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MetaMatters

FOCUS: Peripherals controlled through parallel ports

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During a time lapse imaging experiment, it is often necessary to stimulate or perturb the preparation by, for example, opening or closing valves or by stimulating electrically or optically. MetaMorph®/Metafluor® software is able to control such devices directly during an experiment. The only requirements for this control are a) that the computer running MetaMorph software is equipped with a parallel port, and b) that the device to be controlled can be addressed with one or more 5 volt TTL signals. Most commercial devices meet this requirement. Device control is handled in MetaMorph software through basic journal commands that can be placed on a toolbar. In my lab, we use parallel ports to control a Xenon flash lamp (Flashmic, Rapp Optoelektronik) and a valved manifold (Valve Driver II, Parker Hannifin General Valve) to change the solution flowing over our cells. We use MetaFluor software for time-lapse imaging, but the identical steps can be used within MetaMorph software to control devices.

Hardware Configuration

The interface to the parallel port has 25 pins, and 12 of these pins can be used to send signals to devices. (MetaMorph software knows which 12 pins can be used and only presents those pins in its dialog.) Firing the flash lamp, for example, requires that we send a single, brief positive pulse to the controller along one pin. Our flash lamp controller is equipped with a BNC connector to receive the pulse input. To connect the computer to the controller, we use a standard 25-pin parallel cable, a 25-pin breakout board and a regular coaxial cable equipped with BNC connectors. One end of the parallel cable is connected to the computer's parallel port and the other to the 25-pin receptacle on the breakout board. The breakout board allows us to connect one end of the coaxial cable to whatever parallel port pin we choose. We cut one BNC connector off the cable, strip off the insulation and separate the ground from the signal wire. We connect the signal wire to the screw terminal labeled with the pin number we want and the ground to any one of terminals 21-25 (*Fig. 1*). The other end of the cable is connected to the BNC connector on the controller.

Fig. 1 One method to connect one line of a parallel port to equipment having a BNC connector. The end of a parallel cable (top) mates with the connector on the breakout board. A BNC connector-terminated coaxial cable has had one connector cut off. The signal wire is connected to pin 4 and the shield (ground) connected to pin 21. The BNC connector at the other end of the cable goes to the external control in of the device to be controlled.

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MetaTool Tips:
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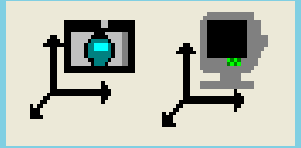

Introducing Bruce Gonzaga...

The free MetaMorph® Software Basics training course is April 20 & 21, 2010!

Bruce Gonzaga manages QA and customer support. He has been with the Meta Imaging Series® group for 15 years. In his current role, he has helped many current users find the best way to make use of their MetaMorph software and get the most out of the acquired images. Some may recognize him from his role as teacher in the MetaMorph software training courses in Downingtown, PA or as part of the MetaMorph team at the many imaging courses MetaMorph software supports.

Bruce Gonzaga

From the Desk of Chris Kier

The MetaMorph® Software Advanced training course is April 22 & 23, 2010!

To efficiently utilize our support and development resources we will be curtailing support for MetaMorph® software versions earlier than version 6. There are two main reasons for this decision:

→ The last update for version 5 was issued more than seven years ago, and the sheer numbers of changes to the software make it difficult for our staff to possess the knowledge base to sufficiently support these older versions.

→ Windows operating systems compatible with early versions of MetaMorph software are no longer available for purchase, and Microsoft no longer supports these older operating systems.

Existing information, application, and technical notes for these earlier versions of MetaMorph software will remain on our web site.

We encourage all of our customers to upgrade to the current version of MetaMorph software and benefit from the additions and improvements that have been made to the package over the last several years. **To make this transition easier, we will be offering upgrades for all earlier versions of MetaMorph Premier software for $2000.** This is a 20% discount from list price. Orders can be placed directly with MDS Analytical Technologies or through any of our partners. A list of our distribution partners and details of the latest version 7 release of MetaMorph software can be found on our web site, link information is located on the back page of this issue.

Come visit us at the American Society for Cell Biology meeting in San Diego! Booth #1313

NEW in MetaMorph® Software version 7.6

AutoAlign Application Module

→ **Compensate for stage shift, vibration or similar small whole field movement that can occur during a timelapse. AutoAlign can be used on a stack of images or on a Multidimensional Data set.**

Multidimensional Motion Analysis Application Module

→ **Track the movement of living cells in 3-D over time. Autolocate the initial objects to be tracked. Track new objects as they enter the field of view. Track objects based on morphometric measurements.**

Hardware Drivers

→ **Lumencor Light Engine**

→ **Many new camera drivers available**

MetaMorph software is available through our distributors: www.moleculardevices.com/pages/distributors.

FOCUS: Peripherals controlled through parallel ports

Installing and configuring the Parallel Port Device

(continued from page 1)

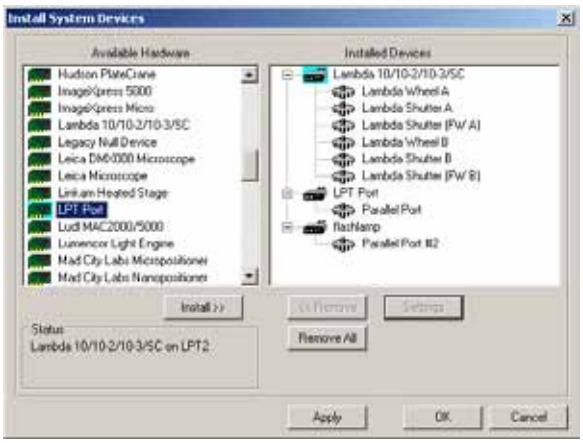

Fig. 2: Adding a parallel port device in Meta Administrator.
Installed Devices shows two parallel ports, one of which has been renamed flashlamp.

