

XMILLY: Rapid photometry data acquisition and control

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1 Introduction

XMILLY is a program for obtaining multichannel rapid photometry. Integration times from 1 millisecond to 60 seconds are supported for a maximum of four channels. It will run on any PC running Real Time Linux and fitted with the appropriate time and photometer control cards. XMILLY runs in X-window mode; the observer is free to use the PC for other tasks even when XMILLY is integrating.

When XMILLY is running, two windows are displayed. One is used for control and interaction with the observer (the *XMILLY* window; Fig. 1) and the other displays the count rate so that the observer has a visual assessment of the quality of the data (the *monitor* window; Fig 2). Only one of these windows will be visible on the screen, but a simple mouse click will bring the other into view. In order for the displays to be more accessible to the observer, two visual display units are available in the dome. Both VDU's show the identical picture, but while one is attached to the PC in the warm room, the other can be placed in a convenient location so that it is visible from the telescope.

Observing with XMILLY is simple. There are two steps involved (i) start X-windows, (ii) tell XMILLY which photometer you are using. After the filter wheel has been initialized and the time synchronized using the one-minute pulse from the time service, you are ready to observe. The only control function of XMILLY is to initialize the filter wheel and to set on any desired filter.

Normally, one should instruct XMILLY to record the data. Each night, is assigned a file name based on the last four digits of the Julian date. If the program has to be re-started during the night, data can simply be appended to the existing file. At the end of the night, data should be e-mailed to the user's home computer or stored on a diskette. Programs are available to re-reduce and plot the data. For integration times shorter than 500 milliseconds, data is recorded only in binary form. A program `bin2asc` is available to convert this file to ASCII if required.

Time is provided by the SAAO time service to XMILLY via the time card; time provided by the PC clock is not used. However, the date given by the PC is assumed to be correct.

2 Starting Linux

You should normally leave the PC running Linux. When the PC is switched on, it will automatically boot into Linux mode. You require a username and password to use the system. These are

Username: `ccd`

Password: ???

You should ask the responsible astronomer for the correct username and password in case this has changed. Next you must start X-windows if it is not already running:

```
startx
```

The screen will blank out and a blue background will appear. On the top left hand of the screen you will see the `pager` window consisting of a small square subdivided into nine smaller areas. Next to it will be a display of the date and time according to the PC. It may not be too accurate, but this is not a problem because `XMILLY` obtains the correct time from the SAAO time system.

The `pager` window is a visual representation of the nine virtual screens that may be used. In other words, you can click on any of the nine squares to display a different virtual screen. The two display units can only display identical pictures and should not be confused with virtual screens. You can think of a virtual screen as if there are nine screens arranged in a square, only one of which is actually visible. For example, you may have `XMILLY` in one screen, the monitor on another screen, `Netscape` on a third screen and an `xterm` window on a fourth screen. You can display any one of them on both display units by clicking on the appropriate square in the `pager`.

Start an `xterm` terminal window by clicking the left button of the mouse and choosing `Connections` and `Xterm`. At this stage you can examine the contents of your account. The convention that we have adopted at SAAO is that users of the `ccd` account should create a subdirectory in which to store their data files. In other words, you are free to delete any loose files in the main directory, but be a little more circumspect in deleting subdirectories unless you are running short of space. The `df` command will tell you how much disk space is available.

Create your subdirectory, choosing an identifiable name (your username at SAAO or elsewhere would be a good choice) and go to that subdirectory:

```
mkdir lab
cd lab
```

(omit the `mkdir` command if you have already created the directory). This is where your data files will be stored. Whenever `XMILLY` is started, it will store data at the place from where it is invoked. Every time you login, please make sure you are in the proper subdirectory before starting `XMILLY`.

