



USER GUIDE

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1) Introduction

Congratulations on your installation of the Smyle Mouse!

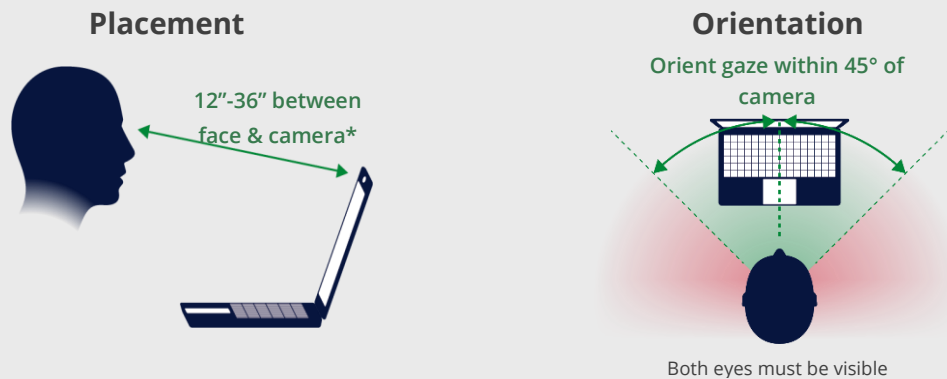
Smyle Mouse is the next generation in head and face based hands-free control of your Windows-based computer. It includes award-winning and patented head mouse functions, which include dwell clicking & smile clicking, as well as an adaptive switch emulator. Furthermore, all these functions are provided by means of a standard webcam that may be part of your laptop or tablet. No specialized cameras, head / sip-and-puff / bite switches, dots on the forehead, wearables or any accessories are required.

Smyle Mouse includes state-of-the-art, industry first, patented and patent-pending features that do not exist in any other commercially available products. It is also highly configurable to the user's needs. Therefore, please use this document to derive the most benefit out of using the Smyle Mouse.

2) Start up and Calibration

To get the most benefit out of using the Smyle Mouse, please note the following.

- Before you begin
 - Watch the Tutorial Videos at least once. (See link to videos [here](#).) The videos are quite short and it takes less than 15 minutes to watch them all. Given that the Smyle Mouse has novel, patent pending features, time invested in becoming familiar with the new concepts can save a lot of time for the user.
 - Seating in front of the camera. Please use the following guidelines.



*Note:

If the user would like to be seated farther way than 36", increase the "Image Resolution Enhancement" setting on the Preferences tab of the Settings window.

- Calibration process
 - Be seated comfortably in the front of the web camera at about an arm's length distance (12-36 inches). When ready, click the "Calibrate and Start!" button on the "Ready to Start Smyle Mouse?" window. That will start the calibration process.
 - First, face the camera and hold your head steady for about 2-3 seconds.
 - Next, smile for about 2-3 seconds, while facing the camera. The smile should be *moderately strong* but not extreme. If possible, keep mouth closed while smiling.
 - Stop smiling and then open your mouth moderately, again for about 2-3 seconds.

After calibration is complete, maintain same distance from the camera (compared to the distance during the calibration), to the extent possible. Note that coming closer to the camera increases the mouse sensitivity and going farther decreases it.

3) Operating Instructions - Overview

Smyle Mouse can be used in two different modes as below. The first mode below (Head/Face Mouse mode) is the default mode, however, it can be changed to the second mode (Adaptive Switch mode) by going into the Mode tab on the Settings window.

a) Head / Face Mouse Mode

This mode allows full mouse control via head motion and facial gestures. There are two simple rules to remember when using face gestures.

Rule 1 (Pointing): Turn your head to move your mouse pointer.



Rule 2 (Clicking): Smile to press a mouse button. (And stop smiling to release it.)



Therefore, by combining head motion and smiling you get a click-and-drag (aka drag), which is very similar to how it would work with a regular computer mouse. That is, if you press and release a mouse button *without moving the mouse*, you get a click. But if you press and hold the mouse button and start moving the mouse, you start a drag command which ends when you release it. Smyle Mouse works in the same way with smile combined with head motion.



Note: For convenience, Smyle Mouse does not require the user to continue holding the smile once the drag process is started. Once drag command is started, the user can release their smile and drag will continue as long as their head is still in motion. The drag command will come to an end when both, the smile and head motion, have come to an end.

b) Adaptive Switch Mode

This mode is for users who are looking to use Smyle Mouse only as an adaptive switch or a just a smile clicker. Here are a couple examples when Smyle Mouse can be really useful to them.

