



GENESIS64 – Natural User Interface with Microsoft Kinect



APPLICATION NOTE

August 2014

Description: Guide to setup and use Natural User Interface with Microsoft Kinect.

General Requirement: Basic GraphWorX64 knowledge, for use of image recognition Kinect for Windows or Kinect for Xbox 360 sensor is required

Introduction

Natural User Interface (NUI) is a way how to interact with software, which is experiencing a boom these days. Thanks to Microsoft Kinect or Sony Move sensors it has been brought to common users by using NUI in console games. Microsoft went further and allowed to Windows (.NET) developers to use API for Kinect. Thanks to this ICONICS brings NUI functionality to GENESIS64, concretely to GraphWorX64.

NUI features implemented in GraphWorX64 allows you to control displays using your voice (Speech recognition) and body (Skeletal Tracking mode) or finger to control any surface like touch screen (Virtual Multitouch mode).

With v10.85 we bring improvements into NUI, including possibility to use speech recognition without Kinect sensor attached to the PC. We also introduce new NUI-ready displays in GenDemo for your review and display configuration reverse engineering.

You can get overview on NUI, its setup and gestures in video placed on our YouTube channel or directly at this link:
<https://www.youtube.com/watch?v=UpP6wQHrp4M>

NOTE: Microsoft Kinect Runtime drivers coming with GENESIS64 are for Kinect for Windows device. It is possible to use Kinect for Xbox 360, but you have to install most recent Kinect SDK on top of Kinect Runtime drivers.

Installation

To get NUI working within GENESIS64 you have to perform custom installation and install Kinect drivers, to do so, please follow these steps:

1. Run GENESIS64 installation (or if you have GENESIS64 already installed just run the installer again and choose Modify)
2. On 'Setup Type' screen select 'Custom' as following figure shows:

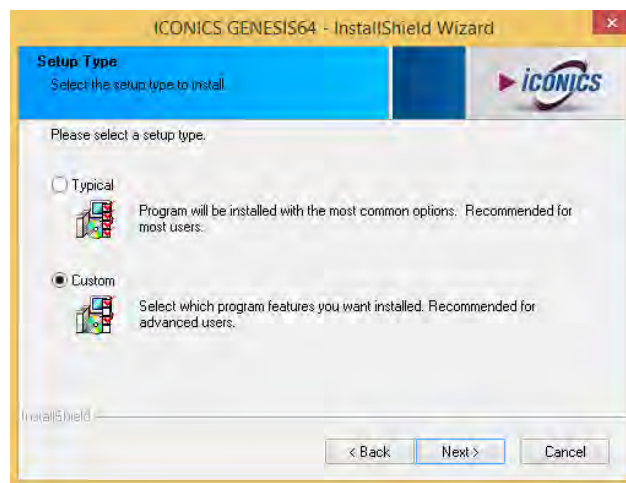


Figure 1 - Custom Installation

3. Click through until you reach 'Select Features' screen, here, at the bottom of the tree, check 'Kinect Runtime' and 'GenDemo64' options (If you want to have GenDemo installed)

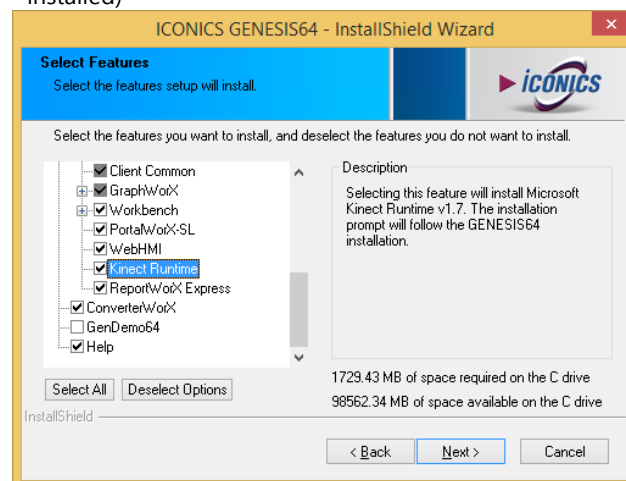


Figure 2 - Kinect Runtime installation

4. Proceed with installation

Setup

If you want to use only speech recognition feature, you can skip this section. Here we explain how to setup Kinect sensor. From Introduction section you know that in Kinect sensor can operate in two modes – Skeletal Tracking and Virtual Multitouch. First you should decide which mode you want to use.



