



# Camera Mouse Suite

## Version 1.0

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# Welcome

The Camera Mouse Suite is a program that allows you to control the mouse pointer and generate mouse clicks on a Windows computer just by using your head.

The purpose of the Camera Mouse Suite is to help people with physical disabilities to access the computer. In particular, the Camera Mouse Suite has proved very helpful to people who have no voluntary movement below the neck, people who can voluntarily control only their head. People with Cerebral Palsy, traumatic brain injury, ALS, Multiple Sclerosis, and various other disorders have used Camera Mouse Suite to access the computer and internet. The Camera Mouse Suite is software that works with your Windows computer (Vista or XP preferred) and your USB webcam. It will run normally on a computer no older than 4 years old. If you have an older computer, we recommend using the Camera Mouse Suite on a newer computer. The Camera Mouse Suite is completely free and may be distributed freely.

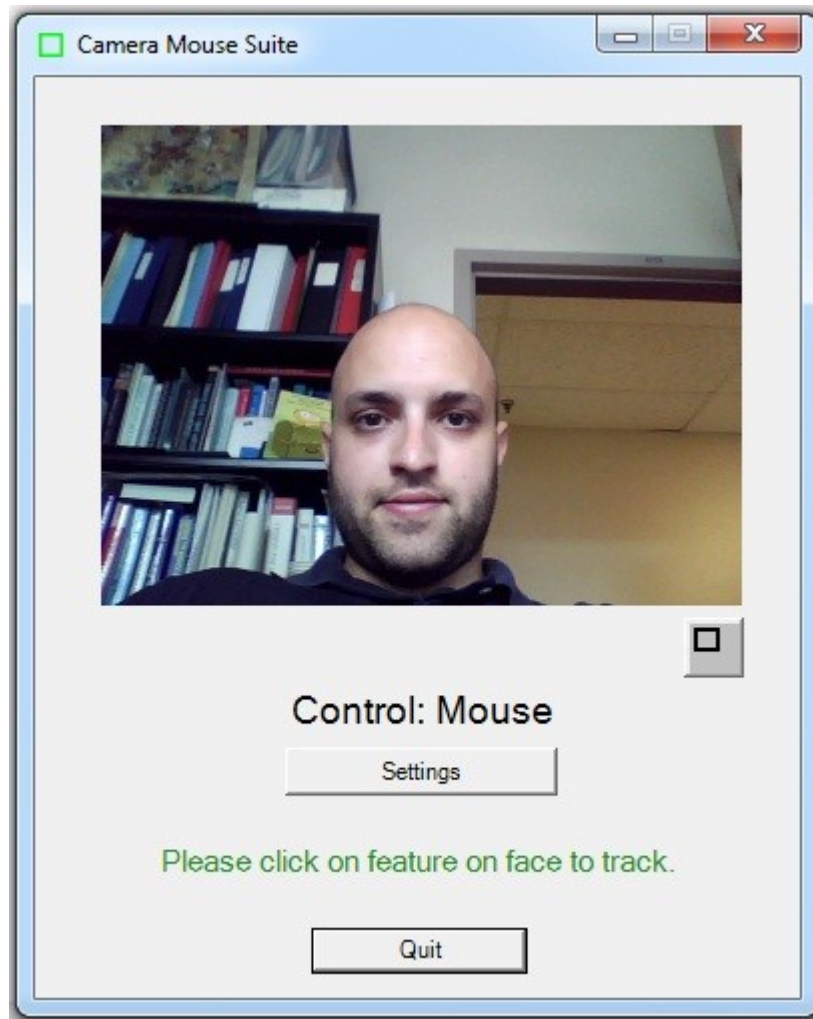
## Getting Started

The following is a guide to using the newest features of Camera Mouse Suite, specifically letting the user perform mouse clicks through eye related movement. There are two different modes that the subject can try:

