SAGUARO
OPEN-SOURCE DATA ANALYSIS AND VISUALIZATION SOFTWARE PLATFORM

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SAGUARO (Software Analysis Graphical-user-interface from University of Arizona for Research in Optics).

Free Share-ware data processing platform for optical engineering.

More than 400 downloads since the beta-release at the SPIE conference in Sept. 2011.

- Matlab™-based data processing platform
- Provide a standard way to manipulate and visualize various types of data
- Operation via the GUI (graphical user interface)
- Data processing by running modules that use proscribed standard formats
- Macro feature allowing pipe-lined modules for complex operations
MAIN PLATFORM GUI OF SAGUARO

User directory setting (top area), ‘Dataset’ panel (left side), ‘Module’ (top-right) and ‘Macro’ (bottom-right) panels in the main GUI.
STANDARD DATA TYPES
IN SAGUARO

Standard data types for SAGUARO are defined.

Every SAGUARO module assumes the standard data format.

Key to compatibility between modules developed by independent developers.
## STANDARD DATA TYPES IN SAGUARO

<table>
<thead>
<tr>
<th>Data Type</th>
<th>File extension</th>
<th>Data format</th>
<th>Header (with e.g. parameter values)</th>
<th>Etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Map</td>
<td>.map</td>
<td>a X b 2D matrix</td>
<td>$\text{Date Created}=08/20/11 1:14 PM $X\text{ size}=1820 $X\text{ unit}=\text{mm} $Y\text{ size}=1820 $Y\text{ unit}=\text{mm} $Z\text{ unit}=\text{mm}</td>
<td>‘NaN’ for background values</td>
</tr>
<tr>
<td>Mask</td>
<td>.mask</td>
<td>a X b 2D matrix</td>
<td>$\text{Date Created}=08/20/11 4:24 PM $X\text{ unit}=\text{mm} $Y\text{ unit}=\text{mm} $Z\text{ unit}=\text{mm}</td>
<td>‘NaN’ for masking area, and 1 for un-masked area</td>
</tr>
<tr>
<td>Frequency Map</td>
<td>.freqmap</td>
<td>a X b 2D matrix</td>
<td>$\text{Date Created}=08/20/11 3:03 PM $X\text{ Max Frequency}=0.048626 $X\text{ unit}=\text{mm} $Y\text{ unit}=\text{mm} $Z\text{ unit}=\text{mm}</td>
<td>‘NaN’ for background values</td>
</tr>
<tr>
<td>Zernike Coefficients</td>
<td>.zernike</td>
<td>a X 3 2D matrix</td>
<td>$\text{Date Created}=06/13/12 1:25 PM $Radius=10 $Height unit=nm $\text{Obscuration Ratio}=0.1</td>
<td>1st column: Zernike Coef., 2nd column: m, 3rd column: n (where $Z_m$)</td>
</tr>
<tr>
<td>Layermap</td>
<td>.layermap</td>
<td>a X b X c 3D matrix</td>
<td>$\text{Date Created}=06/13/12 11:59 AM $X\text{ size}=10 $Y\text{ size}=10 $X\text{ unit}=\text{mm} $Y\text{ unit}=\text{mm} $Layer unit=nm, \mu m $Layer Label=peaks, Airy function</td>
<td>a X b part is defined same as ‘Map’ data type. This data type can store multiple (i.e. c) maps. There is an empty line between a X b maps.</td>
</tr>
<tr>
<td>Coordinates</td>
<td>.coordinates</td>
<td>a X b 2D matrix</td>
<td>$\text{Date Created}=06/13/12 12:16 PM $Column unit=\text{mm}, \text{mm}, \text{nm} $Column Label=x position, y position, Sinc function</td>
<td>Each column may represent any list of data. (e.g. 1st column: x, 2nd column: y, 3rd column: z)</td>
</tr>
<tr>
<td>General</td>
<td>.general</td>
<td>undefined</td>
<td>undefined</td>
<td>Arbitrary user-defined data type</td>
</tr>
</tbody>
</table>

Note: Templates for each data type can be found in the “Templates” folder in SAGUARO.
MODULES IN SAGUARO

Greatest power of SAGUARO is provided by its flexibility using the plug-and-execute module features.

Main SAGUARO platform only provides a convenient environment for the modules, and controls the data traffic between them.

Actual data analysis or visualization is performed by modules.

A module can contain almost any user-defined MATLAB™ functions, which follows a proscribed format to communicate with the SAGUARO main platform.

Numerous modules already have been written and included in the module library (more than 25 modules in SAGUARO 1.4).
Open-source Data Analysis and Visualization Software Platform

DEMO
USING SAGUARO 1.4
CURRENT RELEASE V. 1.4
HTTP://WWW.LOFT.OPTICS.ARIZONA.EDU/SAGUARO/

LOFT, Large Optics Fabrication and Testing group & OEFF
Developing advanced technologies for optical testing and fabrication of large optical components and systems.

SAGUARO

Optical engineering projects often involve massive data processing with many steps in the course of design, simulation, fabrication, metrology, and evaluation. A MATLAB-based data processing platform has been developed to provide a standard way to manipulate and visualize various types of data that are created from optical measurement equipment. The operation of this software platform via a graphical user interface is easy and powerful. Data processing is performed by running modules that use a prescribed format for sharing data. Complex operations are performed by stringing modules together using macros. While numerous modules have been developed to allow data processing without the need to write software, the greatest power of the platform is provided by its flexibility. A developer's toolkit is provided to allow development and customization of modules, and the program allows a real-time interface with the standard MATLAB environment. This software, developed by the Large Optics Fabrication and Testing group at the University of Arizona, is now publicly available.

Open-source Data Analysis and Visualization Software Platform

THANK YOU.