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Enable NUI Features

First thing you need to do is enable NUI Features:

1. Launch GraphWorX64
2. In the right-lower corner of the GraphWorX64 window click 'Preferences'
3. Select 'Runtime Options'
4. Under 'NUI Device' section switch the 'EnableNUIFeature' option to True

Natural UI Settings

1. If your GraphWorX64 instance is not running, launch it
2. In the ribbon switch to 'View' tab
3. At the end of the ribbon you can see 'Natural UI' pane – there is Settings button
4. Now, on the first – 'Kinect' tab you can choose a mode you want to use

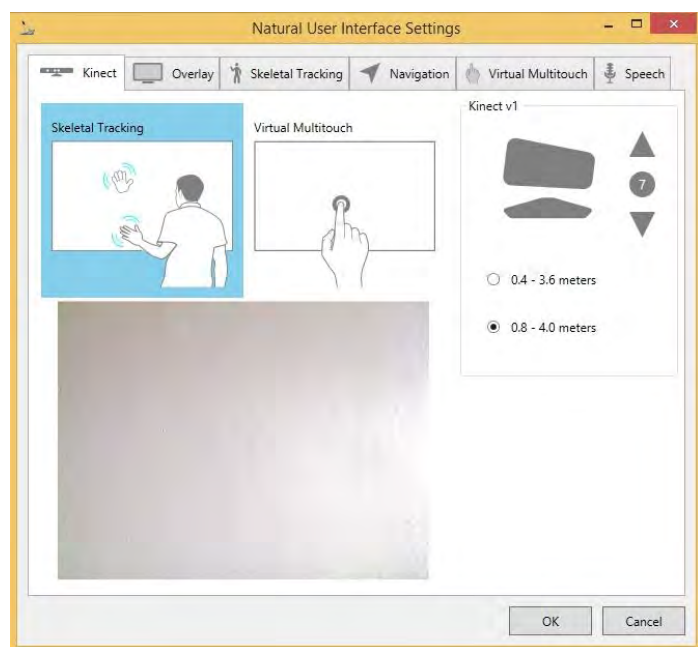


Figure 3 - NUI Settings – mode selection

Video mentioned in the Introduction section shows how to properly place sensor for each mode.

Calibration

For proper functionality of both modes make sure that you Kinect sensor is properly placed and calibrated. To perform a calibration do following:

1. If your GraphWorX64 instance is not running, launch it
2. In the ribbon switch to 'View' tab

3. At the end of the ribbon you can see 'Natural UI' pane – there is Calibrate button
4. This will launch Calibration Wizard which will takes you through process of calibration for selected mode – follow it to calibrate you Kinect sensor

Runtime

Even NUI Feature in GENESIS64 has its own Runtime mode – when it is running GraphWorX listens to your voice commands and performs image recognition to process your commands and gestures in real-time. Please note that this processing can take lot CPU resources.

To enable/disable NUI Runtime mode do following:

1. If your GraphWorX64 instance is not running, launch it
2. In the ribbon switch to 'View' tab
3. At the end of the ribbon you can see 'Natural UI' pane – there is Start/Stop button

Skeletal Tracking mode

Using this mode allows you to control the application by moves and gestures of your body, usually hands and arms. This mode requires to have Kinect sensor in front of you so it can see your whole body.

You can set options for this mode in 'Skeletal Tracking' tab of the 'Natural User Interface Settings' dialog:

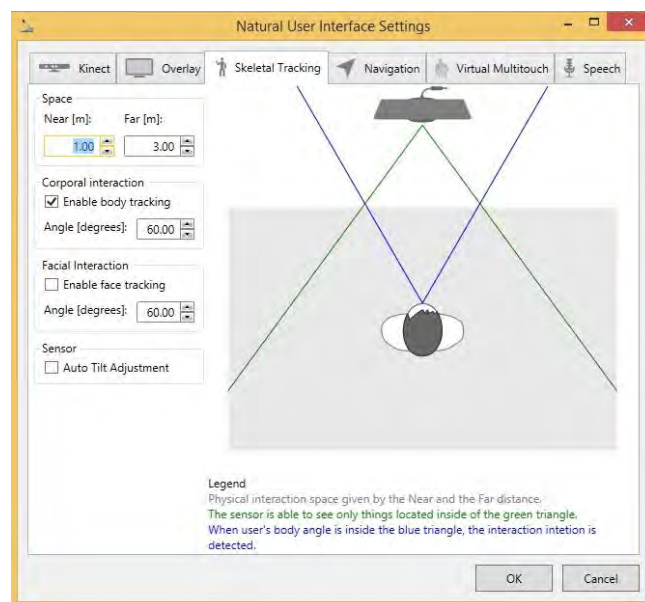


Figure 4 - Skeletal mode settings



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Virtual Multitouch mode

Using this mode you can control application by using your fingers as you would do so using multitouch screen – you can turn any surface like large TV screen or screen projected to wall into multitouch surface.

You can set options for this mode in 'Virtual Multitouch' tab of the 'Natural User Interface Settings' dialog:

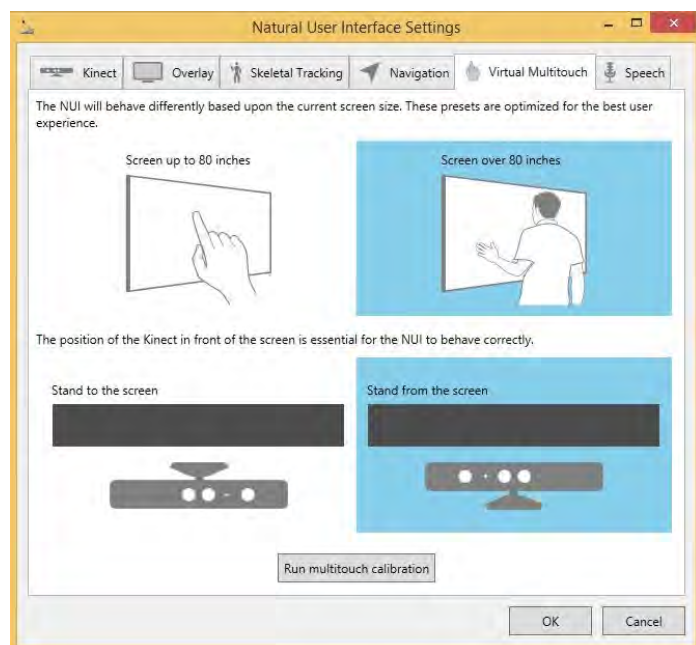


Figure 5 - Virtual Multitouch settings

Gestures

Gesture consists of action activation by clenching your left or right hand into a fist from unclenched hand position and then by appropriate move. After gesture activation the NUI system expects a move of given hand or whole body (according to Navigation settings).

You can set gestures for following actions:

- Zoom
- Walk
- Orbit (3D only)
- Look Around (3D only)
- Panning

For some of these actions you can decide whether it is activated by left or right hand. Each of this action has set specific Control

Mode – a way (gesture) how a parameter of this action is controlled:

- Position Control – accepts a move of hand in plane specific for selected action, while move of hand from origin followed by stopping of hand movement in given position causes fixed change of the parameter's value (based on difference between starting (origin) and ending position)
- Rate Control – accepts move of hand in plane specific for selected action, while move of hand from origin followed by stopping a hand in given position causes continuous change of the parameter's values until action is stopped (by unclenching a fist) or moving hand back to the origin position (difference between starting (origin) and ending position controls speed – rate of continuous parameter value change)
- Body Control – same as Rate Control, but works with whole body movement instead of hand movement, for some actions a squat can be accepted

Please note that it is possible to have configured multiple actions per hand. E.g. you can use your left hand for Zoom and Panning actions, while Zoom will be performed when moving your hand in Z-axis (towards to Kinect sensor) and Panning action will be done by moving your hand within X-Y plane (while keeping constant distance between your hand and sensor).

