PyMidas
- A Python Interface to ESO-MIDAS

ABSTRACT

Finland joined the European Southern Observatory in 2004 and part of its joining fee was a contribution in kind of software expertise. This significant resource, called the Sampo project, will be devoted to exploring the options for the future of data reduction and analysis in an ESO context, to understanding user requirements and to performing a series of major pilot projects to investigate different technologies, approaches and architectures. The Sampo project will run for three years and aims to prepare the ESO community for the data analysis and reduction challenges of the next decades.

The first major Sampo project was the development of an interface from Python to the ESO-MIDAS data analysis and reduction system. This paper describes the motivation for PyMidas, how it has been implemented and gives some examples.

BACKGROUND AND MOTIVATION

Over the last few years the Python language has become very popular within astronomy. It is a stable, robust and freely-available fully-functional, object oriented scripting language that is equally suitable for tiny test scripts and major software projects. It also appears to be a language which both working scientists and professional software developers are happy to learn and use. Work by many groups is providing the additional packages, such as numarray and Matplotlib, which are needed for truly useful astronomical application and finally connections to other major legacy astronomical software systems are emerging, most notably PyRAF where the IRAF "cl" has been replaced by Python.

Although it has not been extensively developed for some years, ESO-MIDAS remains a widely used general purpose astronomical data processing system in the ESO community. MIDAS, like IRAF, represents a huge body of stable and tried-and-tested software built in a software environment that was designed several decades ago. As an initial Sampo project, which would introduce the Sampo team to many aspects of astronomical software and also lead to a useful pilot product, we therefore decided to develop PyMidas - a Python interface to ESO-MIDAS.

ARCHITECTURE AND IMPLEMENTATION

A primary requirement for PyMidas was that it would use a standard MIDAS installation without the need to rebuild the applications base. It was also important that an experienced user of MIDAS could easily adjust to PyMidas without a significant learning curve. The architecture which has been adopted uses a background MIDAS process to which commands are sent from Python, via a small compiled "C-layer". This design allows Python scripting but also retains the ability to execute MIDAS procedures, which are executed entirely within the background MIDAS process.

The architecture of PyMidas is shown in detail in Figure 1. Text files are used for part of the communication but sockets are also used. This model makes it easy to redirect all the text output from a MIDAS command back into a Python list object. Several utility methods are available within PyMidas to provide convenient access to the MIDAS keyword database, image pixels and headers and MIDAS tables.

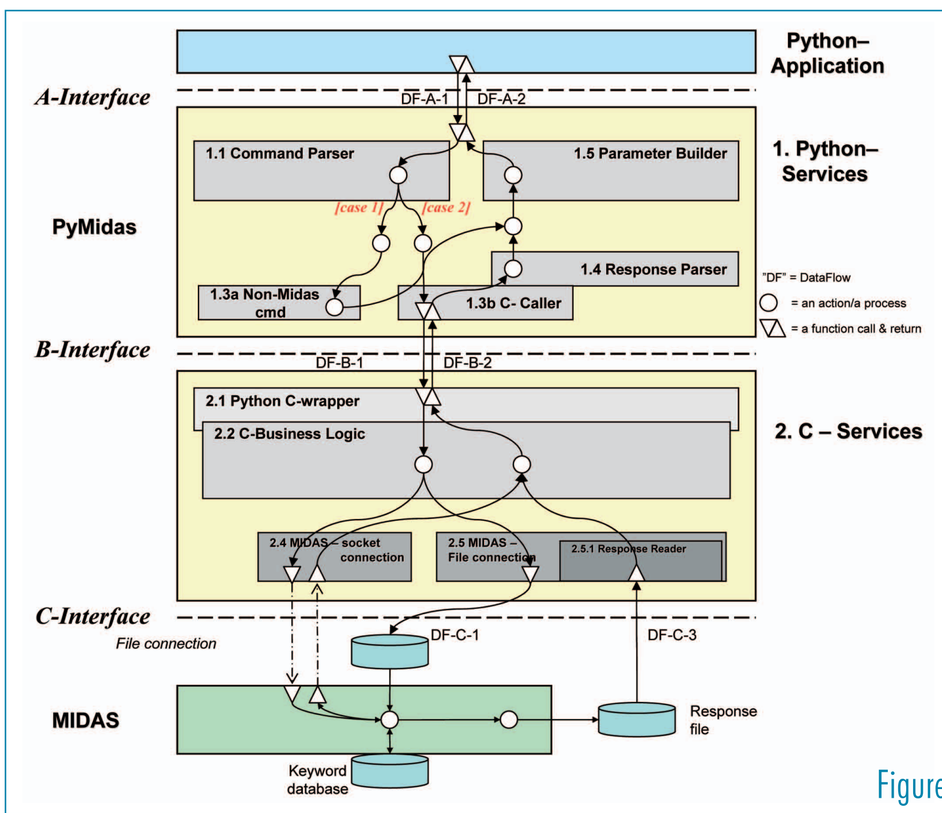

Figure 1

PyMidas allows MIDAS commands to be invoked using three simple syntaxes. Firstly there is a standard syntax for interactive use from Python. This requires a small change from the standard MIDAS syntax, to avoid the use of the "/" separator. This mode allows full use of Python facilities. In addition there is a "mimic mode" that allows the use of exactly the same syntax as traditional MIDAS, at the expense of Python features. Finally PyMidas may be imported as a standard Python package for use alongside other Python packages and systems such as PyRAF.

