

**CMUcam2**  
**Graphical User Interface Overview**

## **Introduction**

This guide provides a brief overview of the CMUcam2 Graphical User Interface (GUI). The CMUcam2 GUI is a java program designed to allow you to explore many of the functions of the CMUcam2 that would normally be hard to visualize. For example, it would be impossible to understand the output from a “send frame” command or a “line mode” packet in a terminal program. It is also designed to allow you to quickly and easily prototype and explore different CMUcam2 configurations that might aid in accomplishing your vision tasks.

### **Recommended System Requirements**

- Java 1.4.0 or higher (1.4.2 will give a significant speed increase)
- 64 Mb of RAM
- Pentium 2 350 Mhz or better
- 50 Mb of disk space for java

### **Windows Installation**

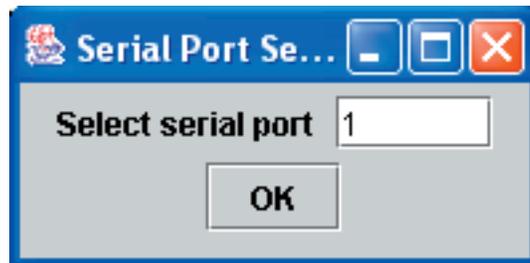
The first step is to determine if your computer already has java installed. The easiest way to do this is to go to the “start menu” and select “run”. Inside the run dialog, type “command” to get a dos prompt. Now try typing “Java -version” into your command line. If a message that says “Java version “1.x.xx” appears then java is installed. If instead you get “command not found” or some similar message, then you need to go to <http://java.sun.com> and download a copy of Java (J2SE, JDK, JRE are all valid things to install). Sun should have platform specific instructions on how to install java. Also be sure that your version of Java version 1.4.0 or newer. If it is not, then you will need to download a new copy of Java.

### **Unix and Mac OS Installation**

The first step is to determine if your computer already has java installed. The easiest way to do this is to open a shell or other command prompt. Now try typing “Java -version” into your command line. If a message that says “Java version “1.x.xx” appears then java is installed. If instead you get “command not found” or some similar message, then you need to go to [java.sun.com](http://java.sun.com) and download a copy of Java (J2SE, JDK, JRE are all valid things to install). Sun should have platform specific instructions on how to install java. Also be sure that your version of Java is version 1.4.0 or newer. If it is not, then you will need to download a new copy of Java.

## First Steps

Once you have Java installed, download a copy of the latest CMUcam2GUI Java program. Unzip the CMUcam2GUI.zip file. Open up the stand\_alone folder. In Windows double click on the CMUcam2GUI jar file. In unix, navigate to the CMUcam2GUI directory and type “java -jar CMUcam2GUI” to execute the GUI.



You should now see a dialog box that asks you to select the correct serial COM port. In windows, type in the number of the COM port that the CMUcam2 is connected to and press the “Ok” button. In unix, make sure that the path to your com port is correct and then press “Ok”. In general, the path should be in the form “/dev/ttyS0” where ttyS0 denotes com port 1. The CMUcam2GUI should now open and display the message “CMUcam version 2 type X ready.” in the “Console” box. That means that the CMUcam2GUI found and was able to communicate with the camera.

The “X” should either be a “6” or a “7” corresponding to the type of camera module that is connected. If you are using an OV6620 module, then a “6” should appear. If you are using an OV7630 module, then a “7” should appear.

