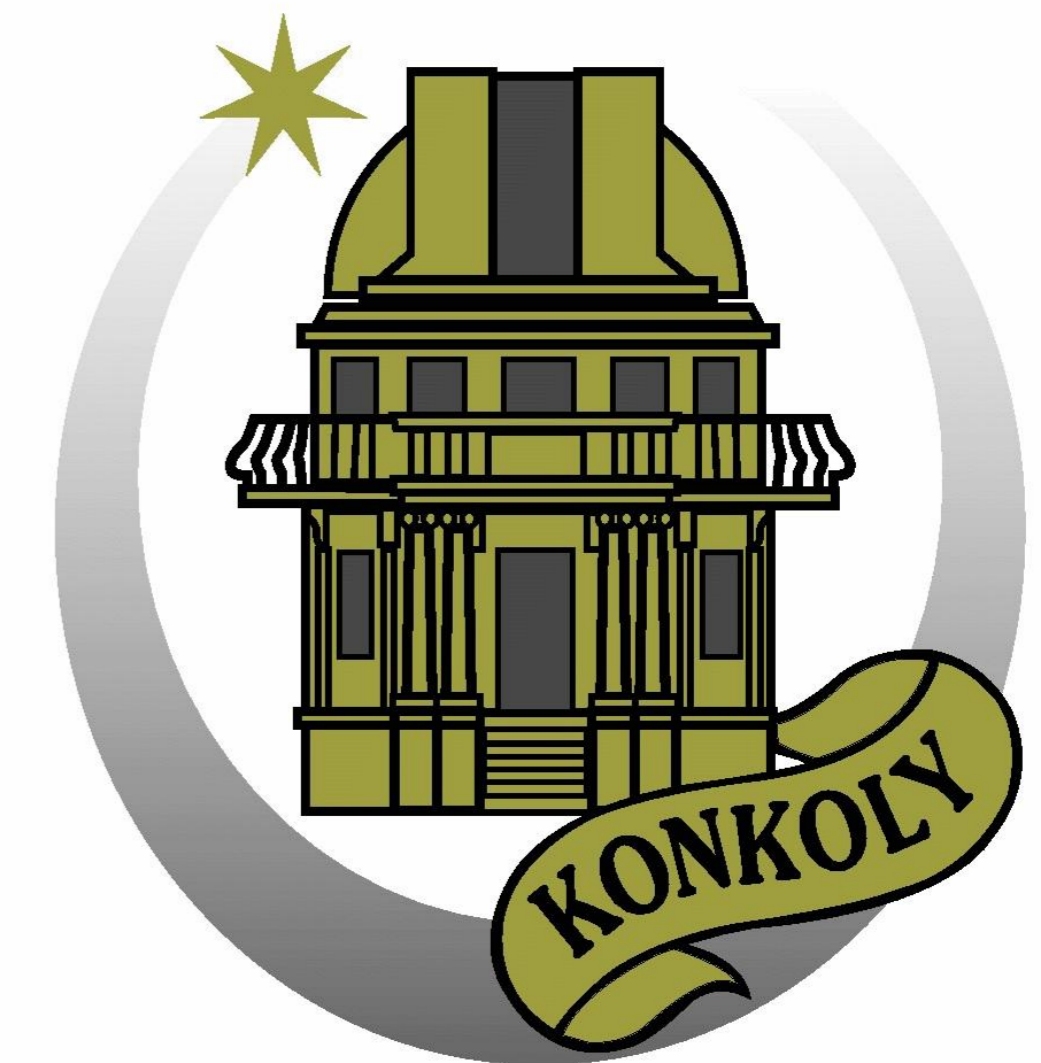


# MuFrAn – A scriptable data processing tool for variable stars



Zoltán Csubry & Zoltán Kolláth  
 Konkoly Observatory  
 P.O. Box 67. H-1525 Budapest, Hungary  
 csubry@konkoly.hu, kollath@konkoly.hu



COROT Week 8  
 May 24-27, 2005, Toulouse, France

## Abstract

We present the properties of a new software developed for examination of multi-periodic signals. The program package MuFrAn disposes a user-friendly graphical user interface and an extended Tcl/Tk script language suitable for definition of complex and repeatable tasks, and creating publication-quality Postscript figures. We implemented the standard frequency analyzer applications (FFT, DFT etc.) in our program, furthermore sample scripts (for example Intelligent Clean) are included. We show the efficiency of this package by means of analyzing sample data.

## Appendix

We present a portion of a report automatically created by MuFrAn. We processed the light curve of  $\Theta$  Tucanae, a  $\delta$  Scuti type star, using a relatively simple script. The steps of the classical whitening procedure (FFT, peak selection, linear and nonlinear fit of frequencies and amplitudes, whitening) was automatically executed, and can be followed in this  $\text{\LaTeX}$  document.

The processing of this data was originally published in 1996 (Paparó et al, 1996), and 13 frequencies was found in the spectrum. Now we did not go through the whole procedure, for we use it only for demonstrational purpose.

