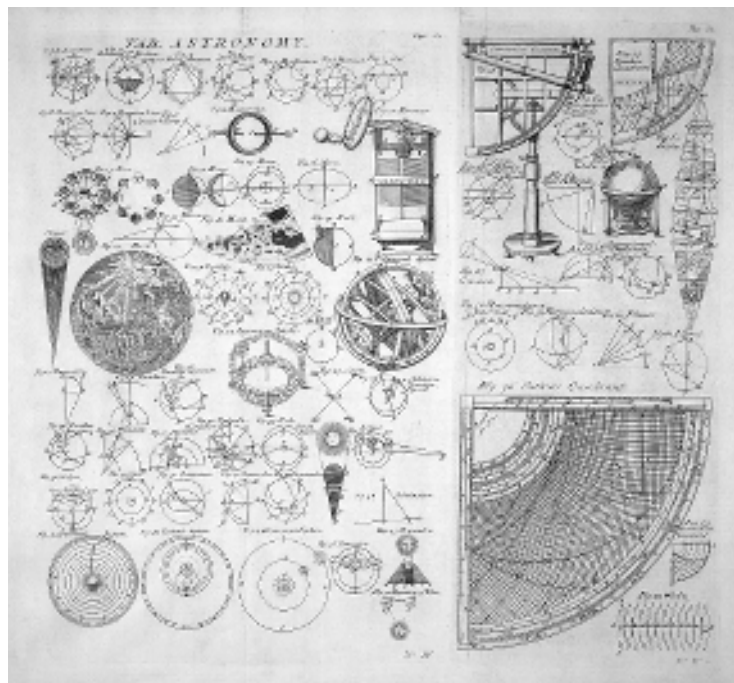


COS Astrolab

v0.9865_20140411

A guide to use of the App.



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1. Abstract

The COS Astrolab web application and its supporting website is intended as far as possible to produce a one-stop resource for astronomy, including data, calculations, and general information. The web site will also contain information on selected good open source software tools, or free software tools. The project will also document the development and support of the COS Astrolab multi function application that could be of general use to astronomers at all levels, using Javascript, HTML and any easy to use, free development tools, that may be found available. The aim is to use standard data and functions that can be re-used throughout the application as it grows. The documentation will always attempt to describe the simplest way to achieve this to for a wide audience.

2. Introduction

This project started out to combine years of experience supporting and developing computer applications with the study of Astronomy and Astrophysics, in an effort to document the development and support of a multi function application that would be of general use to astronomers at all levels. It is worth mentioning right now that when we refer to 'Astronomy' throughout this document we are using the term to cover Astronomy, Cosmology and Astrophysics.

Astronomy, Astrophysics and Cosmology have differing definitions. Astronomy can be described as the observational subject, Astrophysics attempts to explain the observations and Cosmology is the study of the Universe as a whole. As there is much overlap between in the subjects in books and courses, but as stated above, we will usually describe everything under 'Astronomy' for the purposes of this project. We have however included brief, but more detailed definitions below.

Astronomy is the science of celestial objects and phenomena that originate outside the Earth's atmosphere, such as stars, planets, comets, auroras, galaxies, and the cosmic background radiation. It is concerned with the formation and development of the universe, the evolution and physical and chemical properties of celestial objects and the calculation of their motions. Astronomical observations are not only relevant for astronomy as such, but provide essential information for the verification of fundamental theories in physics, such as general relativity theory. Complementary to observational astronomy, theoretical astrophysics seeks to explain astronomical phenomena.

Astrophysics is the branch of astronomy that deals with the physics of the universe, including the physical properties (luminosity, density, temperature and chemical composition) of astronomical objects such as stars, galaxies, and the interstellar medium, as well as their interactions. Because it is a very broad subject, astrophysicists typically apply many disciplines of physics including, but not limited to, mechanics, electromagnetism, statistical mechanics, thermodynamics, quantum mechanics, relativity, nuclear and particle physics, and atomic and molecular physics. In practice, modern astronomical research involves a substantial amount of physics. The name of a university's department ("astrophysics" or "astronomy") often has to do more with the department's history than with the contents of the programs.

Cosmology - the study of cosmology is theoretical astrophysics at the largest scales, i.e. the universe as a whole.

Astrolab attempts to incorporate useful tools to study the above.

2.1. Current Position for COS Astrolab development

In addition we are using some of the colour coding above to highlight the progress at a particular stage in the table.

This is also being used to highlight the title bars of some of the HTML pages within COS Astrolab, to reflect progress with changes. This gives a useful indication of the state of the development of individual parts of the application, e.g. it works but it's not been tested fully, or still being coded but it mostly works.

Colour coding used to highlight status of current development as a whole and individual app page titles.