- Eyebrow Clicker
- Blink Detection

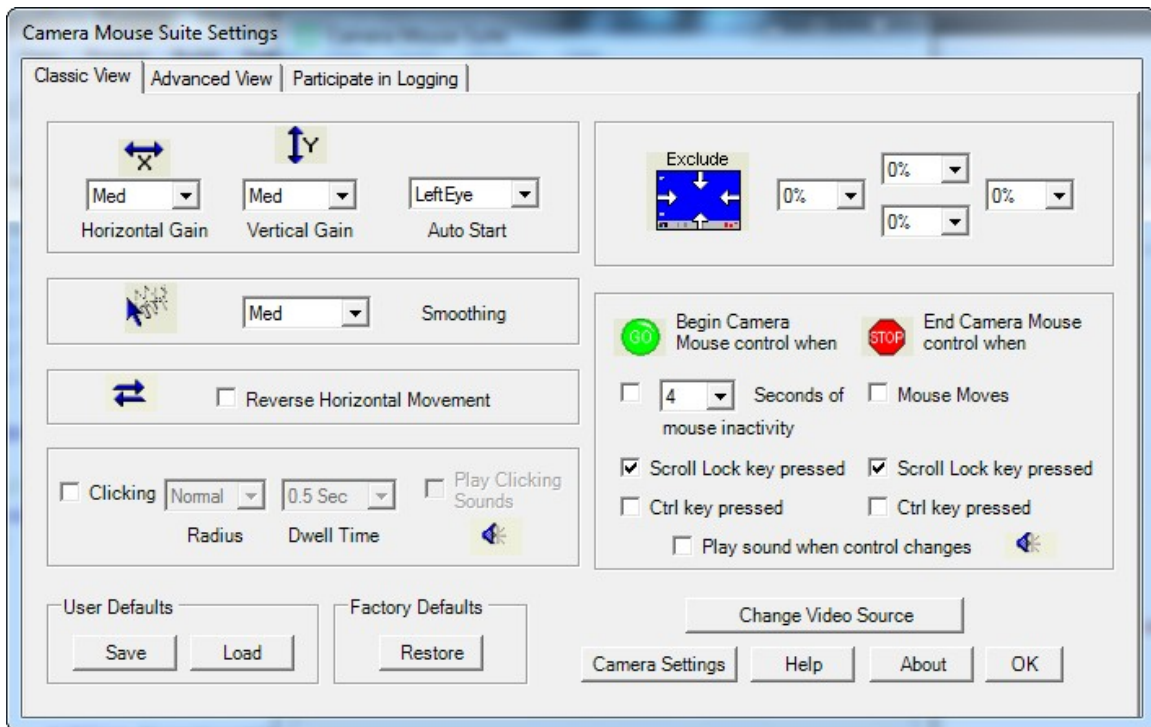
The Camera Mouse Suite should be used in conjunction with a sequential scan-based keyboard application such as E Z Keys. These programs will translate the mouse clicks generated by the Camera Mouse Suite into words and sentences.

After starting Camera Mouse you will be presented with the following window on the screen. If you have multiple cameras connected to your computer you will be asked to select one before you see this screen.