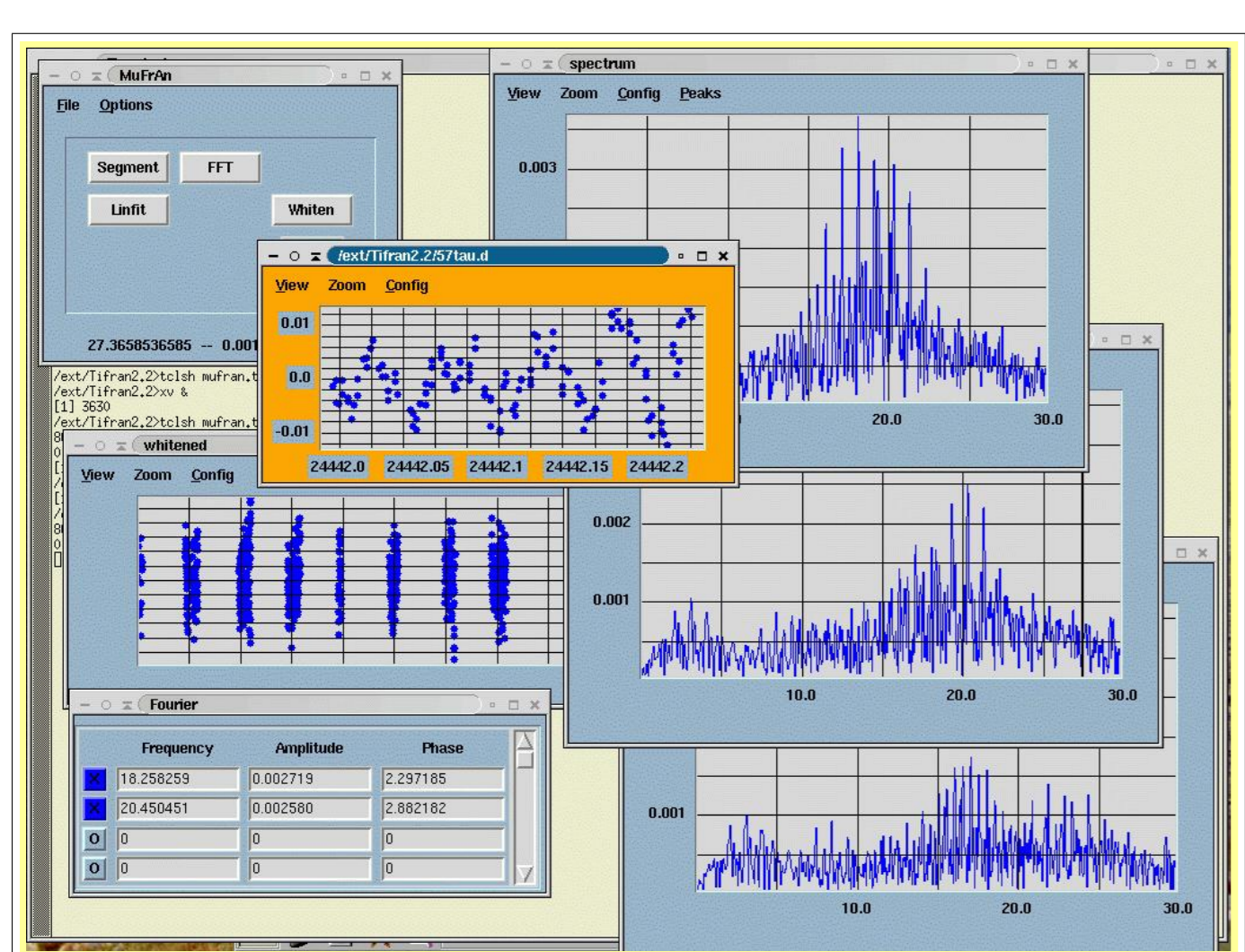
## The new MuFrAn

The previous version of the MuFrAn (Multi-Frequency Analyzer) package developed for analysis of multi-periodic time-series (Kolláth, 1990). That program can be used under UNIX systems. Simple data processing tasks can be easily performed with its interactive command line type user interface. It has minimal GUI capabilities based on Supermongo. Several variable star light curves was analyzed by its help.

The accretion of the amount of photometric data requires highly automatized but user controlled data processing tools. For this purpose we allied the efficient and fast algorithms of the old MuFrAn with the flexibility of another package TiFrAn (Time-Frequency Analyzer) also developed in the Konkoly Observatory (Csubry, 2002). With this combination we have obtained an effective data analyzer tool.

MuFrAn is now running on UNIX/Linux and MS Windows operating systems and requires installed Tcl/Tk package on the computer. The program is available freely for scientific and educational purposes on the Konkoly Observatory web page ([www.konkoly.hu/tifran](http://www.konkoly.hu/tifran)).

User-friendly interactive exertion mode is still available in MuFrAn. Simple tasks can be executed via these easy-to-use interfaces. The GUI itself is written in the extended Tcl/Tk language. In principle expert users can modify it, but we recommend the application of the pre-generated interfaces attached to the package. One of the example GUIs is shown in the figure below.



## Extended Tcl script language

The use of our script language is highly recommended for users proficient in programming. Performing complex and/or repeatable data processing tasks is possible with this option. Several low-level commands with Tcl compatible syntactics are defined to accomplish basic charges (data read/write, FFT, least square fit, etc.), high level macros are also available. MuFrAn can be controlled step-by-step through a command line interface or with complete executable scripts. Users familiar in the Tcl syntactics can easily write effective programs, even complete automatic data processing tools.

The script language of MuFrAn also gives the possibility to create publication quality Postscript figures of the light curves and power spectra. The size and the layout of the images can be adjusted with simple commands.

$\text{\LaTeX}$  output makes it possible to generate an easily readable report of the data processing, during script execution. Users have to build in some simple commands in their script to write comment and data into the document. Postscript figures also can be attached.

Sample programs are included in the package. The report generated by one such script is displayed in the Appendix.

## References

- Csubry Z., 2002, Publications of the Astronomy Department of the Eötvös Loránd University, Vol. 12., pp 117-122.
- Paparó M., Sterken C., Spoon H.W.W & Birch P.V, 1996, A&A 315, pp 400-410
- Kolláth Z., 1990, The Program Package MuFrAn, Occasional Technical Notes of the Konkoly Observatory

## Aknowledgement

This work is supported by Hungarian OTKA (T-038440).

