touchless

TURN **ANY** SURFACE INTO A TOUCHSCREEN

http://www.**touchless**touch.com

Touchless Touch

Manual
V1.8

Contents

Introduction

Touchless Touch allows you to turn any suitable surface into a multi-touch surface by harnessing the power of the cameras on the Kinect or Primesense (OpenNI) sensors.

You can connect a maximum of 4 sensors* to extend the size of the touchable area and increase accuracy when many people are using the surface.

Possible usages include adding touch screen support for a front/rear projected screen, making a projected white board touch-enabled, or for a cheaper way to enable touch support on large format displays.

For most applications only a single sensor is required. For larger multi-user and multi-touch application you may find the need for more than one sensor.

One sensor can theoretically detect all 128 touch points although in practice this is probably physically impossible, thus the support for up to 4 sensors. The software does not mind which sensors are installed, so you can have a combination of different compatible hardware.

* Currently you can only connect one Kinect V2 sensor to a computer at a time.

What's New?

V1.8
- Added support for Windows 10
- Added new "*Reduce Lag*" option for improved smoothing with faster response
- Disabled Windows 8 lockdowns for operating systems other than Windows 8.0
- Added automatic check for updates
- Fixed a bug with the about screen not displaying correctly
- Improved detection of multi-touch points with better rejecting of false data
- Increased responsiveness of the KinectV2/Xbox One sensor
- Overhauled the calibration routine to be more accurate
- Improved the calibration routine for the more precise nature of the Kinect V2/Xbox One Sensor

V1.7
- Support for the Kinect for Windows V2 and Xbox One Sensor

V1.6
- New touch algorithm meaning the software is now much more accurate.
- Added new options to restrict the detection area during calibration.
- Fixed a bug where the Max Touch Points option wasn't being saved.
- Improved multi-monitor support for Windows 8

V1.5
- Fixed bugs with multi-monitor on Windows 8 where primary display was right of another monitor

V1.4
- Fixed major bug with some OpenNI devices not being detected

V1.3.1
- Improved support for OpenNI compatible devices

V1.3
- Massively improved touch detection algorithm.
- Much more accurate and more sensitive.
- Touches are not lost during dragging operations so easily now.

V1.2

- Windows 7 (32 and 64bit) support
- Improved accuracy when using multiple sensors
- Slight speed increase of touch detection
- Improved documentation
- Fixed bug with manual licensing dialog
- Improved Windows 8 compatibility

System Requirements

	OpenNI Sensors	**Kinect V1 / XBox 360**	**Kinect V2 / XBox One**
Processor	*32/64 Bit (x86/x64 CPU)*	*32/64 Bit (x86/x64 CPU)*	*64 Bit (x64 CPU)*
Processor Speed	*Dual-Core 1.66Ghz ***	*Dual-Core 1.66Ghz ***	*Dual-Core 1.66Ghz*
O/S	*Windows 7/8/8.1/10 (32/64 Bit)*	*Windows 7/8/8.1/10 (32/64 Bit)*	*Windows 8.1/10* **64-Bit Only**
RAM	*1G*	*1G*	*4G*
Graphics Card	*DirectX 9.0c or better*	*DirectX 9.0c or better*	*DirectX 11 or better*
Max Sensors	*4*	*4*	*1 (currently)*
Dedicated Ports	*USB 2.0*	*USB 2.0*	*USB 3.0*

** Works even on a Pentium 4 2.0-GHz, but a bit laggy.

USB host controller compatibility (Kinect Sensors)
The Kinect for Windows drivers have encountered compatibility problems with certain USB host controllers when tested in specific computer configurations.

Some examples of these controllers are the AMD Fusion A75 USB2.0 controller, certain NEC USB 2.0 controllers, the Etron USB 3.0 Extensible Host Controller, and the Renesas Electronics USB 3.0 Controller.

On those controllers, you may encounter a problem, such as high lagging, or a Not Ready/Busy status when plugging/unplugging a Kinect.