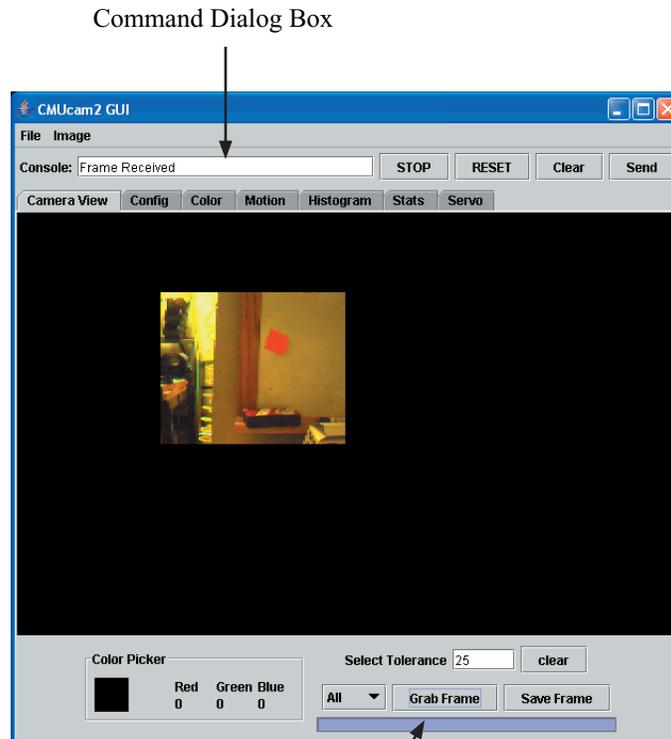


Note, that the Windows default baudrate is always 115,200 so make sure that none of the CMUcam2 baudrate jumpers are set.

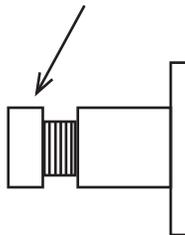
In unix, you need to run a program to configure the serial port to whatever baudrate the CMUcam2 is set on (115,200 baud default) with no flow control, 8 data bits with 1 stop bit and no parity. Included is a linux program called “serialconfig” that does just that. Another option would be to use “minicom”, a freely available unix terminal program.

# Focusing the Camera

Once you see this main screen, click on “Grab Frame” button.



Rotate here to focus



CMUcam Lens Mount

Once you have the ability to send frames from the camera, you should be able to rotate the front part of the CMUcam lens and see the image change. Try to get the picture to be as sharp as possible by dumping frames and changing the position of the lens a small amount each time. Usually the camera is in focus when the lens is a few rotations away from the base.



Out of Focus Image



Focused Image

# Camera View Panel

The image shows a screenshot of the CMUcam2 GUI with several callout boxes pointing to different parts of the interface. The GUI has a blue title bar and a menu bar with 'File' and 'Image'. Below the menu bar is a 'Console' area with a text input field containing 'Frame Received' and buttons for 'STOP', 'RESET', 'Clear', and 'Send'. A tabbed interface below the console shows 'Camera View' as the active tab, with other tabs for 'Config', 'Color', 'Motion', 'Histogram', 'Stats', and 'Servo'. The main window displays a camera feed of a room with a red square on the wall. At the bottom, there is a 'Color Picker' section with a color selection area, 'Red', 'Green', and 'Blue' channels (all showing 0), and a 'Select Tolerance' field set to 25. There are also buttons for 'Grab Frame' and 'Save Frame'. Callout boxes provide detailed instructions for each of these elements.

Tab Panel  
Select other panels by clicking on them.

Stops the camera from processing by sending 'r' and looking for an ACK.

Reset the camera by sending the "RS" command.

Clear any text that is in the command dialog box, so that you can write in your own command.

Send the text that is in the console dialog box to the camera. There is no check on if this is a valid command. The text is sent as is out the serial port.

Clicking on a color in the main window will select that color +/- the select tolerance and put those values into the Track Color boxes on the Color Tab. The selected color will become Cyan.

Sets the values that bound the selected color when they are entered into the Track Color Box on the Color Tab.

This shows the color that is under the cursor in the above window.

You can select to send only a single channel with this menu for faster send frames.