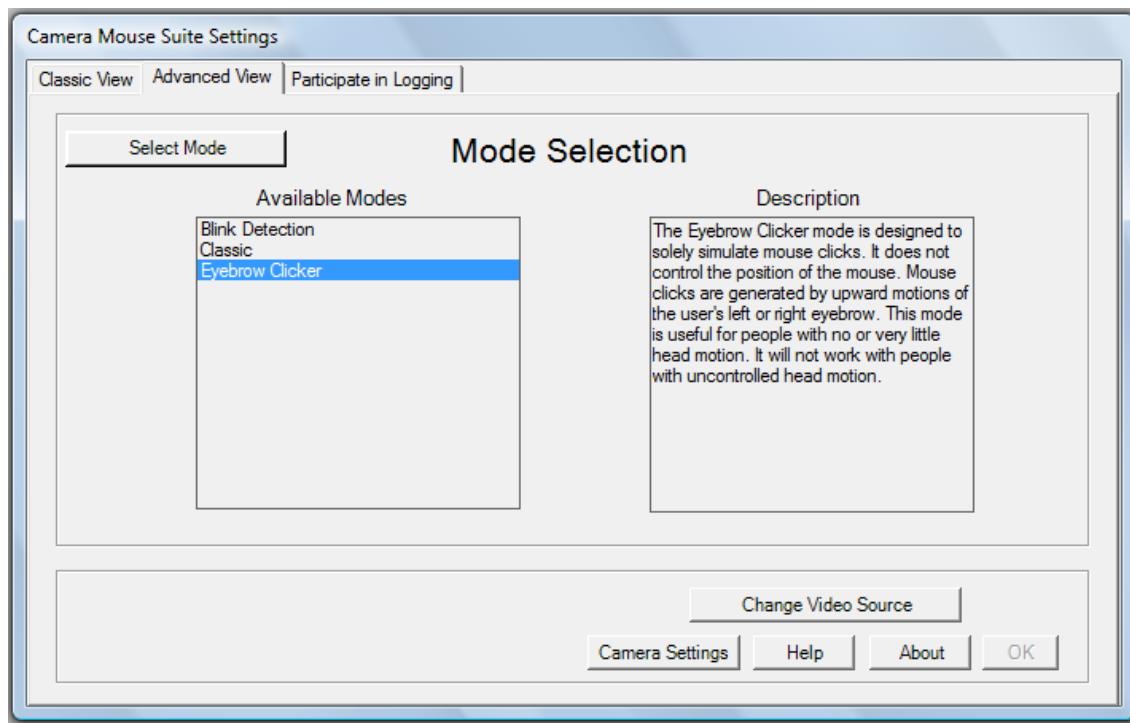


The picture is the view from the web cam. This video will be used to control the mouse pointer and perform mouse clicks. The gray button on the middle right side will minimize the main window which is useful when the program is being used. The quit button at the bottom will exit the program and the Settings button will show the settings window

Click the settings button and you will be presented with the following window:



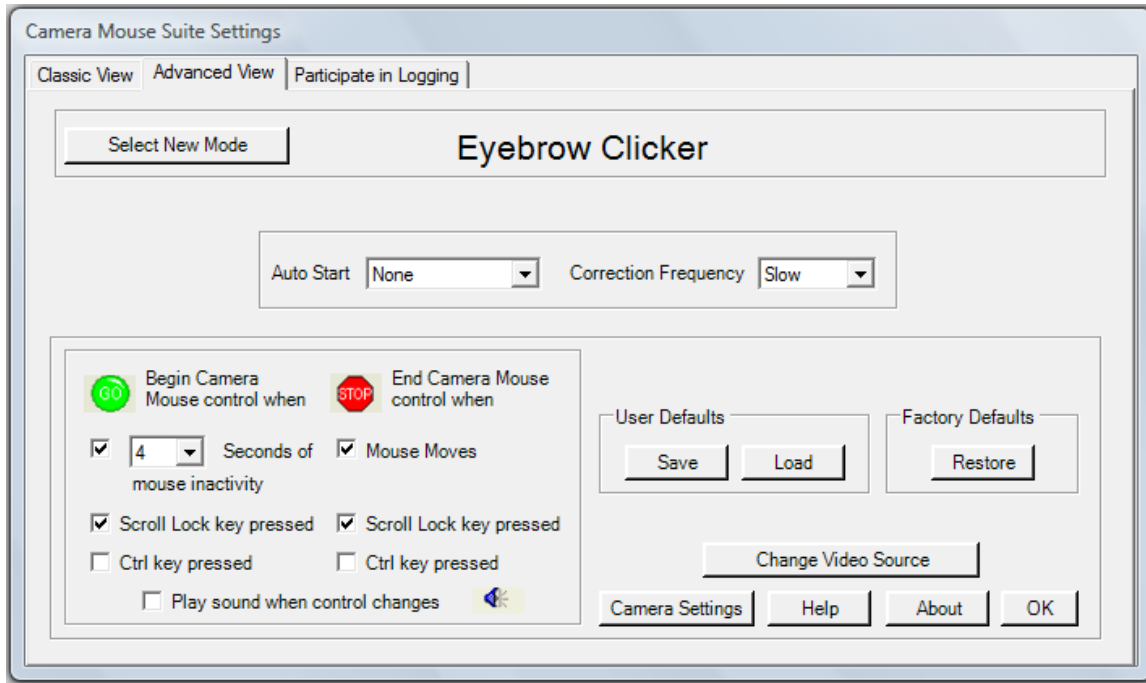
When Camera Mouse is first started it is in classic mode. For your purposes classic mode is not the best mode. You will want to use a different mode. To change modes click on Advance View tab.



By clicking on a mode you can read a short description of each mode.

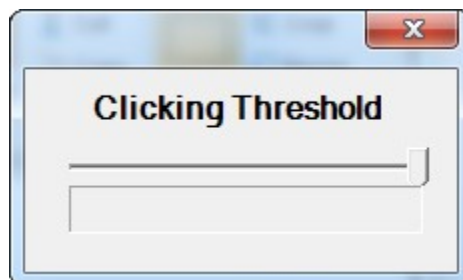
# Eyebrow Clicker Mode

The simplest mode to start with is the Eyebrow Clicker mode. This mode is for users who have control over eyebrow motions. If the user only has blinking control, the Blink Detection mode is better suited than the Eyebrow Clicker mode. When you select the Eyebrow Clicker mode you will be presented with the following window.