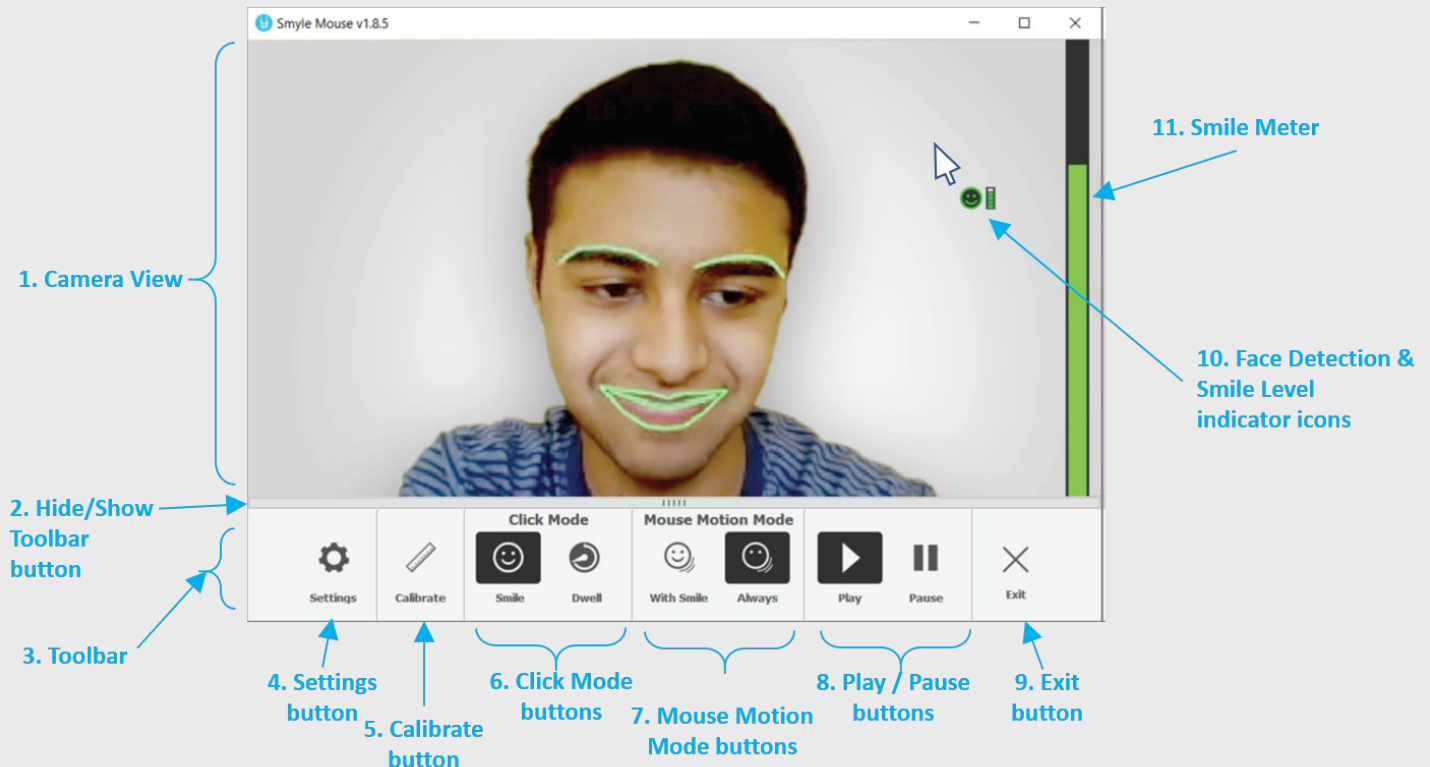
- (1) User is interested in using AAC speech generation or other software via an adaptive switch and is looking to replace their switch. This could be for various reasons. E.g.
 - Extended use of head / knee / etc. switch can cause muscular tiredness or discomfort.
 - Use of sip-and-puff or bite switch can lead to sanitary concerns as well as discomfort due to having to hold something in the mouth for extended periods of time.
 - For caregivers, setting additional switch hardware around the user's face every time they are getting ready to use it can cause unnecessary loss of time and effort.
- (2) User has good hand control and is therefore able to use a computer mouse. However, they are experiencing pain when pressing a mouse button (e.g. due to carpal tunnel syndrome). In this case, they can generate mouse clicks using their smiles in this mode.
- (3) User already has access to an eye tracker, however, is using an adaptive switch along with it to trigger various commands. They can configure Smyle Mouse to generate those commands without having to install and use additional switch hardware

Smyle Mouse's adaptive switch mode can help in each of these cases.

4) User Interface Overview

The following sections provide an overview of the important Smyle Mouse windows that are used for interacting with and configuring Smyle Mouse.

a) Main Window



The Main Window: shows the Camera View (for user feedback) and important buttons via the Toolbar. Note the Main Window is not required to be visible for Smyle Mouse to work, therefore it can be minimized. Following are the main elements.

- 1) **Camera View:** shows what is seen by Smyle Mouse through the webcam. Note that the lips and eyebrows are highlighted in green when things are working well. The highlights will turn red when Smyle Mouse is having trouble seeing the face clearly. Note that both the eyes and the lips need to be seen clearly for best operation.
- 2) **Hide / Show Toolbar button:** allows the user to show or hide the Toolbar below it. Hiding the toolbar is useful in allowing the Main Window to be resized to a small size.
- 3) **Toolbar:** is the horizontal area that is composed of the important buttons.

- 4) **Settings button:** allows to bring up the Settings window, which has various settings that are used to fine tune the operation of Smyle Mouse according to user preference and user condition.
- 5) **Calibrate button:** invokes the quick calibration process. It is recommended to be used every time a new person starts using Smyle Mouse. (Note that the same calibration process is automatically started every time Smyle Mouse is started.)
- 6) **Click Mode buttons:** decide how a click is performed. By default, the "Smile" button is selected (indicated by dark highlight). In that case, a click is performed when the user smiles. If the user selects the "Dwell" button, then every time the user hold their head steady (i.e. dwells the mouse), a click is performed. (See Click Opts window for details on causing Left versus Right versus Double clicks).
- 7) **Mouse Motion Mode buttons:** indicate when the mouse pointer will move based on head motion. By default, the "Always" mode is selected. In this case, the mouse pointer will attempt to move every time a user moves the head. In contrast, if the "With Smile" mode is selected, the mouse pointer will move only if the user also smiles at the time of moving their head. This latter mode is meant for advanced users.
- 8) **Play / Pause buttons:** indicate if Smyle Mouse is functioning or temporarily paused. Note that when the Pause selected both the pointing as well as clicking functions will be disabled. Therefore use of hands will be required once Smyle Mouse is paused, until "Play" is selected again.
- 9) **Exit button:** allows you to exit (completely stop) Smyle Mouse. Once stopped, use of hands will be required to restart Smyle Mouse.
- 10) **Face Detection and Smile Level indicator icons:** are displayed next to the mouse pointer to indicate if the user's face is being detected and the level of the user's smile.



: Indicates face not found

(Move to be within camera's view and turn your face towards it)



: Indicates face found and features detected well



: indicates face found but cannot see all of lips and/or eyes.

(Turn your face towards the camera)

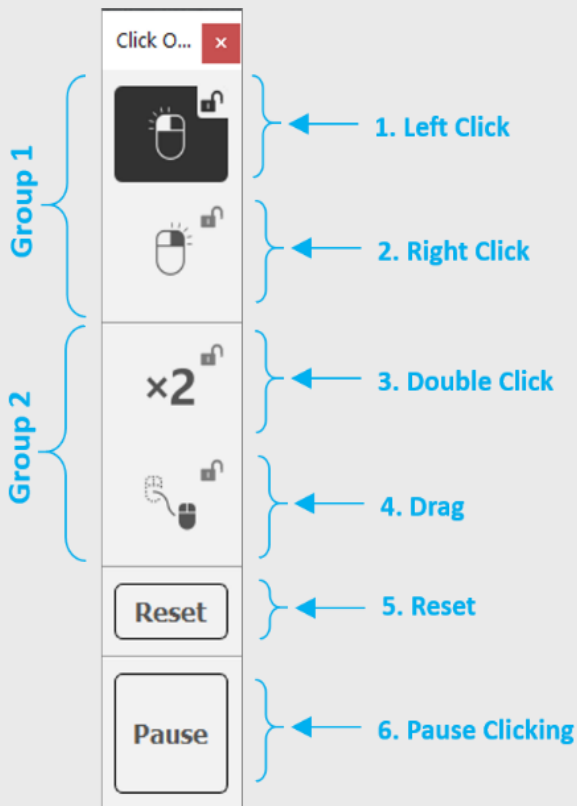


: indicates level of smile detected. (This is a mini version of the Smile Meter below.)