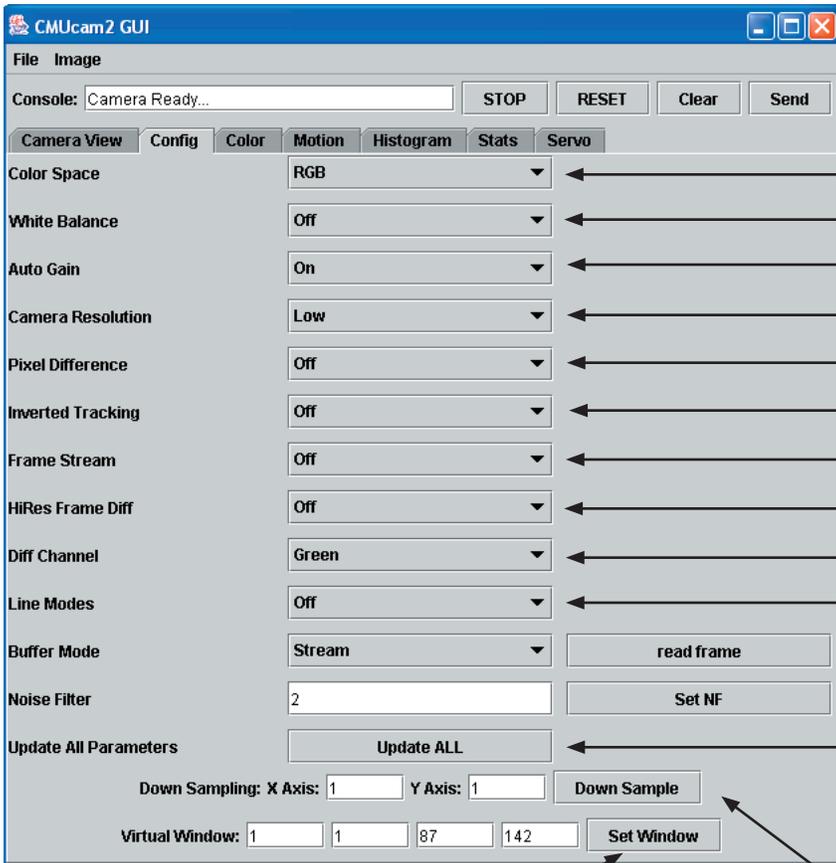
Calls the send frame command.

Lets you save the above image as a jpeg.

Clears the current color selection from the above window so that you can see the image underneath the cyan shaded region.

# Config Panel

This panel allows you to configure all of the CMUcam2 parameters except for servo controls. Each button calls one of the camera configuration commands and sets it with the associated value. Below is a cross reference for each button with the corresponding CMUcam2 command that can be found in the CMUcam2 Manual.



CR command see page 26 in the CMUcam2 Manual. Also, see “Notes on Better Tracking” on page 19 of the CMUcam2 Manual.

See HR command on page 33 of the camera manual.

See PD command on page 41 of the camera manual.

See TI command on page 48 of the camera manual.

See FS command on page 29 of the camera manual.

See HD command on page 33 of the camera manual.

See DC command on page 27 of the camera manual.

See LM command on page 35 of the camera manual.

See BM command on page 25 of the camera manual.

See NF command on page 39 of the camera manual.

In case the CMUcam2 loses power, this command can update all of the configuration parameters.

See DS command on page 28 of the camera manual.

See VW command on page 50 of the camera manual.

# Color Panel

This panel lets you test the color tracking functionality of the camera. To enable and disable line modes, see the config panel.

The screenshot shows the 'Color' tab of the CMUcam2 GUI. At the top, there is a 'Console' field containing 'Tracking Color' and buttons for 'STOP', 'RESET', 'Clear', and 'Send'. Below this are tabs for 'Camera View', 'Config', 'Color', 'Motion', 'Histogram', 'Stats', and 'Servo'. The main area is a dark image with a green bounding box and a red dot. At the bottom, there are input fields for 'min' (210, 0, 0) and 'max' (255, 41, 41), an 'FPS: 26' label, and 'Track Color' and 'Track Window' buttons.

The red dot represents the centroid of the tracked object.

The blue box represents the bounding box returned from color tracking.

These boxes hold the color bound values that are passed into Track Color. They can be automatically set by clicking on the image in the Camera View Tab.

This label shows the frame rate while the camera is tracking.

This button calls the Track Color (TC) command. See page 48 in the camera manual.