Development / Prototype (html bgcolor #FF00FF)	Testing (html #FFFFCC)	Completed (html #CCFFCC)
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It is web browser based and designed to be Web Standards compliant and work with latest versions of Firefox, Safari and Chrome. All pages HTML code is validated to the XHTML 1.0 Transitional standard.

IE is no longer actively supported (in that we do not believe in wasting effort and complicating coding with browser specific commands – the browser must be web standards compliant) as it does not support vector graphics (SVG) files as a default – only with an unsupported plug-in, however 99.9% of the application may work.

3. Current Astrolab Version is 0.9864_20140325 (beta)

Astrolab has been following the accepted version number convention, where version 1.0 is accepted to be the first fully working release. However this really means nothing in the real world, version 0.981 could be almost complete and never need much change or version 4.6 could be considered complete, in that what is in it works, but users find it lacks useful functionality for its intended purpose.

There is a lot of open source software out there that has high version numbers, but has not been updated for a long time, either through lack of time, interest or the developer has moved on. In that case you cannot be sure how much longer it will be supported, no matter how good the application is.

So for an indication of support and continuing development we include a date in our version number 0.9864_20140325. While in development the date is the intended final release date for the current iteration being worked on, so the version number may still increment until the release is put on Source Forge.

[updated 20140402]

4. Installation

For the Windows version – Unzip the complete folder and place anywhere, the application is self contained and web browser based.

The OSX version can use Apple's own tools to package the application ready to copy to a disc image type file that can be downloaded and installed via their own install process into the usual Applications folder.

Or it can simply be compressed to a Zip file and the folder unzipped in OS X and the folder placed anywhere convenient to the user.

[]

5. Starting the Application

Navigation is via normal navigation for the web browser in use. To start the application click on any of the three html pages listed below, or you could rename "auto.html" to index.html if Astrolab is run as a subfolder under your own web server. "auto.html" attempts to select the most appropriate framework based on the OS it detects.

mMain.html starts 'mobile device version' – reduced graphics, simple menus, each page displayed in full, no frames

main.html starts full version in frames

auto.html attempts to detect 'device' to load appropriate version

fDefault.css and fEnvironment.js contain parameters to set font size and layout, a mobile device / tablet version usually being set to have a smaller default font.

6. Application Contents

Artefacts

Below is a list breaking down the current functions in Astrolab. The background colour code shows current state of development in the individual page header, and as shown on application pages, supporting web pages, documents and application status tables etc.

Development / Prototype (html bgcolor #FF00FF)	Testing (html #FFFFCC)	Completed (html #CCFFCC)
---------------------------------------------------	---------------------------	-----------------------------

6.1.1. Folders

Folder	Description
/css	Style sheets controlling page layout and font size
/datasets	Contains data sets for reference and study
/imageLib	Images used in the application
/imageLibMoon	Specific Moon images related to Phase calculations
/documents	Supporting documents
/utility	Misc utilities related to project

6.1.2.

Framework

Page / File	Description
auto.html	Start application and attempt to detect OS and version to start
cConstants.js	Constant values used in the JavaScript
fEnvironment.js	Environment control variables
fAppWindow.html	Main application window
main.html	Start frame view
fMenu001.html	Mobile device version menu 1
fMenu002.html	Mobile device version menu 2
fMenu003.html	Mobile device version menu 3
fMenu004.html	Mobile device version menu 4
fMenuWindow1.html	Frame version menu 1
fMenuWindow2.html	Frame version menu 2
fMenuWindow3.html	Frame version menu 3
fMenuWindow4.html	Frame version menu 4
fTitleWindow.html	Frame version main menu
mMain.html	Start mobile device view

fDefault.css	Default page formatting
cMathLibNew.js	Math lib

6.1.3. Applications

Page	Description
cCalc001Eclipse.html	Solar Eclipse Calculations – past and future
cCalc002Lunar.html	Lunar Phase Calculations
cCalc003Crater.html	Impact Cratering – Crater Size
cCalc003CraterHlp.html	Impact Cratering – Help
cCalc005AstroCalc.html	Astrophysics Calculator
cCalc006JavaEx.html	Java Test
cCalc009Kepler.html	Kepler's Laws of Planetary Motion
cConv001Dist.html	Distance Conversions
cConv002Temp.html	Temperature Conversions Between Scales
cCalc004ConvDeg.html	Convert Degrees/Minutes/Seconds to/from Decimal and Radians

6.1.4. Data Pages

Page	Description
cData001Mercury.html	Planetary Data – Mercury
cData002Venus.html	Planetary Data – Venus
cData003Earth.html	Planetary Data – Earth
cData004Mars.html	Planetary Data – Mars
cData005Jupiter.html	Planetary Data – Jupiter
cData006Saturn.html	Planetary Data – Saturn
cData007Uranus.html	Planetary Data – Uranus
cData008Neptune.html	Planetary Data – Neptune
cData009Pluto.html	Planetary Data – Pluto
cData010Sun.html	Star data – The Sun
cData011StarClass.html	Star Classification
cData012AstroConst.html	Astrophysical Constants
cData013MathConst.html	Mathematical Constants
cData014PhyConst.html	Physical constants
cData015PT.html	Periodic Table of the Elements