- 11) **Smile Meter:** indicates the level of smile detected.

b) Click Options Window

Click Options window allows the user to choose what type of click command is generated based on a smile or dwell gesture. The below picture shows the default activations on the window.



Group 1: (Choose Left vs. Right Click)

- Based on which button in the group is activated, Smyle Mouse generates a Left or Right click upon a smile or a dwell.
- Only one button in the group can be activated at a time.
- If Right is activated, it resets to default (Left) after the click unless the lock button (at the top corner of the button) is also activated.

Group 2: (Choose Double click vs. Drag)

- Based on which one is selected, Smyle Mouse generates a double click or drag upon a smile or a dwell.
- Only one button in the group can be activated at a time.
- If a button is activated in this group, it is combined with the activation in Group 1. E.g. if buttons #2 and #3 are activated, then a smile will result in a Double-Right click.
- If any button is activated in this group, it resets to default after the smile / dwell, unless a lock button is also activated.

5. Reset: resets any locked activations of buttons 1:4.

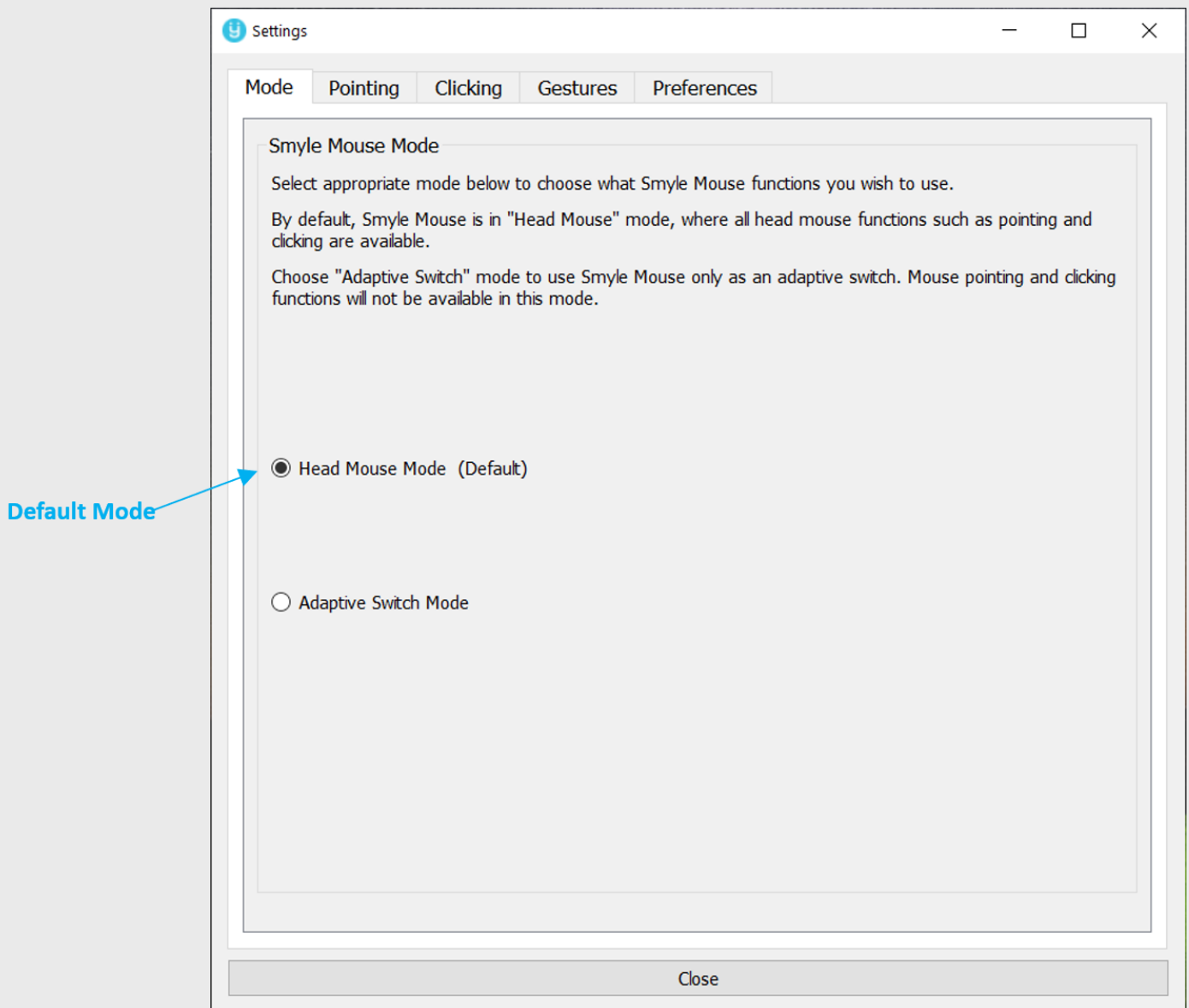
6. Pause Clicking: temporarily pauses click signals from getting generated upon any smiles/dwells. The exception is that click signals will be generated when the mouse pointer is on the click Options window itself.

c) Settings Window

Settings window provides a rich set of parameters that allow the user to configure Smyle Mouse to their needs and preferences. It has multiple tabs that organize different configurations settings.