If this happens to you, you may have to restart the Touch service or reboot your computer. You can also try updating your USB controller drivers, or plugging your sensor into another USB 2.0 controller. For more information about this issue see
http://msdn.microsoft.com/en-us/library/jj663798.aspx

Kinect V2/Xbox One Hardware Compatibility
As USB3.0 is still relatively new there are some USB ports that are not compatible with the Kinect V2. For more information see http://support.xbox.com/en-GB/xbox-on-other-devices/kinect-for-windows/kinect-for-windows-v2-known-issues

Software Installation

Installation is straightforward. Do not connect any sensors until the installation process completes.

1. Find and run the *setup.exe*
2. Follow the on-screen prompts
3. During the installation the Kinect for Windows Runtime will appear. You must complete this process for the installation to work.
4. If you are on Windows 7 you may be asked if you wish to proceed installing an unsigned driver. You must accept this dialog or the software will not work.
5. If you are using a 64-Bit version of Windows 8/8.1/10 you will be prompted with a second Kinect for Windows installer. You must also complete this process for the installation to work.
6. After the installation, connect the sensor(s) to the computer. Drivers will automatically be detected and installed correctly. After about a minute the sensors will become active and will be ready for calibration. If they are not detected restart your computer and try again.

Hardware Installation

Hardware installation is straightforward but there are a few important things you need to know.

Kinect Sensor
This software is designed to work with the *Kinect for Windows* V1, V2 and Xbox One sensors *.
The *Kinect for Xbox 360* sensor will only work if you download the full Kinect SDK from Microsoft
(http://www.microsoft.com/en-us/download/details.aspx?id=40278).
You can find out more information on where to purchase one of these sensors on our website.

Primesense OpenNI Sensor
This software is designed to also work with the Primesense OpenNI sensors. You can find out more information on where to purchase one of these sensors on our website. From our experiments the Kinect sensor has proven to be slightly more accurate but your tests may vary.

Drivers
Kinect for Windows drivers are included in the installer with this product. Drivers for Primesense devices will accompany those products and may need to be copied into the OpenNI folders within this software installation.

Multiple Sensors *
If you are using multiple sensors then each one must be connected to its own dedicated USB controller on the computer.

If you receive errors relating to low USB bandwidth then you are sharing a USB controller with more than one sensor, or have too many other devices connected.

This is a hardware limitation but can easily be bypassed by trying different USB ports or purchasing separate USB controller cards.

* To use the Xbox One sensor you require the Windows adapter from Microsoft.
** Currently Microsoft restricts the use of the KinectV2/Xbox One sensor to one per machine.

Sensor Mounting

The software allows a level of flexibility with the way the sensor is mounted; there are a few exceptions to this and checking the following will greatly increase accuracy.

1. **Minimum distance**
    The sensor cameras have a minimum and maximum detection range.   The sensor must be placed at least 40cm away (we recommend at least 60cm) from the touchable area. The sensor has a range of about 4 meters, (See *Fig 1*). It is perfectly acceptable to have the sensor mounted a distance from the surface rather than right next to it.   You can also add up-to 4 sensors to extend past the 4-meter limit or increase accuracy where multi-touch is used.
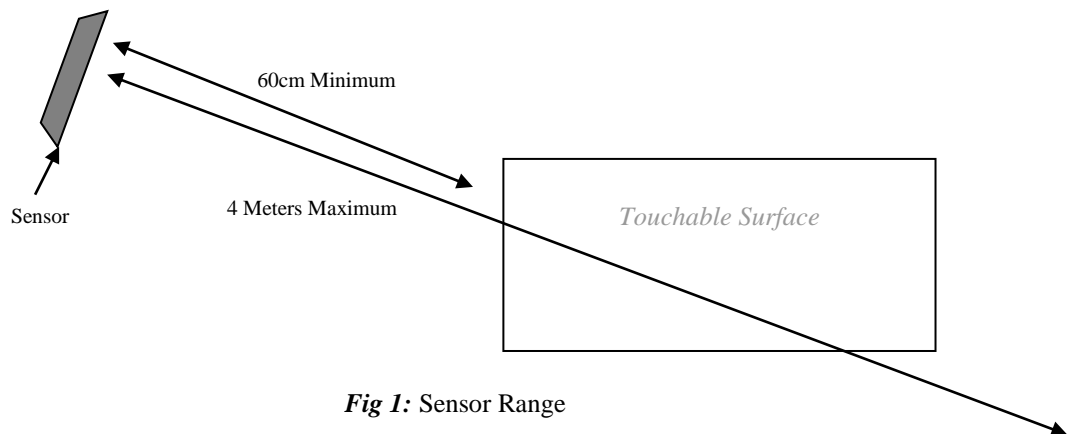
Fig 1: Sensor Range