6.1.5. Equation Pages

Page	Description
cEqu001Drake.html	Drake Equation
cEqu002Parallax.html	Stellar Parallax
cEqu003Luminosity.html	Luminosity
cEqu004Vol.html	Volume and Area of a Sphere

6.1.6. Information Pages

Page	Description
cCredits.html	Acknowledgements for code and other contributions.
cInfo001Ehubble.html	Edwin Hubble original paper
cInfo002SIUnits.html	SI Units – explained as used in the application
cInfo003Parsec	Parsec help
cInfo004HRDiagram	Example HR Diagram
cInfo005Gloss.html	Glossary
cInfo006Equ.html	Equation List
cInfo007Clock.html	
cInfo009SDS.html	Standard Data Sets
cInfo010GNUL.html	GNU Licence
cInfo012Geom.html	Geometry Help

6.1.7.

Utility Pages

Page	Description
cUtil001WebBr.html	Current Web Browser Standard Check
cUtil002WebBr.html	Current Web Browser Information

6.1.8. Data Sets

Folder	Description
300BS	300 Brightest Stars
HRDiagData	
PeriodicTable	Periodic Table data
SolarSystem	Solar System Data
SunSpots	Average Monthly Sunspot number since 1749

YaleBrightStarCatalogue	Yale BSC
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6.1.9. Demo

Page	Description
cVectorG001.svg	Under development
cCalc006JavaEx.html	Link to java applet
appletexample.jar	Applet used in the above

AstroEquations.xls

Equations, constants and values used in the Astrolab application. Spreadsheet AstroEquations.xls contains a list and 'test harness examples' of equations to be used in Astrolab. It also lists values for constants and measurements used in Astrophysics, using National Physical Laboratory and CODATA recommended values.

7. Astrolab Run Time Structure

Originally there was a 'tablet' based version and a 'windowed' version for desktop use. The principle was that the core of the application was identical in both the local PC / Tablet and online / standalone application. This made use of HTML frames for a 'windowed' version, however this increased the work required, so now the 'tablet' version has been adopted for wherever the app is run. All options are now controlled by a simple menu selection system on main menu pages and individual function pages

The mMainTab.html page starts the application.

All core applications have file names starting with 'c'. Application framework files that run the core pages have file names starting with 'f'. HTML file names follow the Java function naming convention of starting with a lower case letter e.g. planetData.html

Application 'windows', menus and calculations are driven by HTML 5 and Javascript.

[updated 20140408]

8. Appendix E - Using Excel in Astronomy

Excel stores dates and times as a number representing the number of days since 1900-Jan-0, plus a fractional portion of a 24 hour day: `dddd.dttttt` . This is called a **serial date**, or **serial date-time**.

8.1. Dates

The integer portion of the number, `dddd`, represents the number of days since 1900-Jan-0. For example, the date 19-Jan-2000 is stored as 36,544, since 36,544 days have passed since 1900-Jan-0. The number 1 represents 1900-Jan-1. It should be noted that the number 0 does **not** represent 1899-Dec-31. It does not. If you use the `MONTH` function with the date 0, it will return January, not December. Moreover, the `YEAR` function will return 1900, not 1899.

Actually, this number is one greater than the actual number of days. This is because Excel behaves as if the date 1900-Feb-29 existed. It did not. The year 1900 was not a leap year (the year 2000 is a leap year). In Excel, the day after 1900-Feb-28 is 1900-Feb-29. In reality, the day after 1900-Feb-28 was 1900-Mar-1 . This is not a “bug”. Indeed, it is by design. Excel works this way because it was truly a bug in Lotus 123. When Excel was introduced, 123 has nearly the entire market for spreadsheet software. Microsoft decided to continue Lotus’ bug, in order to fully compatible. Users who switched from 123 to Excel would not have to make any changes to their data. As long as all your dates later than 1900-Mar-1, this should be of no concern.

8.2. Times

The fractional portion of the number, `ttttt`, represents the fractional portion of a 24 hour day. For example, 6:00 AM is stored as 0.25, or 25% of a 24 hour day. Similarly, 6PM is stored at 0.75, or 75% percent of a 24 hour day.

As you can see, any date and time can be stored as the sum of the date and the time. For example, 3PM on 19-Jan-2000 is stored internally as 36544.625. When you enter a time without a value, such as entering 15:00 into a cell, the date portion is a zero. The zero indicates that there is no date associated with the time. You should remember that entering just a time does **not** automatically put in the current date.