



# Introducing the new VSG Toolbox for Matlab

Cambridge Research Systems new VSG Toolbox for MATLAB is a whole new way to get the best from your VSG system. MATLAB is possibly the most popular tool for scientific and technical computing today. It offers a unique combination of ease of use and very powerful data manipulation and visualization. Its interactive script language is very easy to learn and use. However, it incorporates a vast range of powerful mathematical functions and graphics. It's simple command line interface allows you to quickly try out commands and immediately see the result.

```
epochTable = cat(2,currentEpochPupilWidths,blankPadding);

% And we keep a track of the
% the first entry in the table
currentEpochTrackedFlags = f
blankPadding = k
trackedTable = c

% CREATE A TABLE, ROWS ARE D
% =====
% For each epoch that we have
% it with all previous epochs
for i = 2:numEpochs
    currentEpochPupilWidths =
    blankPadding =
    currentEpochPupilWidths =
    epochTable =

    currentEpochTrackedFlags =
    blankPadding =
    currentEpochTrackedFlags =
    trackedTable =
end

matrix = mesh(sin([1:4*pi/100:4*pi]*ones(100,1)'));
vsgSetDrawPage(VSG.VIDEOPAGE,0,0);
vsgPaletteWrite([0:1/255:1:0:1/255:1:0:1/255:1],0,256);
vsgDraw2DArray(0,matrix,[0,0]);
vsgSetDisplayPage(0);
```

We previously offered basic MATLAB support, but now in response to customer demand we are launching .....

## ..... VSG programming the MATLAB way.

The Toolbox lets you develop VSG applications using MATLAB with all the features that you have come to expect. It combines the power and convenience of MATLAB with essential VSG features, for example: guaranteed precise stimulus presentations.

- Fully vectorised programming: easily manipulate vectors and matrices in Matlab and pass them directly as arguments for VSG functions.
- Represent palettes and stimuli as Matrices - perform matrix operations on them and transfer them to the VSG.
- Integrated help from the MATLAB command line. Each Toolbox function is completely described and details arguments, return values and includes a complete example.
- MATLAB style error checking and range checking.
- Create stimuli using the power of MATLAB and easily transfer to the VSG for display.
- Many new functions to simplify VSG control and interrogate its status.
- Free, quick response technical support from our dedicated web portal and our team of scientists, programmers and engineers.

### More power, more applications

The VSG Toolbox isn't just a new MATLAB interface, but includes an array of new tools to simplify development of VSG applications. Based upon customer feedback and technical support requests, the new tools address the needs and problems of developing real vision science applications. All of the tools are supplied as M script files, so you can examine exactly how they work and even modify them to your own special requirements. The new features are too numerous to describe in detail here so take a look at our web site for more details: [www.crsLtd.com/vsgToolbox](http://www.crsLtd.com/vsgToolbox)



# The Tools

## Stimulus Drawing

New algorithms are all implemented in MATLAB to enhance the VSG's drawing capabilities.

- Commonly used stimuli including: Gratings, Checkerboards, Gabors, Gaussian Derivatives
- Noise drawing, with wide range of statistical properties
- Drawn to sub-pixel accuracy
- Can be used with Colour Tools, to directly draw chromatic stimuli in any supported colour space
- Multiple moving regions - Easily specify relative motion between multiple stimuli (ViSaGe only).

## Psychophysics

A completely new set of functions implement many commonly used psychophysical techniques

- Bayesian Statistics
- Classical methods: Method of Adjustment, Method of Constant Stimuli, Method of Limits
- Adaptive methods: Log/Linear ascending/descending staircases, PEST, QUEST, ZEST and more

## Calibration, Photometry and Colour

As well as support for standard colorimetric colour specification, the new Colour Tool allows you to define stimuli in terms of actual cone stimulation. Underlying the new Colour Tool are Spectroradiometric display calibration routines.

- Monitor calibration using the new CRS and third-party photometers and spectroradiometers
- Standard colorimetric spaces: CIE 1931, CIE 1976 etc.
- Cone fundamental based colour spaces: SML, DKL etc, using Judd/Vos, or Stockman/Sharpe matching functions
- Photopic and Scotopic Luminance,  $V_M(\lambda)$ ,  $V_2^*(\lambda)$ .
- Stimulus specification Colour contrast, LMS and cone quantum catch

## Eye Movements

CRS Video Eye Tracking systems can be easily integrated for Gaze tracking and gaze contingent displays

## Dot Plotting

- Dot plotting sequences specified by matrices
- Random dot stereograms using Z buffer to specify disparity

## Electrophysiology

Popular stimuli for ERG/VEPs including Checker Boards, Gratings, Isoluminant Colour and Motion Onset. All with configurable output trigger.

## Real Demonstrations

The VSG Toolbox includes a collection of real demonstrations that implement classic vision science experiments. These can be used as the basis of your own experiments, to understand VSG technical and programming concepts, and as teaching tools. All the demos have an easy to use GUI interface. Developing this Toolbox is an on-going project and new demonstrations will be constantly added. Currently we are working on:

- Contrast Sensitivity, cone isolating stimuli, retinotopic mapping stimuli for functional imaging, coherent and incoherent motion thresholds, M-sequences, biological motion, tachistoscopic displays, common visual illusions, pupillometry, electrophysiology

## How To Get It

The complete VSG Toolbox is due for release in quarter 3 of 2004. It is available free of charge to all our existing customers and is compatible with the VSG2/3, 2/4, 2/5 and the new ViSaGe system. You can download a preview version from our website that includes all the fully documented vectorised functions, Video Eyetracker Toolbox tools and some sample applications. For more information, take a look at [www.crsLtd.com/vsgToolbox](http://www.crsLtd.com/vsgToolbox)