2. **Viewing Angle**
    The Kinect V1 and Primesense sensors have a viewing angle (field of view) of about 58 degrees. The Kinect V2 sensor has a viewing angle of 71 degrees. Detection is not possible outside this angle. Once again, the use of multiple sensors can help with this limitation. *See Fig 2*.
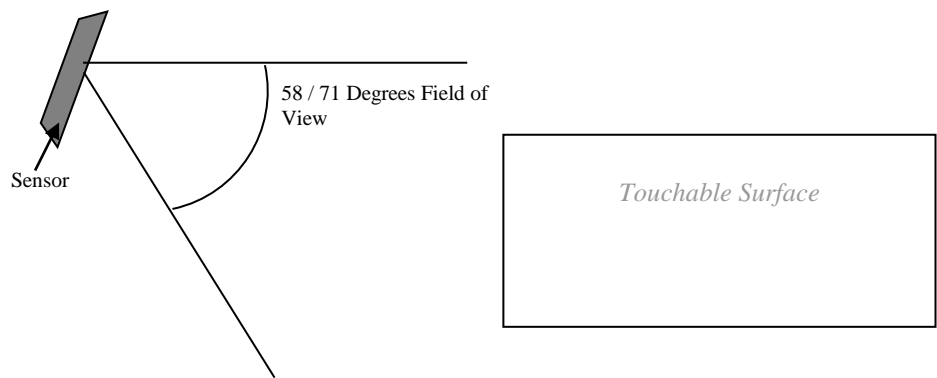
Fig 2: Sensor Field of View

3. Position Around the Surface

The sensor(s) can be placed at any position around the surface. *See Fig 3.* The calibration process automatically takes this into account. We recommend placing the sensor(s) in a corner, looking across the surface. This is the most accurate location.
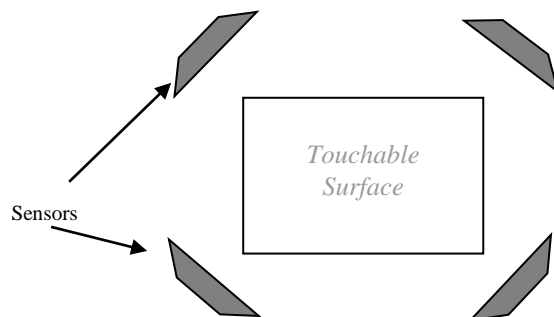

Fig 3: Sensor Position Around the Surface

4. Angle of Sensor

The sensor must be mounted *flat* against (or as close to as possible) to the surface being touched. See *Fig 4*. **The sensor should not be twisted or mounted up side down**. See *Fig 5*. The sensor should only be rotated in the same direction as it would normally tilt up or down.
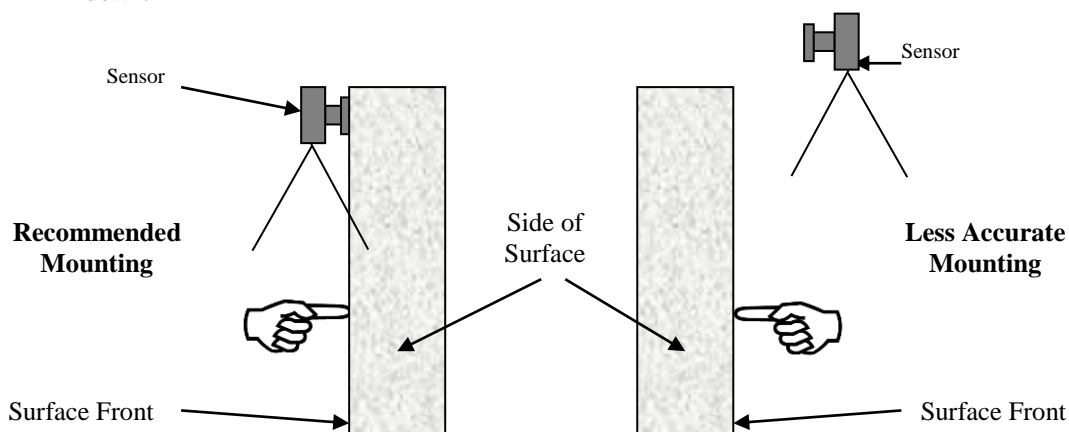