To use the parallel port, we need to add it as a device using the Meta Administrator. Open the administrator and click on Configure Hardware, Install System Devices. Scroll down to and select LPT Port. Click Install and the LPT Port will appear in the list of Installed Devices. You can change the name LPT Port to something useful, like Flashlamp (*Fig. 2*). Double click on Parallel Port and the properties of the parallel port will be displayed. Use the drop down labeled Port to choose the parallel port in your computer, here LPT2 (*Fig 3*). Unless you know that your device requires the pin to drop from high (5 V) to low (0 V) rather than low to high (much more common), you do not need to check any of the boxes next to the list of Output Pins. You can OK your way out of the Administrator. We are now ready to write the journal to control the flash lamp.

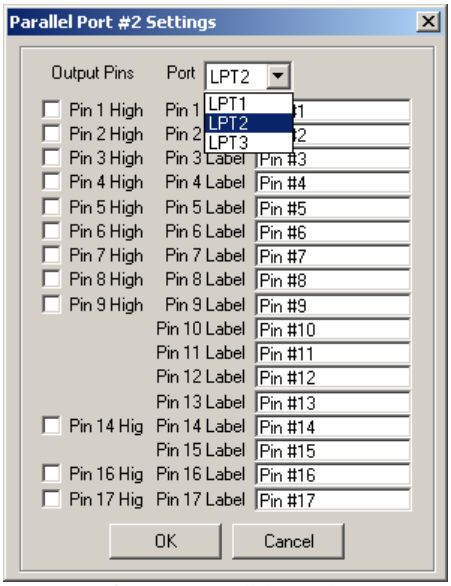

Fig. 3: Configuring a parallel port device in Meta Administrator. The device has been assigned to LPT2.

Firing the flash lamp with Journals

Fig. 4: Send DIO Data dialog. All pins of the Parallel Port device have been set off, i.e. low.

To fire the flash lamp, we need to send a brief TTL pulse to the flash lamp. This journal assumes that the flash lamp has been linked to the parallel port on pin 4. In MetaFluor software, we create a journal by clicking Journal, Create Journal and save it with a name (Fire flash lamp). This action will bring up the Journal Editor. The MetaFluor software command to change the voltage on a parallel port pin is Send DIO Data. (In MetaMorph software it is Set Digital I/O). In MetaFluor software, scroll down the alphabetical list of commands to Send DIO Data and drag it into the functions area of the Journal Editor. Double clicking the Send DIO Data entry will bring up the dialog where the pin(s) we need can be set (*Fig. 4*). In Device Name, choose the name that you used when you created the parallel port device. The dialog displays the 12 pins we can set high, and allows four actions for each pin: turned off (set low), turned on (set high), toggled from its current state to the other, or ignored. Push the All Off button to ensure that no pins other than pin 4 will be set high, then set pin 4 to On. OK out of the dialog. When run, this journal will set pin 4 high, and leave it high. To enable the flash lamp to be fired again, we need to set the voltage low again on pin 4. We drag another Send DIO Data command into the journal below the first one. Open the dialog for this entry and click the All Off button. OK out of that dialog. Running the journal now will set pin 4 high and immediately set it low again. For our flash lamp, that is a pulse of sufficient duration to fire it. We'd also like to record the time at which the flash lamp was fired, so we scroll the alphabetical list of commands to Event Mark and drag it into the Functions area of the Journal Editor below the Send DIO Data commands. Double clicking on the Event Mark entry brings up the Event Mark Dialog, where we can enter "flash". Save the journal. We can add it as a button on a taskbar. During an experiment, when the button is clicked, the flash lamp will fire and an event mark will be made to record the time the lamp was fired.

Help! My new computer has no parallel ports!

With the advent of USB ports, fewer and fewer new computers come with parallel ports. Inexpensive parallel ports that fit into a PCI or PCIe slot are readily available, and are treated identically as native parallel ports. However, it is useful to know that Meta only recognizes the first 3 parallel ports in the machine. USB to parallel port devices are also available. However, the latency between sending the command to the USB port and the time the pin is set high may be unacceptably long for inexpensive USB to parallel port devices.

Controlling a device such as a flash lamp via a parallel port involves controlling one pin. Other devices, such as the Valve Drive we use to change solutions, require that a combination of pins be set high. We also need to turn one solution off when turning another one on. This process is identical, but involves several Send DIO Data journal commands. It is easy to see how this kind of control of peripheral devices through the parallel port enables experimenters to control such devices as behavioral apparatus, lighting, pico-spritzers easily from within MetaMorph or MetaFluor software.

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About MetaMorph® Software MetaMorph® software is the leading, world-class image acquisition and analysis software. Combining the most flexible and powerful tools for image acquisition, processing, and analysis, MetaMorph® software offers a complete solution for even the most demanding live-cell imaging needs.

About MDS Analytical Technologies

MDS Analytical Technologies, a business unit of MDS Inc., is focused on the research, design, manufacture and marketing of state-of-the-art tools for mass-spectrometry, drug discovery and bioresearch. MDS Analytical Technologies' products are designed to help accelerate the complex process of discovering and developing new drug compounds, and are sold to research scientists around the world. The mass-spectrometer product lines are also sold globally through joint ventures with two of the world's leading analytical instrumentation and life sciences companies, Applied Biosystems, Inc. and PerkinElmer, Inc. Find out more at www.mdssciex.com or www.moleculardevices.com.

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