PyMidas was developed on Linux Fedora Core 3 but has also been successfully installed on other systems. The main requirements are Python 2.3 or later, along with normal packages such as Distutils, gcc and MIDAS 05JUN or later. At present PyMidas requires a new and unreleased version of MIDAS with some small changes at the system level, but all future releases of MIDAS will automatically support PyMidas. More details of requirements and installation instructions are available through the PyMidas web page link given below.

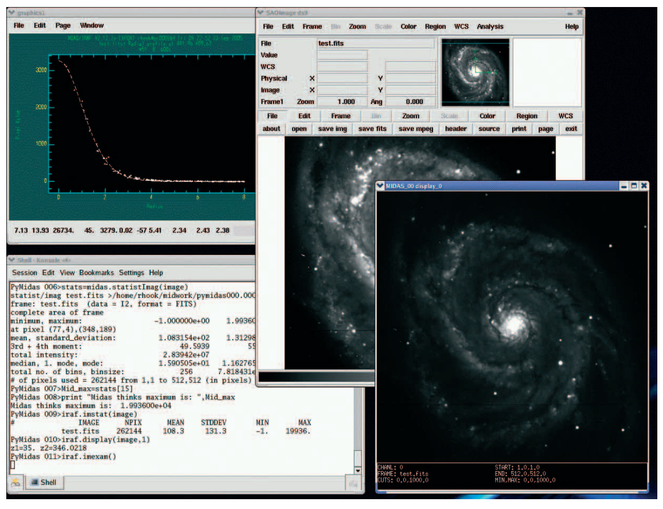

Figure 2

EXAMPLES

Figure 2 shows a typical interactive PyMidas session in which different modes are exercised and both PyRAF and MIDAS tools used.

The following short Python code snippet shows how PyMidas allows IRAF and MIDAS commands to be conveniently mixed, and information exchanged between them and Python internal variables. Some lines have been omitted for clarity:

```
### A simple test script for PyMidas

# Load both PyMidas and PyRAF Python packages
from pymidas import midas
from pyraf import iraf
import os

# Main module
def run(image=None):

    # Default IRAF image of M51 if none specified
    if image == None:
       os.system('rm test*.fits')
       iraf.imcopy('dev$pix','test.fits')
       image='test.fits'

    # Get image stats from both MIDAS and IRAF
    midas.do('stat/image '+image)
    iraf.images()
    iraf.imstat(image)

    # Create the MIDAS image display
    midas.createDisp()

    # Display the input image using MIDAS
    midas.loadImag(image,'cuts=0,1000')

    # Set some names for output files
    outdr='test_drz.fits'
    outwt='test_wht.fits'

    # Loop over a range of angles
    for angle in range(36):

       print " ***** Angle is: ",angle*5.0," ******"

       # Rotate the image using drizzle in IRAF/STSDAS
       iraf.drizzle(image,outdr,outweig=outwt,scale=1.0+angle/10.,\
        kernel="turbo",rot=angle*5.0,outnx=512,outny=512)

       # Add an offset value using MIDAS
       midas.computeImag(outdr+' = '+outdr+'+'+str(angle*20.))

       # Load the image with MIDAS
       midas.loadImag(outdr,'cuts=0,1000')
```

DISTRIBUTION AND SUPPORT

PyMidas has been developed as an experiment within the context of the Sampo project. As such it is not a formally supported piece of ESO software. However, we are happy for anyone to download, install and use it without any support obligations. The current release is available from the PyMidas link given in the references below. We also plan to distribute it in future with ESO-MIDAS distributions, starting in Autumn 2005, and also as part of the ESO Scisoft software collection.

REFERENCES

PyMidas:	www.eso.org/sampo/pymidas
ESO-MIDAS:	www.eso.org/midas
Sampo:	www.eso.org/sampo
Scisoft:	www.eso.org/scisoft
PyRAF:	www.stsci.edu/resources/software_hardware/pyraf
Python:	www.python.org
numarray:	www.stsci.edu/resources/software_hardware/numarray
Matplotlib:	matplotlib.sourceforge.net

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