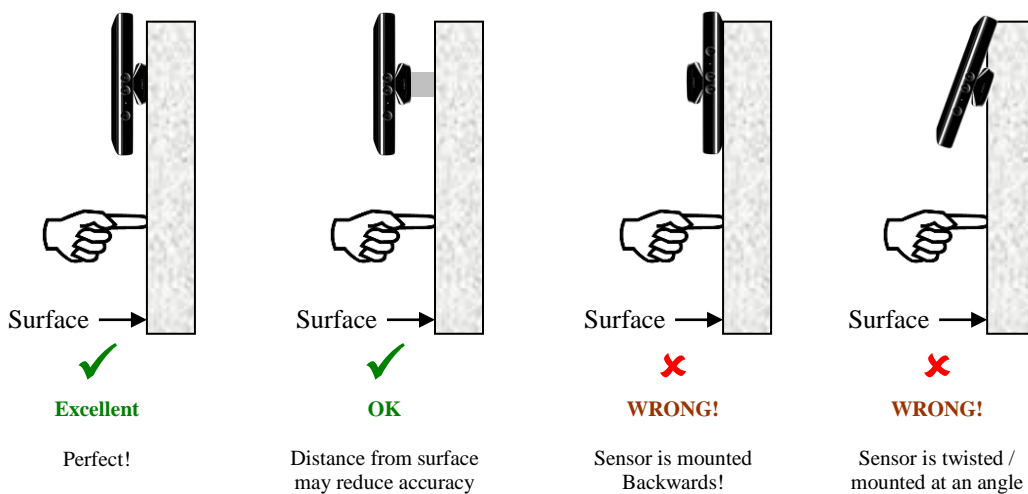*Fig 4:* Sensor Mounting – View from Side of Surface, Sensors Looking Down

Fig 5: Sensor Mounting – Right and Wrong (side view), Sensor Looking at You

Configuration

Once the software is installed it will place a small icon in the notification area of the task bar that looks like this:

If you right-click the icon you will see a menu like the following:

About...

Licence...
Configure...

Exit...
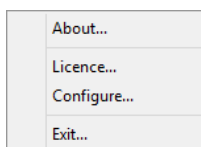
Choosing *Configure* or double clicking the icon takes you into the configuration screen as follows:

Shows the current status of the sensors

The minimum touch distance from the surface

Touch distance range

Reduces the touch detection area if there is a raised border at surface edge

Strength of false/ghost-touch blocking

Increases the finger detection size for using multiple sensors

Shows the current status of the system

Changes how information from multiple sensors is used.

Shows an image of what the sensors can see

Smoothing strength applied to touches, increases lag as a side effect.

Optional Windows 8.0 Settings

Use special algorithm to reduce lag

Starts the calibration process

Sets the movement threshold before the pointer is locked which prevents it jumping around

Allows you to manage your licence for this software

Sets the maximum number of touch points that can be detected at any one time

Starts the Pen and Touch Windows control panel

Controls the Windows touch animations

Reduces the CPU usage but increases lag as a result. Only use when using a slow CPU.

Configuration - Demo Mode

Status
Sensor 1: ● Not Calibrated
Sensor 2: ○ Not Connected
Sensor 3: ○ Not Connected
Sensor 4: ○ Not Connected
Status: No sensors are calibrated. (Preview not displayed)

Settings
Min Touch Distance from Surface: 15 mm
Touch Range: 5 mm
Surface Border Clipping: 5 pixels
Ghost Touch Blocking Strength: 2
Multi-Sensor Finger Detection Size: 150 %
Smart Multi-Sensor Mode: ☑
Movement Smoothing Strength: 6
Reduce Lag: ☑
Pointer-Lock Strength: 80
Max Touch Points: 128
Lower CPU Usage: ☐

Windows 8.0 Tweaks
☐ Disable Windows Start Screen
☐ Disable Windows Corners
☐ Disable Windows Charms Bar

Windows Tweaks
☐ Disable Windows Touch Effects

Options
Calibrate Devices...   Licence Management...   Pen and Touch Control Panel...