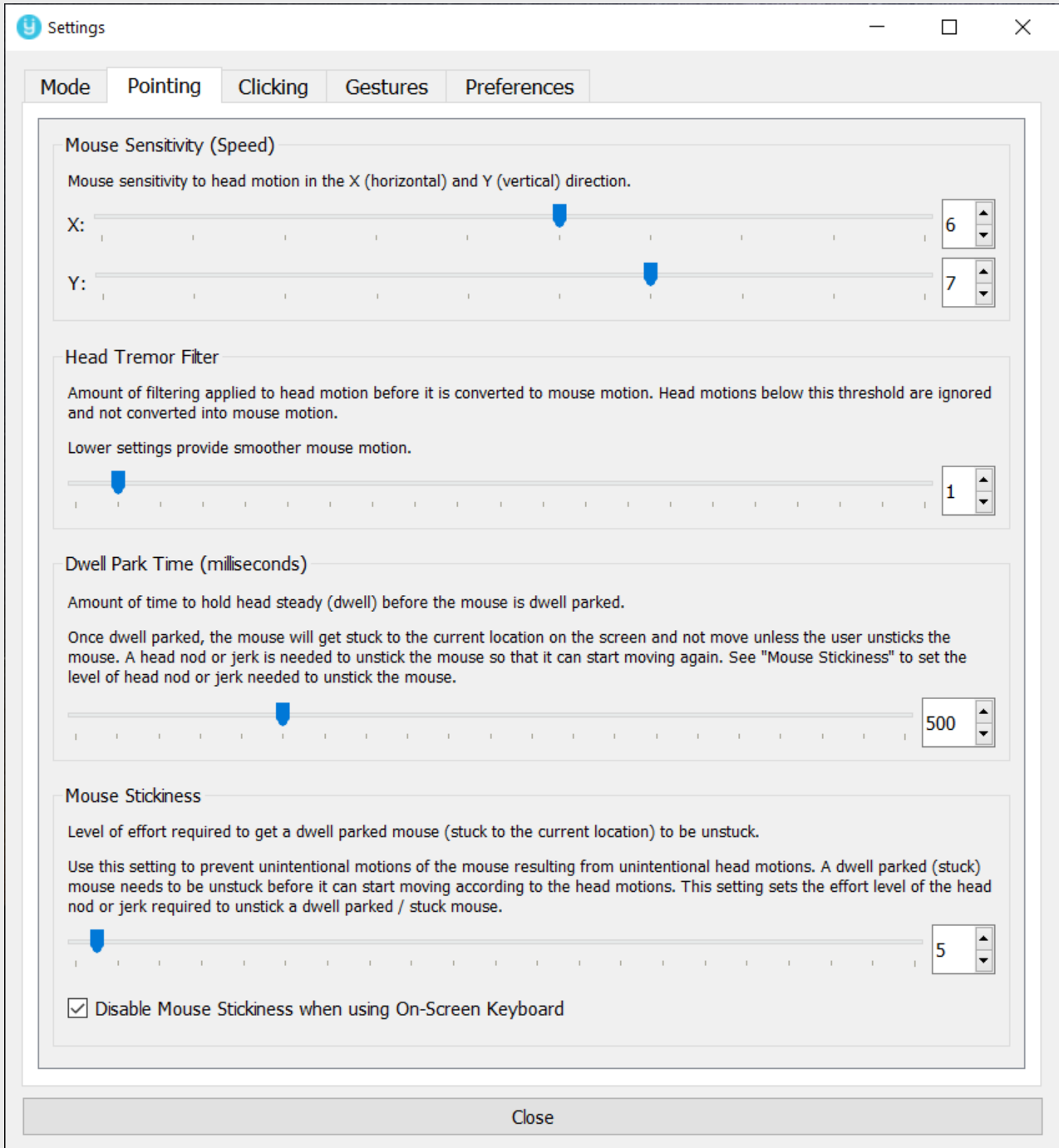
[1] Mode Tab

This allows the user to choose whether they want to use the head mouse functions of Smyle Mouse (i.e. pointing and clicking) versus use Smyle Mouse only as an adaptive switch or a selector.



[2] Pointing Tab

This tab has various settings that determine how the mouse moves in accordance with the user's head motion.



We recommend that the user try out the various pointing settings described below and adjust them as per their individual preference.

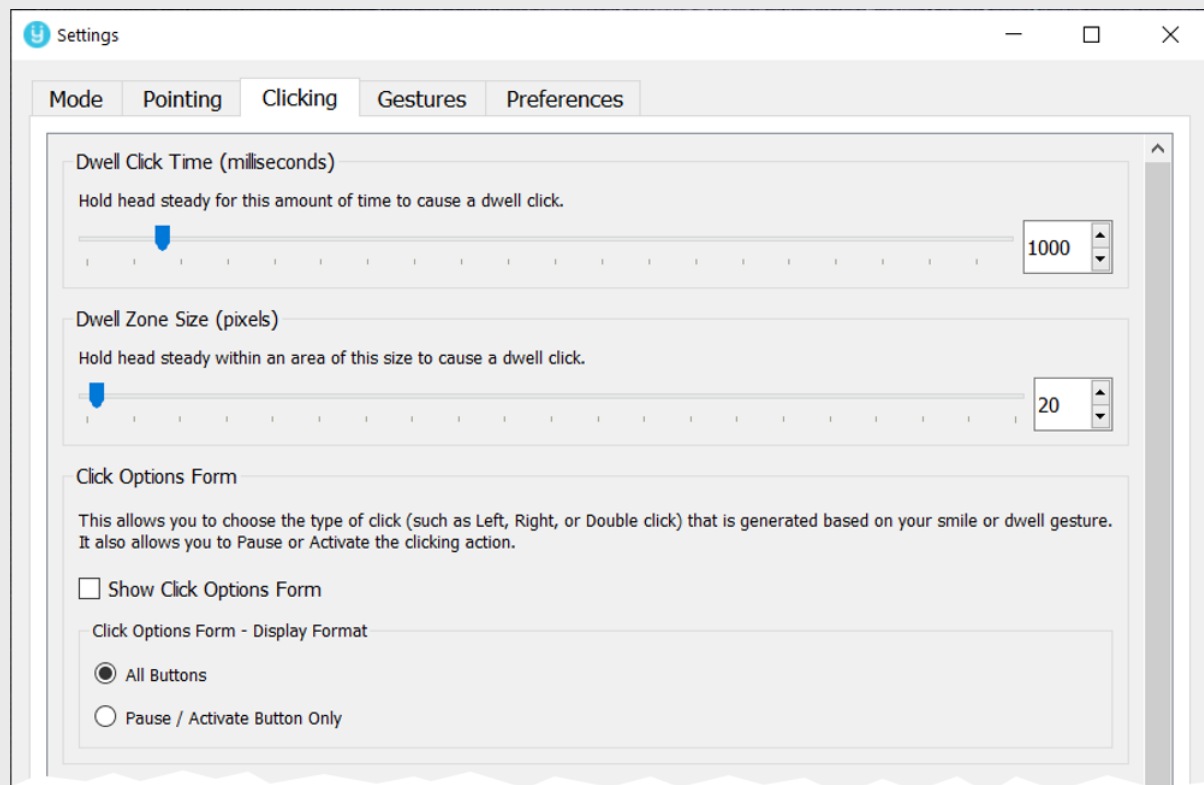
Additional Information on [various](#) settings on the Pointing tab:

