display them on the play control screens.
- Memory screen , which automatically lists files of CD-i Title data, as well as Favorite Track Selection and Favorite Picture Selection programs and titles accumulated in the players non volatile memory (NVRAM) The information stored can be sorted into alphabetic, size or date order. Also indicated is the percentage of the total memory space occupied, to show you when you should consider deleting old files to make room for new ones. Once you have made your personal preferences, the shell ensures that the player automatically adopts them when starting up.

Protected mode

For unattended and public use the player can be put into protected mode. This is the replaces the trade mode but the features are extended.

- This disables the open tray function to prevent unauthorized disc exchange.
- It also restricts access to modify the "preferences" and remove intermediate results.
- In combination with its autostart function it makes the system the best choice for POI/POS systems

Customizing features

As the products appear more and more in specialized environments we are faced with customer specific requirements. Our experience with these requirements have resulted in an organizational system to allow for such custom modification. Software and/or hardware to adapt the behavior of the player to customer requirements can now be made available in an organized way. Such modifications could include:

- Delayed start-up to accommodate pointing devices and peripherals with a long boot time (e.g. Touch Screens)
- Lock functions to disable playing CD-DA discs or to allow only playing discs provided for by the company.
- For security reasons companies might want to make discs which will behave completely differently on authorized and non authorized players.
- Disable Option access for unattended use or disable IR. pointing devices for multiple CD-I player environments.
- Company name or special message during start-up.

This is in a nutshell the new features of the CD-i 490. The multiple enhancements are making of this player the most versatile player for use in professional environments, especially in POI/POS systems.

Gerard Smelt

■ The TCM keydisc

Once a point of sales or a point of information is in the field, there is no way to check if the gear is doing what it has to do. It is simple to imagine a player playing the last hits instead of the sales application or a player running an adventure application as replacement of the info application. These scenarios aren't possible anymore with the CD-i 479/490 players Philips developed. In combination with a keydisc, these players can be instructed to only the disc the gear is intended for or to refuse CD-DA discs. In addition to these locking features, the player can lock or unlock the option button, display customer specific messages and recognize touchscreen displays.

First of all there is the key disc. This disc is only supplied by Philips and has a unique code embedded for each customer.

TCM function

In normal circumstances —without protection— an application on disc has the same name as it's entry in the File Structure Volume Descriptor (FSVD). When starting a CD-i application, the file name and directory path of the application is read from the FSVD. The file loads into memory and the first module in the file starts executing.

The protection mechanism consists in allowing a difference between the FSVD and the applications' file name. A normal player will not be able to play such a disc as it doesn't find the application —with it's name adapted— that corresponds to the entry in the FSVD. Only a player able to filter out the difference between both names will play the disc. The difference between both names is created by adding a postfix to the original name:

```
Adapted name=
      "FSVD name"
  &   "company dependent part"
  &   "variable code"
```

A protected file name on disc with 'cdi_show' as FSVD-entry would become:

```
Adapted name=
      "cdi_show"
  &   "LOCK"
  &   "0001",
```

resulting in 'cdi_showLOCK0001' as filename on disc.

The variable code in the adapted file name can be used in many different ways: as identification number of the application, as chapter number when the total package has one application per chapter, as security level,… The player holds the 'company dependent part' together with a list of four digit numbers (equivalent to the adapted application names on disc) and only plays the discs that have a number from this list in their adapted application name.This content of the list depends of the applications the player may or may not run. The player simply ejects the disc where the application name doesn't match one of the entry's in the list and displays an appropriate message on screen.

The TCM Keydisc.

When inserting the keydisc in the player, the following features become available:

- Create or delete the '.mbsc' postfix file in non-volatile RAM. The '.mbsc' postfix file contains the list of disc numbers the player may play. The player goes in lock when it finds a '.mbsc' postfix file in memory.

- Edit the entries in the '.mbsc' file. The numbers are entered or edited in an input list in the playershell of the CD-i player.

- Create customer specific messages. The message entered here is displayed each time the player detects a disc it is not allowed to play.

An example

The company Notgoodenough distributed her product information to the dealers on CD-i discs (mastered with TCM in mind). The complete set, divided over several discs, consists of a documentation part, a sales training, technical instruction, et cetera. Notgoodenough also ordered a keydisc with PRO1 as company dependent part. The player of the sales people was locked to the sales training and wouldn't play any of the discs they received except the sales disc. Suppose the adapted name of the sales application was 'salesPRO10004', then the entry in the '.mbsc' file would be '0004'. The player of the technical staff may access the documentation (with docPRO10002 as name) and the technical disc (with techPRO10007 as name). The contents of the '.mbsc' file in their player would be '0002' and '0007'.