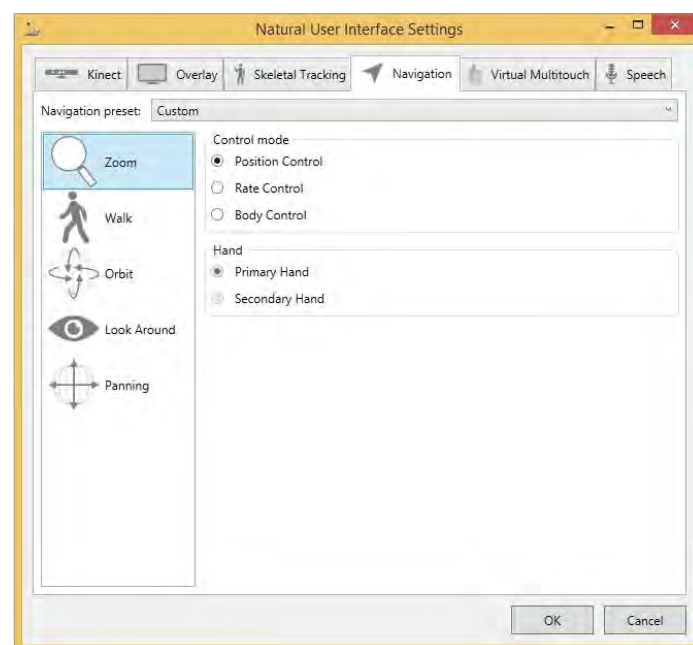


Figure 6 - Navigation (gestures) settings



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Speech Recognition

For this feature you do not need to have a Kinect sensor attached to the PC, just Kinect Runtime drivers have to be installed.

Speech Recognition can work in two modes, which can be set in NUI Settings:

- Pre-command mode – computer will listen and execute issued command after you will say a 'Pre-command' (e.g. 'computer'), when command is executed, you will need to say pre-command again to be able to execute another command
- Start/stop listening – after issuing 'Start listening' command the computer will continuously listen to everything you will say and execute said commands until you will issue 'Stop listening' command

You can assign a speech command to pick actions used in the display and launch them by issuing this command. To do so:

1. Make sure you have NUI features enabled
2. Select a pick action
3. In pick action's properties seek for 'Execution Trigger – Natural UI' section
4. There you can find VoiceCommand (what computer expects to be said by you to execute a command) and VoiceFeedback (what will computer say when command is executed) properties – fill in the word or words for command execution and feedback

Note: During configuration you don't need to say any commands to 'teach' computer what it should expect. You just simply write a command in text and voice synthesizer will take care to understand to your command as well as to provide voice feedback.

You can set options for this mode in 'Speech' tab of the 'Natural User Interface Settings' dialog:

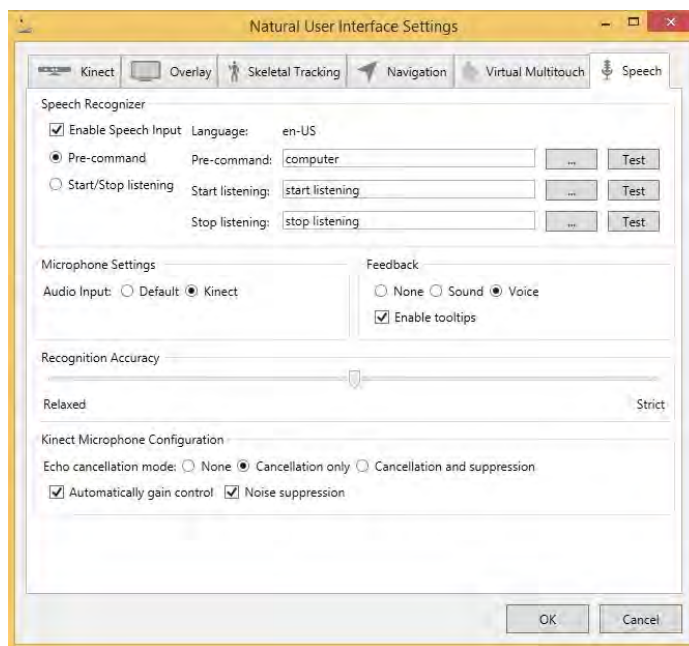


Figure 7 - Speech Recognition settings

GenDemo NUI-enabled display

In C:\Program Files\ICONICS\GENESIS64\GenDemo\Examples\Kinect_Automotive you can find a display which has UI controls with NUI-enabled features