View Manual   OK   Cancel

Pressing *Calibrate Devices* will start the calibration process.
Some settings update in real-time as you adjust them.

Calibration

The calibration process is <u>very important,</u> and if performed correctly will yield very accurate results. If you find that your results are poor then repeat the process taking time to make sure each point is recorded correctly. Do not rush this step.

Pressing *Calibrate Devices* will cause the display to go black and the following message appear:
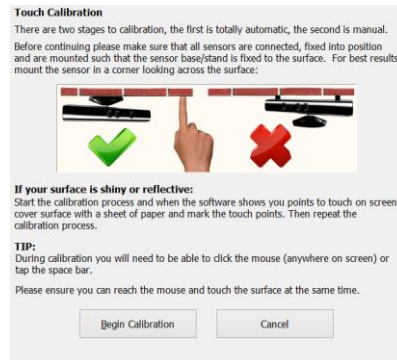
You need to make sure you can reach a keyboard or a mouse during the calibration process. This may require a USB extension or cordless/wireless keyboard or mouse.

Once you have read all of the information press *Begin Calibration*. The software will attempt to connect to up-to four sensors if possible. Once connected you will get the following warning:
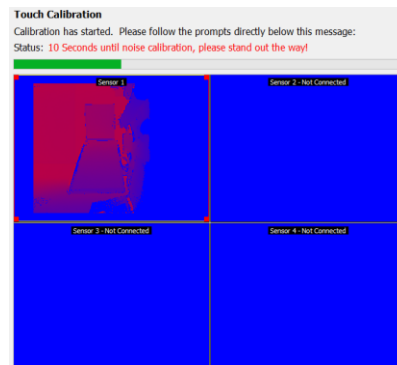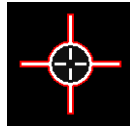

This is a 10 second warning to get everyone out of the range of the sensors. After this 10 seconds the software will take readings of depth and noise. You <u>must not</u> be in range of the sensor during this process.

After this completes you will be shown with the following screen:
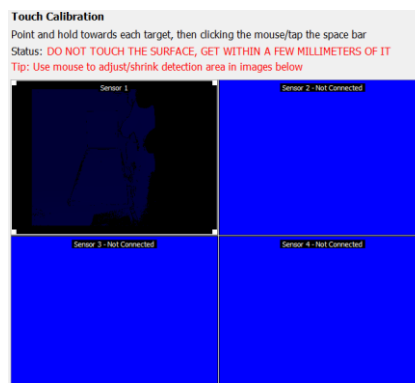
On screen you should also see a flashing target looking like this:

The background of the image of each sensor should be blue/black. If not, press ESC and start again.

To continue, point to this target with your finger, getting as close as you can _without actually touching the surface_. Your arm and hand will be highlighted in a green/yellow colour.

If you find that areas of the screen are being detected incorrectly then use the mouse and crop the image by dragging the four flashing squares in the corners of the image.

The tip of your finger will be shown by a red square. It is important not to continue until you are happy that the red square represents your finger tip as best as possible. Below shows being too near, too far away and perfect positioning of the finger:

Too Far Away	Perfect	Too Near
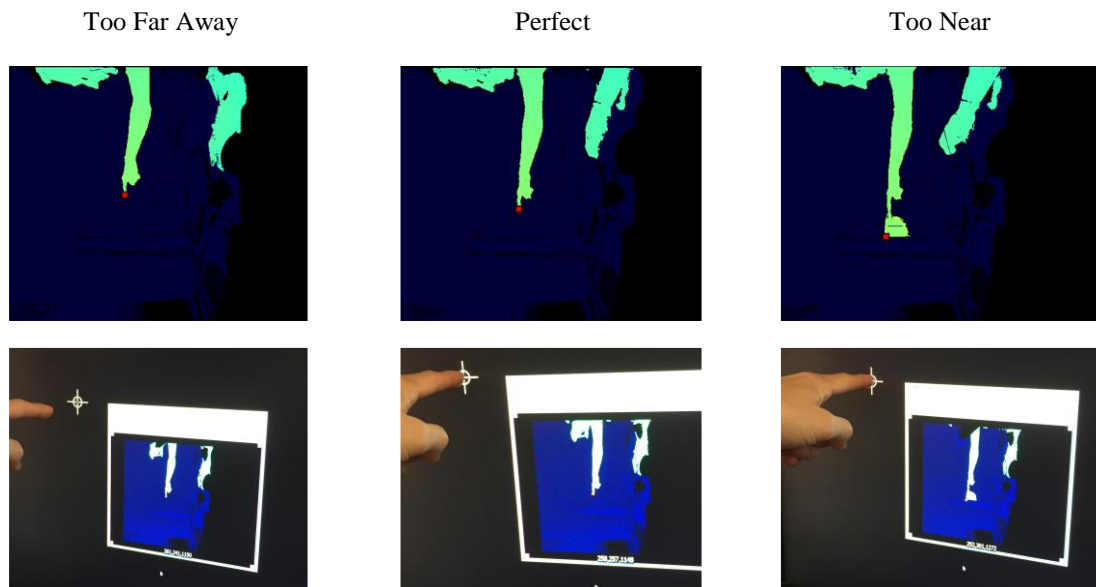
Once you are happy, press and hold the space bar, or press and hold the left mouse button. The software will read information about where your finger is and then the next target will be shown.

Repeat this process as many times as the software asks (usually four times in total) until the following appears:
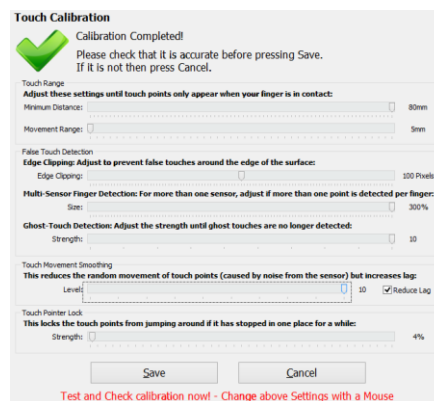
The settings applied on this screen will be unique to your setup. Touching the screen at this stage will show a blue circle marker. This allows you to fine-tune the calibration. Work your way gradually down through the settings until you have a perfect result. The settings are as follows:

Minimum Distance	Use this to adjust how close your finger should be to the screen to be registered as a touch.
Movement Range	Use this to adjust the range from the above setting that a touch can be detected in.
Edge Clipping	Sometimes if your surface has a bevelled edge it can trigger false touches. Adjusting this allows you to restrict where touches can be detected within the display.
Multi-Sensor Finger Size	If you are using more than one sensor then this lets you adjust how large an area should be detected as the same point across the sensors.
Ghost Touch Strength	If you notice random blue dots appearing then use this to prevent "ghost touches". These touches are caused by noise in the data received from the sensors.
Movement Smoothing	The result from the sensors can sometimes jitter a little. Adjust this until you find the blue dot follows your finger smoothly, but without too much lag.
Reduce Lag	Ticking this reduces lag within the smoothing algorithm.
Pointer Lock Strength	With the sensor noise it is hard for the software to determine when you are not moving your finger. This setting allows you to set the strength of detection of non-movement. If it is detected the pointer is locked in place until enough movement occurs.

After adjusting each setting touch the screen to see how it changes the results.

Once happy press *Save* and your calibration data and settings will be saved.

The second part you touch and hold various points on the screen while clicking the mouse/tapping the space bar. You should be able to see the "detected" points within the previews. If other areas are detected then adjust the detection area using the resize buttons and the mouse.

The last part allows you to test the calibration without applying it. Use the sliders on this screen until detection is optimal and false detection is prevented.

Calibration with Reflective Surfaces (Whiteboards, Glass etc)

If you find calibration gives a poor result then check to see if your surface is reflective. This is usually an issue with Whiteboards, glass etc. This is especially an issue with the Kinect V2/One sensor as its IR transmitter is much stronger than other sensors.