Secondary locking function

Unfortunately, the locking features just described are only applicable to CD-i discs. In some cases the locking features can't be implemented on a CD-i title due to limitations in the pre-mastering step. It is even so that this locking method can't be implemented on Video CD's. To overcome this drawback, a secondary protection mechanism is implemented in the player.

The mechanism is similar to the TCM system but uses other data to check permissions. When locking is enabled and there is a '.mbsc' file in memory with at least one entry, the inserted disc is searched for adapted filenames. In case no names are found, the player checks the four first characters of the 'Publishers string' in the FSVD on disc. When they match the with the code in the '.mbsc' postfix file, the disc will play. Else, the disc is ejected and the customer specific message appears on the screen.

The major difference between both locking systems is that the TCM function connects the disc(s) to a particularly player while the second system locks the player to a particularly disc. In the first case the disc(s) won't play on other players and the player won't play other discs, while in the second case the locked player will only play the protected discs with the major difference that these discs can play on any other player.

Additional functions

Except for the CDDA disable function, TCM holds other non-disc related functions for protection and/or locking. The CDDA disable function is rather straight forward: when TCM locking is enabled, the player refuses to play audio discs. Note that it is also possible to lock out or enable audio discs via the keydisc. An other function is the trade mode. In trade mode the player will automatically activate the 'play' icon on every screen showing the icon. Besides this the player also desactivates the option button. Note that it is also possible to lock the option button via the keydisc.

Keydisc functions

When the keydisc application is running, the screen gives access to the functions described hereafter. They can be enabled and disabled separately from within the keydisc application. These functions are , of course only accessible when the code of the disc match the code stored in the player. All settings made in the keydisc application are stored in the file '.keycontrol' in non-volatile RAM.

- Customers text: the user can enter a two lines of text (79 characters maximum) that are displayed during startup of the player.
- Touch screen recognition: when enabled, the startup procedure of the player is delayed to allow the touchscreen to finish it's initialization.
- Option button: this function shows or hides the option button in the settings screen thus enabling or disabling the access to the option screen.
- Disc locking: enables disc locking on application name and publisher field.
- Disabling CDDA: enables or disables playback of audio discs.
- Intro animation: this setting makes the selection between three screens displayed during startup of the player. The first screen is the default PHILIPS startup screen. The second possibility shows nothing during startup while the third selection displays the text entered in the 'customer text' during startup.

Teit Uldal

■ Starting MediaMogul without CD

MediaMogul can be started without the MediaMogul CD, to allow developers to easily exchange MPEG CD's while using the ScriptWriter. This technique works on any Macintosh or Windows installation of the I2M authoring card and a fully installed copy of

MediaMogul on the host's hard drive.

The procedure for enabling this feature is as follows:

1 In your favorite text editor —in Windows or on the Mac—, open the file `Strt_MM`, located in the MediaMogul folder on the host hard drive. In the original file, the last line reads:
`ex optshell /cd /h0` or something similar.
Edit the last line so that it reads:
`ex optshell /h0 /h0` and save the file.

2 Start CDIPlayback.

3 Put CDIPlayback in the 'CD-RTOS' mode, and then 'reset' CDIPlayback.

4 When CDIPlayback presents the $ prompt, type the following at the prompt:
`copy/cd/CDI_MEMO/h0/CDI_MEMO` (press return)

Make sure that you type the above EXACTLY - spelling and case are important!

5 That's it! Take the MediaMogul CD out of the CD drive, and start up MediaMogul as usual. Notice that it no longer gives the 'business' about needing the CD to start up, and MediaMogul appears just the same!

From the Web

How to contact Philips Media Systems

For support:

- **USA**

  Philips Professional Support
  7185 Vista Drive
  West Des Moines, Iowa 50266
  USA
  Tel.: +1 515 225 7000
  Fax.: +1 515 225 0252
  E-mail: support@cdprosupport.com

- **Other area's**

  PIMC
  (On behalf of Philips Media Systems)
  Support
  Maastrichterstraat 63
  B-3500 Hasselt
  Belgium
  Tel.: +32 11 242546
  Fax.: +32 11 242273
  E-mail: support@pimc.be

For Authoring equipment distribution:

- **USA**

  Philips Professional Support
  f.a.o. Brad Lundy
  7185 Vista Drive
  West Des Moines, Iowa 50266
  USA
  Tel.: +1 515 225 7000
  Fax.: +1 515 225 0252
  Email: bradl@optimage.com

- **Other area's**

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

Editorial:

ie@pimc.be

Interactive Engineer
is a publication of Philips Media Systems
Its purpose is to provide up-to-date information on CD–i technology to all supported developers and PMS software engineers.