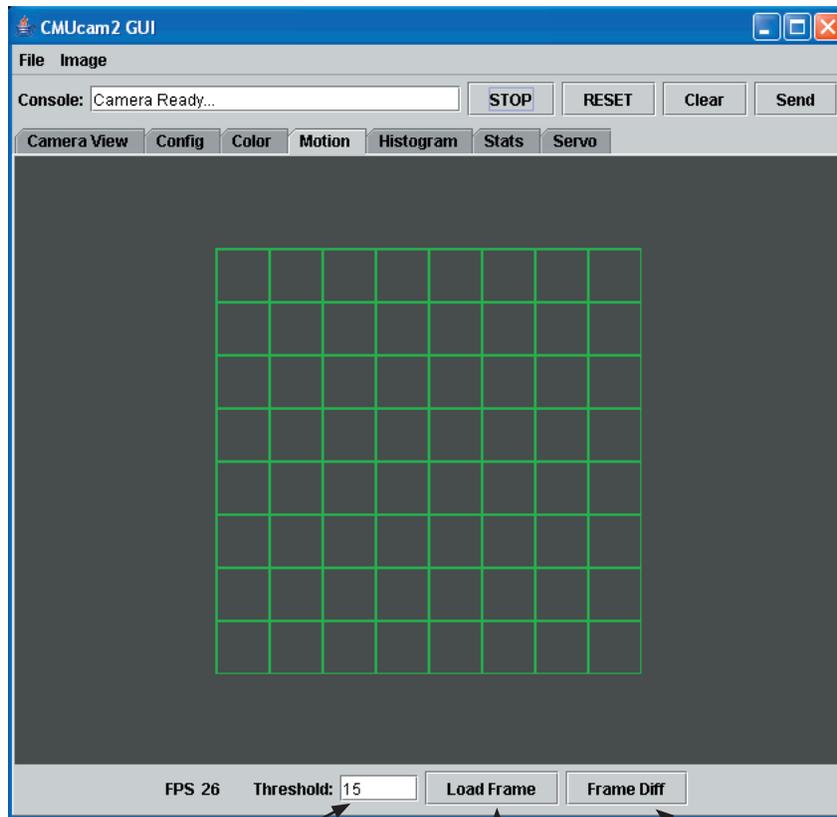
This button calls the Track Window (TW) command. See page 49 in the camera manual.

**Line Mode Color Legend**

- Line mode 1 bitmap of tracked object
- Linemode 2 min/max per line values
- Linemode 2 Middle Mass per line

# Motion Panel

This panel lets you test the frame differencing functionality of the camera. To enable and disable line modes, see the config panel. Gray scale boxes may also appear representing intensities of regions during linemodes 2 and 3.



This box sets the threshold value that is sent to the frame difference command.

This button calls LF which can be found on page 34 of the camera manual. Press this first and then click on Frame Diff.

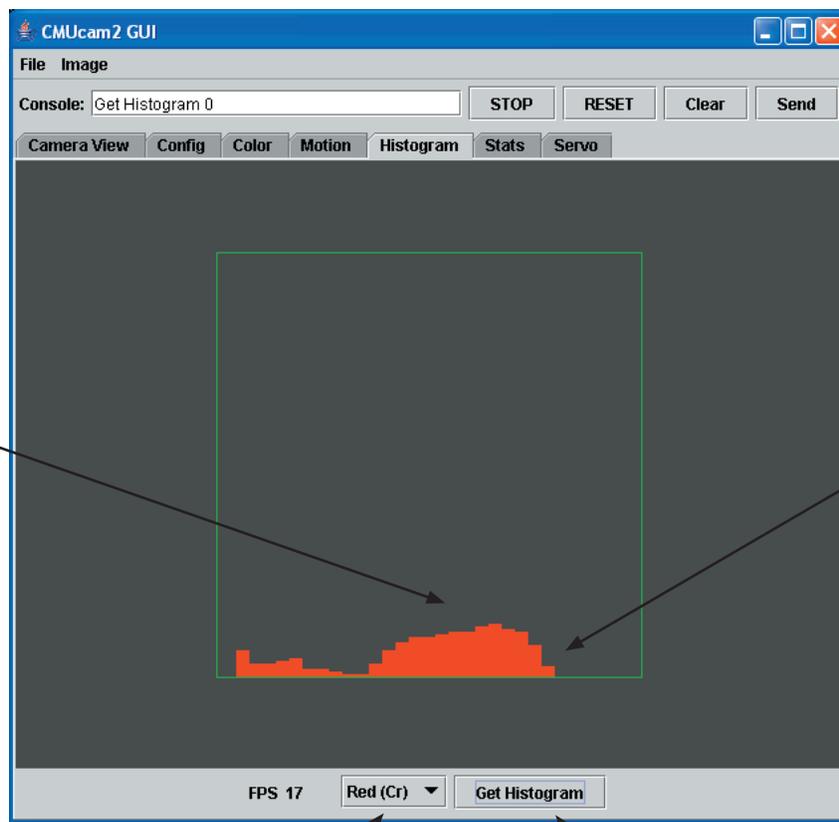
This button calls FD which can be found on page 29 of the camera manual. Press this after you have loaded a frame.

**Color Legend for Motion Panel**

-  Bounding box of tracked region
-  Linemode 1, changed region
-  Centroid of changed region

# Histogram Panel

This panel lets you test the histogram functionality of the camera. A histogram with pixel differencing enabled gives you interesting data about the distribution of sharp edges in an image. This can be used to determine focus as well as the amount of texture found in a scene.