- Mouse Sensitivity – Adjust this such that the user is able to move the mouse end to end on the display screen with only moderate and comfortable head motion.
 - A larger setting in Y direction (with respect to the X direction) is recommended. This is because typically humans have less range of head motion in the Y direction.
- Head Tremor Filter – Set this to the lowest setting the user can work with. We recommend a setting of 1 or 2 if the user has no tremor and has good control over their head.
 - Smaller values of this setting provide finer and smoother control over the cursor. Higher settings are recommended for users without sufficient head control or with head tremor.
- Dwell Park Time – Recommended default is about 600 milliseconds.
 - Increase this time if the user seems to need more time to place the cursor precisely. Decrease this time for faster dwell parking.
 - After the user gets a feel of the dwell park mechanism, they can turn off the “Animate Dwell Park” option in Preferences tab.
- Mouse Stickiness – The concept of mouse stickiness allows the user to naturally move their head without the mouse pointer leaving its parked location on the screen. This setting indicates the threshold head motion (speed) needed to make the parked mouse pointer move again. For example, to move and park the mouse pointer at the top right corner of the display screen, the user would move their head in the top right direction. Once the mouse pointer is dwell parked, however, they can move the head back to a more comfortable position. The mouse will stay in the parked location as long as the user moves their head back slowly, that is, at a speed less than the threshold defined by the Mouse Stickiness setting.
 - Default setting is 20. Lower settings allows to restart the mouse motion more easily, but make it harder to leave the mouse parked at a particular location. High settings do the reverse. We recommend the user experiment with this setting to find their sweet spot.
 - Many users prefer to not have mouse stickiness when using an on-screen keyboard. Smyle Mouse therefore disables mouse stickiness automatically when it detects that the On-Screen Keyboard (OSK) is active *and* the pointer is over the OSK window. The “Disable Mouse Stickiness when using On-Screen Keyboard” checkbox is provided to control this automatic disablement.
 - ❖ This concept provides user convenience and reduces the chances of neck strain. It can also improve user productivity by eliminating the effort required to constantly manage the location of the pointer.

[3] Clicking Tab

This tab has various settings that determine how the click signal is generated based on the user performed gesture.

Part 1: Basic Options



- Dwell Clicking is the process by which a user generates a click by holding their mouse pointer steady enough for a given amount of time. The steadiness is defined by the following settings—
 - ❑ Dwell Click Time –is the amount of time to hold the head (and therefore the mouse pointer) steady on the screen before a click will be generated.
 - ❑ Dwell Zone Size – is the size of the zone / circular area within which to hold the mouse pointer for it to be considered to be “steady” or dwelling.
- Click Options form allows the user to choose which type of click should be generated based on the user’s smile or dwell. E.g. Left single click, Right single click, Left Double click and so on.
 - ❑ Show Click Options form checkbox shows or hides the Click Options form. To save on desktop space, the user can choose the “Pause / Activate Button Only” if they are interested only in left single clicks.

Part 2: Advanced Options

The screenshot shows a window titled 'Settings' with a navigation bar containing 'Mode', 'Pointing', 'Clicking', 'Gestures', and 'Preferences'. The 'Clicking' tab is selected. Below the navigation bar, there is a section titled '[ADVANCED OPTIONS]'. This section contains three main settings:

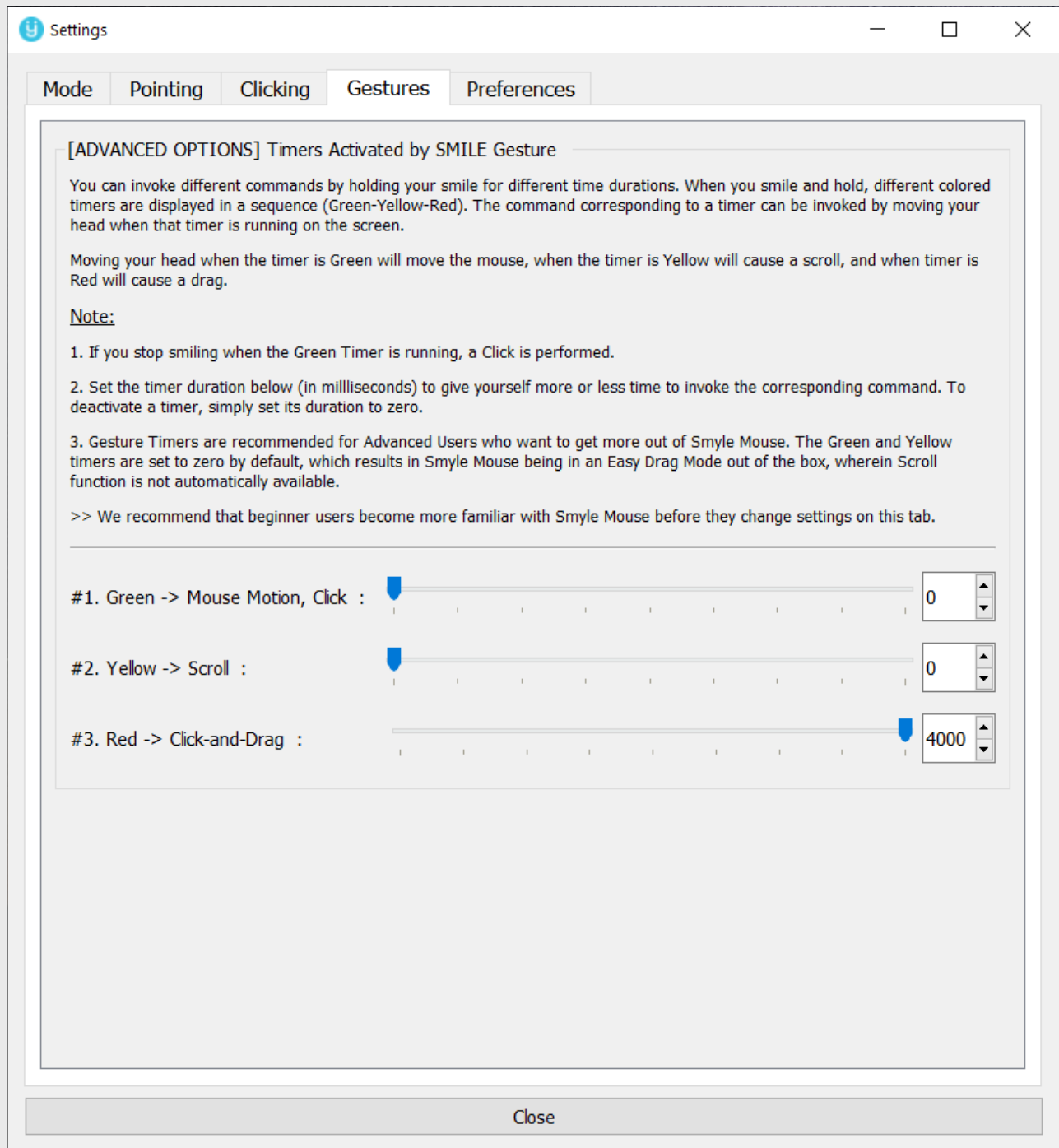
- Perform Click Instantly Upon a Smile**: A checkbox labeled 'Activate Instant Click' is currently unchecked. The text explains that by default, a mouse button is pressed when the user starts smiling and released when they stop. This setting allows for an instant click at the start of a smile. It includes two notes: Note 1 states that the mouse pointer will freeze while the user is smiling; Note 2 states that the setting is ignored if Mouse Motion Mode is not 'Always' or if Green and Yellow gesture timers are non-zero.
- Max Allowable Head Motion at Start of a Smile**: A slider control with a blue marker and a numeric input field set to '10'. The text explains that this helps distinguish intentional smiles from inadvertent ones, such as while talking or playing games.
- Click Assist Level**: A slider control with a blue marker and a numeric input field set to '10'. The text explains that users need to hold their head steady to perform a click, and this setting provides assistance for users with unsteadiness.

At the bottom of the settings panel, there is a 'Close' button.

[4] Gestures Tab

This tab has settings for an advanced user. In the default simplified experience meant for beginner users, there is no consideration given to the amount of time the user smiles and holds their head steady.

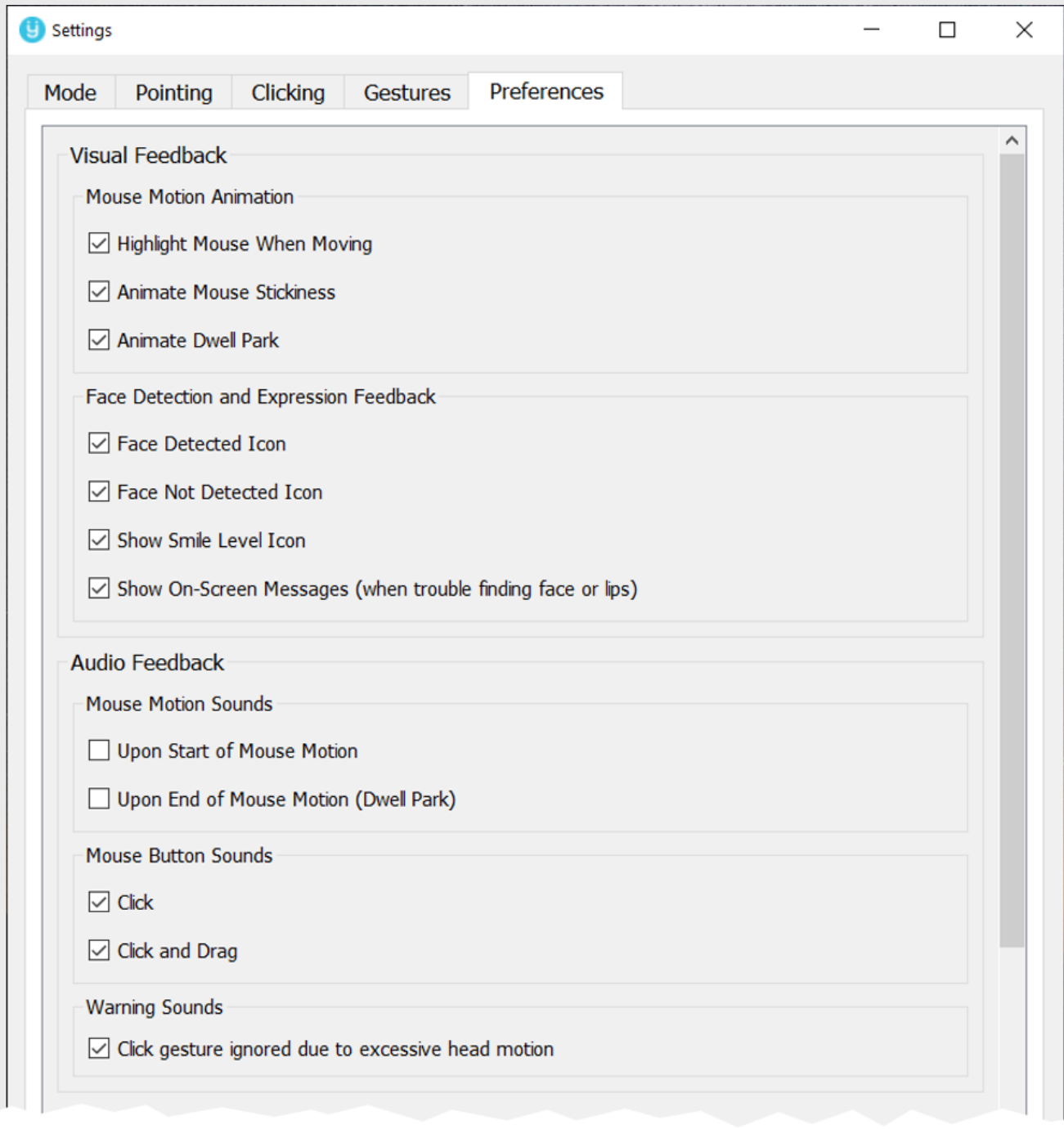
In this tab, users can define the durations for a short, medium and long smiles (and holds) (represented by the Green, Yellow and Red timers). Holding steady for different amounts of time can be used to trigger different commands such as Mouse Motion, Scroll or Drag.