3 Starting `XMILLY`

To start `XMILLY`, type

```
xmilly
```

from an `xterm` window. This will start up the monitor (Fig. 2) and the photometer select (Fig. 3) windows. Both will appear simultaneously (sometimes the monitor window will obscure the photometer select window). You must click on the bar of the monitor window and drag it to a separate screen. Just slide it off the edge of the screen, click on the `pager` to the screen you are sliding it to, and position it on that screen. By clicking on the `pager` you can now bring either the monitor or photometer select windows into view.

The photometer select window has a button labeled *Photometer* and displaying *Manual* as the selected photometer. You need to click on this button to display a drop menu listing all available photometers. At the moment they are



Figure 3: The photometer select window.

Manual
Modular
STAP
UCT

The manual photometer assumes that control is entirely by hand, and photometer control is disabled. Select the photometer you want. As soon as you have chosen the photometer, the XMILLY form (Fig. 1) will appear and remain there until you exit from XMILLY. Depending on the choice of photometer, a *Filter Wheel Initialization* form will appear. After a while, it will disappear on successful filter wheel initialization. Next, you need to wait until the minute pulse arrives. Notice that the SAST is continuously displayed on the box in the bottom right. Before the minute pulse arrives, the time is in red; afterwards it is in black. In this box there is some information on the altitude of the Sun and Moon and lunar phase.

4 Counter selection

By default, it is assumed that the photometer is connected to counter 1 (counters are numbered 0, 1, 2 and 3 on the SAAO photometry card). If you need to change this value, or for multichannel use, click on the **Counters** button. Set or unset the check box next to the counter(s) you wish to use.

5 Starting and stopping an integration

You need to decide whether you are going to record the data in a local file or not. To record data, click on the **Disk** button and select **Record on Disk**. If you have been recording, but which to stop doing so, select **Stop recording**. A form giving the default file name will be displayed. You may change it if you wish, or else click on **OK** to proceed.

When you are ready to start an integration, click on the **Object** button. This will display a form in which you should type in the name of the object, the RA and DEC and the integration time (in milliseconds). Click on **OK** when you have finished. To start the integration, click on the **Start/Stop** button or flick the switch on the photometer to the up position.

To stop the integration, click on the **Start/Stop** button or flick the switch on the photometer to the down position.

Each integration is assigned a run number. All runs are recorded together on the same file.

If the integration time is less than 500 milliseconds, each run will be recorded as a separate binary file. If the normal filename is, for example, `m1501.dat`, the

binary files will be given names `m1501.001`, `m1510.002`, etc. according to the run number.

6 Printing

There is no facility for using the on-line printer. Since it is very easy to scroll backwards and forwards on the left panel and to insert comments at any point, there is no longer a need for a printer. If you insist on a printout, please print the file to a Laserjet printer on site.

7 The monitor window

The purpose of the monitor window is to display the count rate in an analog fashion so that the state of the data can be assessed at a glance. Every second during an integration the screen is refreshed with the data points moving from right to left. Scaling is made automatically from the count rate during the first second, but the observer can change the scale and the offset in both X and Y. In this version, only the first channel is displayed.

Several numbers are displayed across the top bar. The numbers labeled by `Min` and `Max` are the minimum and maximum counts that are visible in the graphics area. `IntTime` is the integration time in milliseconds. The `SAST` is displayed in the middle of the bar. Next is the current run number. Finally, the number of integrations are given (`Cnt No`). The graphics area is cleared before the start of an integration.

By default, a maximum of 4096 integrations can be displayed. The time axis can be expanded by moving the slider marked `X-scale`. In the same way, you can change the Y-magnification by moving the slider marked `Y-scale`. It may be convenient to scroll the display in the X- or Y-axis. This is accomplished by clicking on the sliders labeled `X-zero` and `Y-zero`. To reset the display to the default X and Y magnifications and offsets, click on the `X-Reset` and `Y-Reset` buttons.

8 Terminating XMILLY

`XMILLY` can be terminated gracefully at any stage by clicking on the `Exit` button. You need to click on the `Exit` button on the monitor as well.