The current settings are sufficient, and do not need to be changed. The Auto Start option turns on the automatic initialization, which finds the user's eyebrow in the video frame. However, to start, it is best to leave this option as "None". It is also best if you leave the correction frequency as slow. For information about the lower left panel, please click "Help". If you make any changes, please remember to select Save.

You should still see the window with the video from your camera. The caregiver should use the mouse to click the center of the left or right eyebrow of the user in the video. The eyebrow selected should be the one which the user can move up or down most comfortably. Upon selection of the eyebrow, the caregiver should press Tab and the user should follow the instructions to move the eyebrow up and down naturally for a short period of time. As the user moves his/her eyebrow up and down you should see a blue bar grow and shrink in this window:



The blue bar represents the amount of eyebrow motion detected. This motion is used by our system to generate mouse clicks. The knob pointing down on the blue motion bar is the slider.



Every time the end of the blue motion bar grows from the left to the right of the slider position, a mouse click is generated. The slider position needs to be set by the caregiver such that when the user is stationary the end of the blue bar is to the left of the slider position and when the user is raising his or her eyebrows, the end of the blue bar is to the right of the slider.

Therefore the following sequence of events causes a mouse click to occur:

1. The user raises his or her eyebrow.
2. This causes the blue motion bar to grow in the right direction
3. The end of the blue motion bar moves past the slider
4. A mouse click is generated.

## Automatic Initialization

The automatic initialization feature can be used to automatically select the eyebrow of the user without manual clicking of the mouse. To try this feature, click the settings button, and change the “Auto Start” settings to either the left or right eyebrow. This action will initiate a countdown. When the countdown is complete; look straight into the camera and blink. If the system finds your eyes, the green square will appear on the eyebrow. If the system cannot find your eyes Camera Mouse will give you a message to try to help find your eyes faster. If the system incorrectly labels something that is not the eyebrow, press the Tab button. Once the eyebrow has been correctly identified proceed as if the tracking point was manually selected.

These are all the instructions of the eyebrow clicking mode. With this mode, we hope that the user can send mouse left clicks to the computer.

# Blink Detection Mode

To load the blink detection mode, click on the Settings button in the original Camera Mouse Suite window, click on the Advanced View tab if it is not already selected and then click on the Select New Mode Button. From here select the Blink Detection mode from the list of available modes. At this point the Camera Mouse Suite Settings window will show the settings for the Blink Detection mode.

In the Camera Mouse Suite Settings window, if the user is not going to be using Camera Mouse to control the position of the mouse pointer, uncheck the Enable Mouse Pointer Control. For an explanation of the other options related to mouse pointer control, select the Help button. The Switch Eyes box can be checked if the camera horizontally flips the image of the user. When the Play Sound box is checked, a sound will play when a left click is simulated. This gives the user auditory feedback when his/her eyes are closed and a left click command is simulated. The Blink Time is the period of time the user will have to close his/her eyes to simulate a mouse command. The eye status window is a helper window that shows the predicted eye state and can be used to determine if the system is correctly identifying the user's eyes.

The blink detection mode allows the user to simulate left clicks by closing his/her eyes. The blink detection mode has a more complicated setup than the classic or eyebrow modes; first because it must use the automatic initialization and second because the system needs to learn how the user's eyes appear when they are open and closed. Once the blink detection mode has been selected, the user should look at the camera and blink. Again messages will appear indicating if the user needs to do something different for the eye detection to work.

Once the eyes are found the user should move his/her head naturally in all directions he or she can. If the user cannot move their head then, he/she should just continue to look at the camera during this part of the initialization. Once this part of the initialization phase is done, the user should face the camera with their eyes open. When the system tells the user to close their eyes, the user should close their eyes. At this point the system should be placing red/blue rectangles around the user's eyes.

If the rectangle is red the system believes the user's eyes are open. If the rectangle is blue the system believes the user's eyes are closed. If the rectangles are near to the eyes but are not indicating correctly whether the eyes are open or closed, press F2 to redo the last part of the setup.

It is important for the caregiver to make sure that the system is classifying the eyes correctly in the beginning. If not they should press F2 to redo the last part of the initialization where the user looks at the camera with his/her eyes open and then closes his/her eyes when Camera Mouse instructions them to do so.

Press Tab to reset the entire initialization. If the locations of the rectangles are not close to the user's eyes, the entire initialization will have to be reset by pressing Tab. Once the initialization is complete the user can perform a left click by closing his/her eyes for the predetermined amount of time.