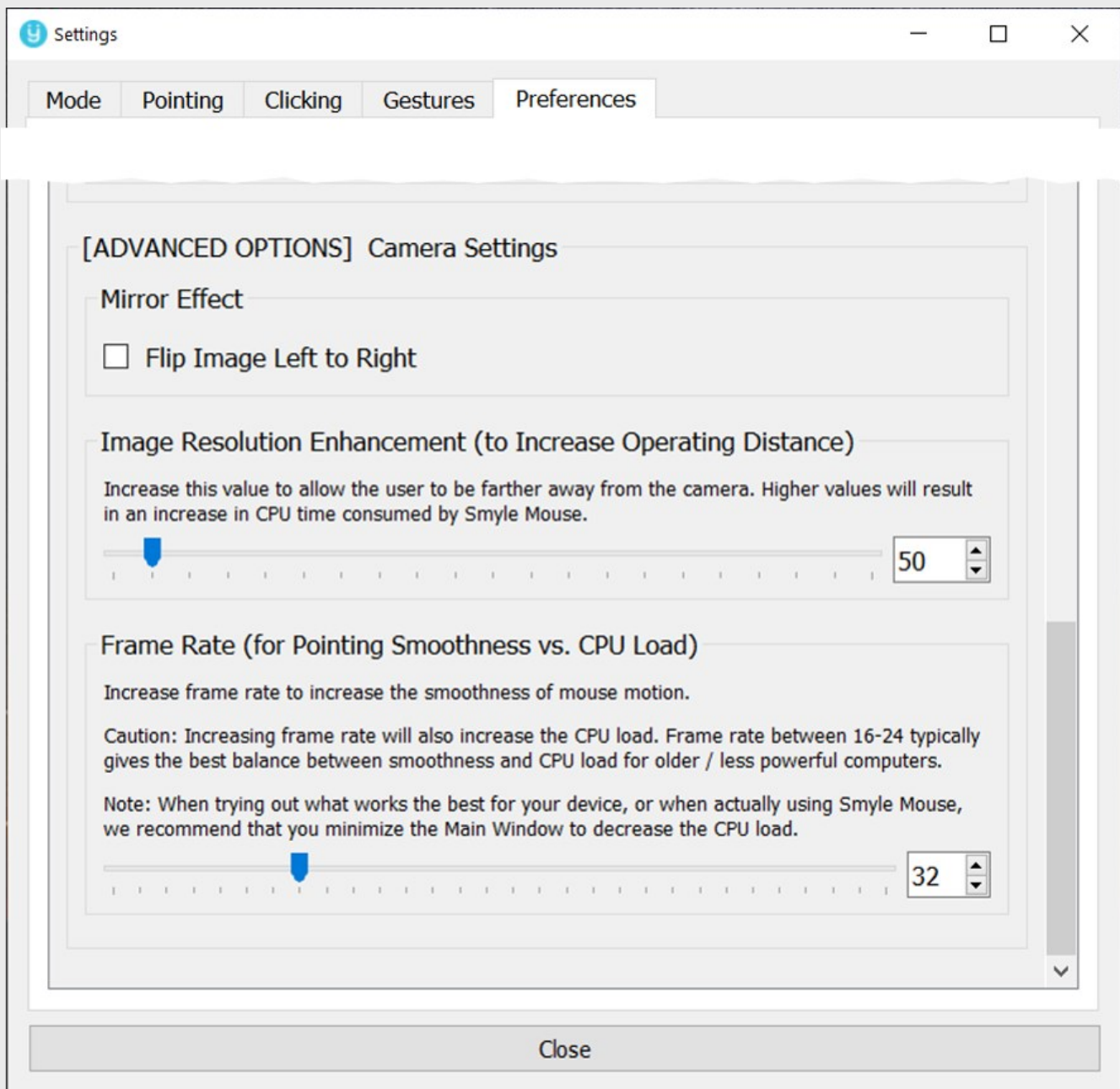
[5] Preferences Tab

This tab has user preference settings that control the audio visual feedback provided by Smyle Mouse. It also has some advanced features that relate to camera settings that have an impact on the operating distance, smoothness of operation as well as CPU time consumption.

Part 1: Basic Options



Part 2: Advanced Options



- **Mirror Effect:** Flips image captured by the camera from left to right to cause a mirror image. This is to be used to compensate in case the camera is flipping images.
- **Image Resolution Enhancement:** Enhances the image captured by the camera to allow the user to be situated much farther away from the camera. The default setting of 50 allows the user to be 12-36 inches from the camera. This can be increased to up to 100 inches. Note that higher setting increases the load on the computer's CPU.

- Frame Rate: Allows control over the number of camera frames per second (FPS) utilized by Smyle Mouse. The default value is 32. We recommend a setting of 16-24 fps for older or slower computers.
 - Decrease this to lower the load on your computer's CPU. However, this may introduce some choppiness in the mouse pointer's motion.
 - Increase this setting to process more camera frames per second. This will increase the smoothness of pointer motion, however, may increase the load on your computer's CPU as well as the power consumption. Note that every camera has an upper limit on the maximum FPS it can provide. This FPS limit cannot be overcome by this setting.

5) Trouble Shooting

1. **Smyle Mouse sometimes thinks I am smiling when I am not.**

Solution:

Try one or more of the following—

- Perform a calibration and make sure to smile moderately when prompted during the process.
- Make sure you are facing the camera when working on your computer so that your lips, nose and irises of both eyes are visible to the camera without obstruction.
- Make sure facial features are being detected correctly and smoothly by checking the camera view displayed on the main Smyle Mouse window.
 - Correct the lighting situation such as low light or intense backlight, if required.
 - Try using a webcam that performs well in low light.

