SEMESTER PROJECT: TELESTO AUTOMATION

SOFTWARE PART

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SUMMARY

- Initial state of Telesto Software
- What has been done ?
- Encountered problem
- Ressources used
- Works to do before reports
- What should we do next ?

INITIAL STATE OF TELESTO SOFTWARE



Here the Beast



INITIAL STATE OF TELESTO SOFTWARE

Use 3 software:

- OSBus Controler for shutter and mirror control.
- Maestro for pointing and positioning.
- TheSkyX Professional give a user friendly interface to communicate with Maestro and the camera control.

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OSBus Controler

TheSkyX Professional

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GOAL

- Having just one program that does everything we want.
- Having an easy way to point at different object in the sky including satellites
- Minimizing user error during starting and ending procedure

- Make a Command line interface.
- Make it able to track satellites for observation.
- Automate starting and ending procedure.

WHAT HAVE BEEN DONE: COMMAND LINE INTERFACE

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COMMAND

- start: launch all needed software, check communication with SkyX and connect camera
- help: give further information on a given command
- add_catalog: add a tle url or file path to add satellites data into the program
- target_celestial_body: point a known celestial object
- Target_satellites: point and follow a satellites based on its NORAD ID
- set_bin: set the binning of the next picture
- exit: close all software and disconnect camera (should be used after ending procedure)

WHAT HAVE BEEN DONE: TLE LOADING

Windows PowerShell

PS C:\Users\Voxa\Desktop\Cours EPFL\BA5\Projet de bachelor\TelestoInLine> py .\TelestoInLine.py C:\Users\Voxa\AppData\Local\Programs\Python\Python310\python.exe Welcome to the Telesto command line interface Type ? to list commands Telesto>start Running Skyfield 1.45

You start observation at : 2022-12-18 15:28:02.159845+01:00 Load debris files

Ready

Telesto>

WHAT HAVE BEEN DONE: POINTING AND TRACKING

- Take in charge basic theSkyX pointing
- Now can point and track satellites from tle files

WHAT HAVE BEEN DONE: IMAGE PARAMETERS



2 Windows	PowerShell			_	×
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HEADER CORRECTION: OBSERVER

ዾ Windows PowerShell

Windows PowerShell Copyright (C) Microsoft Corporation. Tous droits réservés.

Testez le nouveau système multiplateforme PowerShell https://aka.ms/pscore6

PS C:\Users\Voxa> cd '.\Desktop\Cours EPFL\BA5\Projet de bachelor\TelestoInLine\'
PS C:\Users\Voxa\Desktop\Cours EPFL\BA5\Projet de bachelor\TelestoInLine> py .\TelestoInLine.py
C:\Users\Voxa\AppData\Local\Programs\Python\Python310\python.exe
Welcome to the Telesto command line interface
Type ? to list commands
Telesto>start
Running Skyfield 1.45

You start observation at : 2022-12-19 13:24:11.290597+01:00 Load debris files

74 fv: Header of 00004069_flat.fits[0] in D:/Test/

- 🗆 X

File Edit Tools Help

Search for:	Find Case sensitive? No
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BITPIX =	16 / number of bits per data pixel
NAXIS =	2 / number of data axes
NAXIS1 =	4172 / length of data axis l
NAXIS2 =	4148 / length of data axis 2
EXTEND =	T / FITS dataset may contain extensions
COMMENT	FITS (Flexible Image Transport System) format is defined in 'Astronomy
COMMENT	and Astrophysics', volume 376, page 359; bibcode: 2001A&A376359H
BZERO =	32768 / offset data range to that of unsigned short
BSCALE =	1 / default scaling factor
OBSERVER=	'Tester ' / SBIGFITSEXT The name of the observer
ORIGIN =	'OBSGE ' / Description of location
TELESCOP=	'RiFAST-600' / SBIGFITSEXT The model Telescope
FOCALLEN=	2280. / SBIGFITSEXT Telescope focal length in mm
APTAREA =	282600. / SBIGFITSEXT Aperture area mm^2 less central obs
APTDIA =	600. / SBIGFITSEXT Aperture diameter in mm
SBUUID =	'{79a67dd1-709d-4956-a4fa-2229c0254263}' / Photo UUID
EXPTIME =	 / SBIGFITSEXT Total exposure time in seconds
SWCREATE=	'TheSkyX Version 10.5.0 Build 10305' / SBIGFITSEXT Name & version of s
COLORCCD=	0 / Non zero if image is from a color ccd
DISPINCR=	<pre>1 / Non zero to automatically display the image in</pre>
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IMAGETYP=	'Flat Field' / SBIGFITSEXT Light, Dark, Bias or Flat
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HEADER CORRECTION: OBJECT NAME

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ENCOUNTERED PROBLEM

- The control computer had a lot of problem, different version of python were installed leading to conflict why trying to running the program. Everything was clean.
- There is a design fault in the software that erase the offset parameters in the pointing models it wasn't fixed since.
- Bad weather that prevent testing.

WORKS TO DO BEFORE REPORTS

- Make verification for the tracking
- Make experimental measure on Telesto and program capacity

WHAT SHOULD WE DO NEXT ?

- Integrate the imaging in the program to avoid as much as possible to use the SkyX.
- Find a way to have a remote installation. There is an ssh server on the control pc but still need to turn on the pc and Telesto on the spot.
- Finish automation for starting procedure
- Create a virtual environnement for running Telesto safely

RESSOURCES USED

- Kent Barbey report to have the basis of the set-up.
- Skyfield python libraries to load tle and compute satellites position: <u>https://rhodesmill.org/skyfield/</u>
- Kennet Sturrock PySkyX_ks scripts: python interface to communicate with theSkyX: https://github.com/kenneth-sturrock/PySkyX_ks
- Kennet Sturrock himself to understand how his scripts works.
- Software Bisque Documentation to understand further how to communicate with theSkyX: <u>https://www.bisque.com/wp-content/scriptthesky/annotated.html</u>