This issue is easy to resolve, but requires an extra step as follows:

1. Perform calibration as per the previous page.
2. When you are shown the points on screen to touch, affix a large piece of paper over the top so that it completely covers the dot and as much of the surface as possible. Calibrate each point as normal. Do not remove the paper.
3. If calibration has not improved, repeat steps 1 and 2 with the paper still attached. The calibration should now be accurate.
4. If the calibration is still poor check that the sensor is mounted flat against the surface and not tilted. For best results we recommend mounting the sensor in a corner and angled to look across the face of the surface.
5. If you still have poor results then look closely at the depth image as you move your finger about. Look for reflections of your hand in other areas of the image. This indicates other reflective surfaces that need to be covered.

Tip: You can also try pointing slightly further away from the surface.

Licensing

The software will run in un-restricted demo mode until registered. You can purchase a licence from the website by following the links within the software.

All licences must be activated before use. Activation requires an Internet connection. If an Internet connection is not available you can manually activate the software by visiting a special website from another computer.

NOTE: A licence can only be transferred to another computer if it deactivated first.

You can only transfer a licence a limited number of times, and each time you activate a licence you will be told how many more times you may transfer it.

You can access the licence screen by going into the configuration (see *Configuration and Calibration*) or by choosing *Licence* from the menu that pops up from the icon in the notification area in the task bar.

The licence management dialog is shown below:

Troubleshooting

The following table identifies possible issues and resolutions:

Problem	Solution
Sensor status says "Not Connected"	The software did not detect this sensor. If it is connected check that it is working.
Sensor status says "Busy"	The software attempted to connect to the sensor while it was starting up. This error should clear after a while.
Sensor status says "In Use"	The software attempted to use this sensor but it is in use by another application.
Sensor status says "Not Enough USB Bandwidth"	The software attempted to start this sensor but there was insufficient USB bandwidth to start it. This means there are too many other USB devices connected to the same USB controller. Or you have another sensor connected to the same USB controller.
Sensor status says "Not Powered"	The sensor was found but it requires an external power supply that has not been connected/not working.
Sensor status says "Not Calibrated"	The sensor was detected but it hasn't been calibrated yet
I connected the sensors to different USB ports and the calibration is wrong	The software uses the USB port to identify the each sensor. If you swap two sensors USB ports the software cannot detect this and re-calibration is required.
Configuration dialog says service is not responding	The software is unable to communicate with the Touch service. Check that it is installed correctly and running
Touches are being detected while I am no where near the surface	Re-calibrate the sensors and carefully adjust the sliders at the end of the process. If you are unable to get to the calibration options because of the false touches simply cover the sensor cameras.
Touch detection is really lagging	A small amount of lag is expected due to the image processing. If this detection is very slow check the CPU resources being used by the application.
I am seeing more than one touch point when I touch the surface	If you are using more than one sensor try re-calibration. If this does not resolve the problem then increase the finger detection size until the problem stops

If you are only using one sensor then increase the distance from screen values and decrease the detection range. |
Touches are detected at the edge of the surface but no one is touching it.	The surface probably has raised edges. Adjust the border/edge clipping until this problem stops
Kinect drivers could not be found	The Kinect for Windows section of the installation did not complete successfully. Re-install this application and ensure this section is completed.
Primesense drivers could not be found	Please consult the documentation that came with

	the sensor. You may be required to copy Primesense drivers from the installation to the folder where you installed this software.
Calibration of points gets worse the further from the sensor I touch	Ensure your sensor is mounted correctly and flat to the surface. Each end of the sensor must be exactly the same distance from the surface/wall.
Not all fingers are detected on my hand	If you have only one sensor then some of your fingers will be obscuring others. If you are using multi-touch, add another sensor.
On Windows 7 calibration works but windows does not recognise touches.	The Windows 7 Multi-touch driver has not installed. Please uninstall and re-install the software.
Calibration results in very poor accuracy	If your surface is slightly reflective or shiny then please see the section on *Calibration with Reflective Surfaces*
Windows or the software is not detecting my Kinect V2 Sensor properly	See the known issues page on the Microsoft website at http://support.xbox.com/en-GB/ xbox-on-other-devices/kinect-for-windows/ kinect-for-windows-v2-known-issues
The Kinect for Xbox 360 Sensor is not being detected.	The Kinect for Xbox 360 sensor is not for commercial use. You need to use the Kinect for Windows sensor. You can get the Kinect for Xbox 360 working by downloading and installing the Kinect SDK from Microsoft: http://www.microsoft.com/en-us/download/details.aspx?id=40278