The height of the bars represent the number of pixels that fall into that bin.

The bars themselves represent the actual bins. The lower values are on the left and larger valued bins are on the right.

This menu selects the channel that the histogram operation is to be performed on.

This button calls the GH command that can be found on page 30 of the camera manual.

# Stats Panel

This panel lets you test the statistics functionality of the camera. Different line modes can be enabled on the config panel.

The screenshot shows the CMUcam2 GUI with the 'Stats' tab selected. The main display area contains three vertical bars representing statistical data. The leftmost bar shows a gradient from dark to light, representing the mean color value minus the deviation. The middle bar shows a gradient from dark to light, representing the mean value. The rightmost bar shows a gradient from dark to light, representing the mean color value plus the deviation. Below the bars, the status bar displays 'FPS 11' and 'RGB: 110 79 29'. A 'Get Mean' button is located at the bottom right of the status bar. The console area at the top shows 'Get Mean' and buttons for 'STOP', 'RESET', 'Clear', and 'Send'.

This column shows the mean color value minus the deviation color value. When linemode 2 is enabled, the deviation of each line is used to calculate the different strips going down the bar.

This column shows the mean color value plus the deviation color value. When linemode 2 is enabled, the deviation of each line is used to calculate the different strips going down the bar.

The middle bar represents the mean value. This example shows different mean values going down the length of the bar, because linemode is enabled.

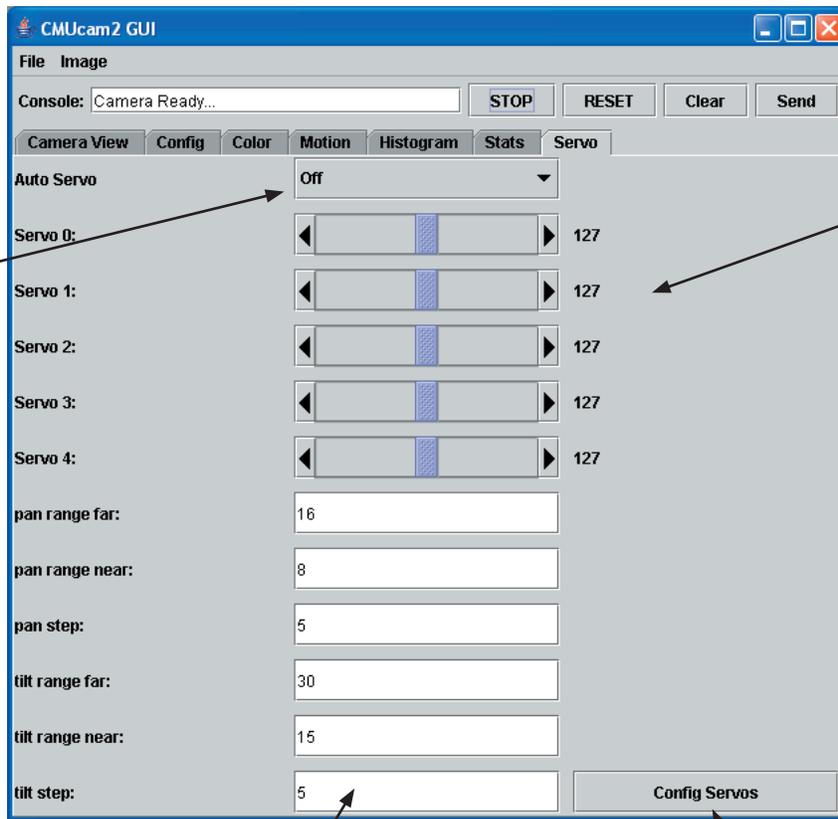
These boxes show you the mean value written out in text.

This button calls the GM command that can be found on page 31 of the camera manual.

# Servo Panel

This panel lets you test and configure different servo properties. See the SO, SV, SP, SM and ST commands in the CMUcam2 manual for more information.

This option calls the SM command found on page 46 of the camera manual to enable the automatic servo tracking.



These slider bars call the SV command found on page 48 of the CMUcam2 Manual to set the current servo positions.

These fields configure the different parameters that alter the way the automatic servoing control law works. See SP command on page 47 of the CMUcam2 manual for more information.

This button sends the SP command found on page 47 of the camera manual, using the parameters from the fields above.