2. **Smyle Mouse is not detecting my face though I can see it in the camera view displayed in the main window.**

Solution:

Try one or more of the following—

- Make sure you are not too far away from the camera. A rough rule of thumb is to be about an arm's length from the camera.
- Correct the lighting situation such as low light or intense backlight, as required. Make sure your facial features (such as eyes, nose and lips) are visible clearly to the camera by checking the camera view shown in Smyle Mouse's main window.

3. **Difficulty in placing the cursor precisely on a tiny area. I keep on missing the target and often overshoot or undershoot.**

Solution:

Try one or more of the following--

- Reduce Head Tremor Filter setting. This increases the granularity and smoothness of motion, allowing for finer placement.
- Increase Dwell Park time. This will provide your more time to fine tune the placement before the pointer dwell parks.
- Reduce Mouse Stickiness setting. This especially helps when moving mouse pointer through short distances. You can restore the setting as you become more skilled at it.
- Turn on "With Smile" Mouse Motion mode on main Smyle Mouse window. Then, keep on smiling while trying to place the pointer precisely by making small head motions. Stop smiling while holding the head steady when the pointer is at the desired location.

(You may want to reduce the Dwell Park time when using the "With Smile" mouse motion mode.)

4. Difficulty with moving the mouse through large distances on the screen. The mouse is not moving far enough even though I have already turned my neck to the maximum extent.

Solution:

Try one or more of the following--

- Start the head motion at a higher than average speed (versus starting at lower than average speed). Higher head speeds move the mouse pointer through disproportionately larger distances.
- Increase the Mouse Sensitivity setting so that smaller head motion translates to large mouse motion.
- While Smyle Mouse is running, go to the Microsoft Windows' Control Panel and change Mouse settings as follows.
 - i. Turn on "Enhance Precision".
 - ii. If needed, increase "Pointer Speed".
- If you are using the "Always" Mouse Motion Mode, set the "Mouse Stickiness" setting to about 20 (or something you find comfortable). Then, to use a golf analogy, rather than trying to hit hole-in-one, make more than one attempt to get to your destination. That is, in the first attempt, move the mouse towards the destination to the maximum extent that is comfortably possible, and let it dwell park. Then pull the head back bit slowly (so that the dwell parked mouse remains in its new location) and then make another attempt to bring it closer to or at the final destination. Repeat as needed.
- If you are using "With Smile" Mouse Motion Mode, start with the head positioned in the *opposite* direction to the direction in which you would like to move the pointer. For example, if your pointer is in the middle of the screen and you would like to move it to the right edge of the screen, then point your head to the left *before* you begin smiling and moving your head towards the right. Secondly, you can also try to move the pointer to the target through multiple attempts, progressively getting closer to the target with each attempt.
- Try "Bouncing off the Opposite Edge" method to move the mouse pointer through large distances. For example, if the mouse pointer is near the left edge of the screen and you would like to move it all the way to the right edge of the screen, start by moving the head to get the pointer to move beyond the left edge of the screen and then pull it back to the right (a little bit faster) in one smooth head motion. This technique is especially helpful when working with large or multiple monitors.

5. Smile not resulting in click or switch command. What do I do?

Solution:

Try one or more of the following--

- Check if your face is being detected, by checking the Main Window and/or the face detection indicator icon.
 - If the face is detected make sure that facial features (lips and eyebrows) are being highlighted in green (and not red). If red --
 - Turn your head towards the camera so that both your eyes and entire lips are visible to the camera and retry.
 - Turn your head so that it is reasonably vertical.
 - Make sure there is enough light on the face and there is not strong back-lighting.
- Perform your smile quickly. A good rule of thumb is to start and complete the smile in about the amount of time it takes to say the word "click".
- Try to hold your head steady throughout your smile. That is, hold your head steady when from start to end of your smile.
 - If you get a Drag (instead of a Click) then increase the "Click Assist Level". That will help generate a Click instead of a Drag.
 - If you hear a beep sound when smiling (instead of a click sound), that means there is too much head motion before the smile gesture. Increase the "Max Allowable Head Motion at start of a Smile" setting in the Clicking tab and retry.
 - Note: If you plan to use Smyle Mouse to play fast action games that need clicking when the mouse (head) is moving, then look into "Activate Instant Click" below before increasing this setting too much.
- If you are in "Head Mouse Mode" and do not need to drag in one step (that is by starting your smile and simultaneously moving your head), then turn on the "Activate Instant Click" in the Clicking tab. This will make clicking much easier and regardless of presence of head motion. However, to do a Drag, you will need to use the Drag icon on the Click Options form.
 - Note that when Instant Click is activated, the mouse pointer will freeze upon a click until the time you stop smiling.
- If you are in the "Adaptive Switch Mode" and do not need to distinguish a switch button press from release (for scanning purposes), turn on "Activate Instant Switch Release" on the Mode tab. It will be visible only when you are in the Adaptive Switch Mode.
 - Note that we recommend using this setting for users with uncontrollable head motions, e.g. certain users with Cerebral Palsy.

6. I would like to be farther away from my camera? The face highlights turn red when I do so.

Solution:

- In Settings window > Preferences tab, try increasing the "Image Resolution" in steps of 50 pixels and retry. Higher the value, the farther you can be. However, it also means that it can increase the CPU time consumed by Smyle Mouse.

7. How to increase the fineness or smoothness of mouse pointer motion?

Solution:

- In Settings window > Pointing tab, decrease the "Head Tremor Filter" to increase the fineness of mouse pointer motion.
- In Settings window > Preferences tab, increase the "Frame Rate" setting. This will allow Smyle Mouse to use more frames every second, and thereby increase the smoothness of mouse pointer motion. Note that this may increase the computer's power consumption as well as the load on its CPU.

8. The display in the Main Window and my pointer motion has become choppy. The face highlights seem shaky and seem slow to update.

Solution:

- You probably have a camera with poor low light performance. Some cameras automatically (severely) decrease the frame rate when the light is low. This can lead to slow refresh of face highlights, inconsistent smile detection and choppy mouse motion. If you notice this, move to an area where the lighting condition is good so that the face is better lit.

The other option is to use a webcam with better low light performance. Pay special attention to automatic exposure control in low light or adverse light situations. We recommend cameras equivalent to a Logitech C270 camera or better.

