



## MILO Kinect Guide

24/7 Technical Support

1-800-344-1707

## MILO Kinect

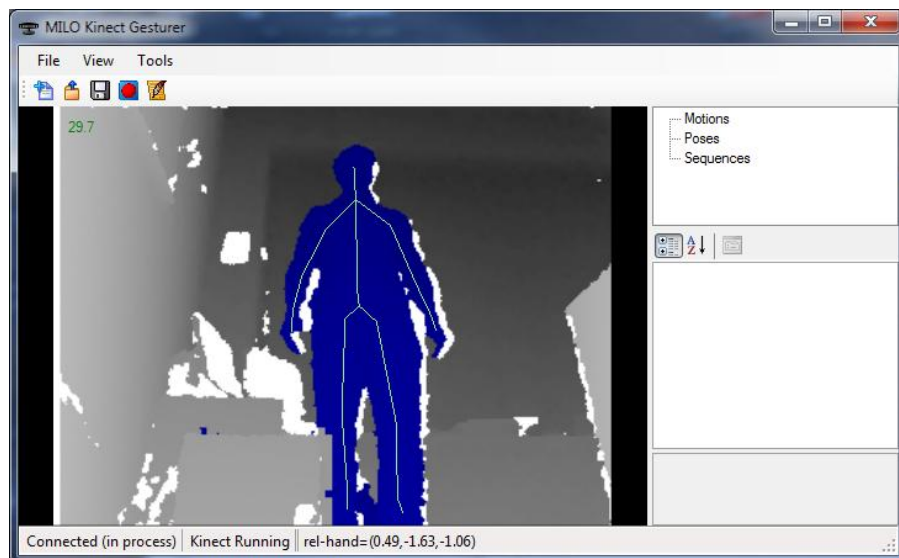
Milo Kinect provides tools to allow integration of Kinect for Windows with Milo-Range and Course-Designer. It lets customers create a variety of human based interactions through poses, hand motions, and pose-sequences as well as voice commands and other events.

The package includes two utilities:

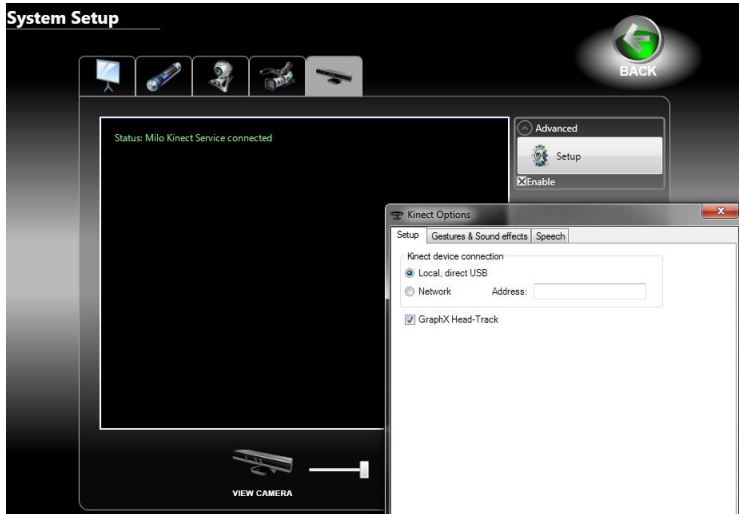
- Milo Kinect Service – allows Range software to communicate locally or through a server with Kinect hardware.
- Milo Gesturer – allows recording and testing poses, motions and sequences as well as test out speech capabilities

In addition, recent versions of Milo Range 4 and Course Designer 4 enable utilizing these new features. This document will review all of these enhancements.

At the end of the document, you will find setup instructions for the Milo Kinect hardware.



## Milo Range Kinect Options



To enable Kinect in Range, from the System Setup screen, select the Kinect icon. Click on “Advanced” to expand, and check the “Enable” check box. (The Kinect icon will be visible in System Setup only if “Milo Kinect Service” is installed on the computer)

To change options, click on “Setup” button to open the “Kinect Options” dialog.

- “Setup” tab:
  - Select “Local, direct USB” or “Network” connection and relevant address. Default MILO Kinect option from IES ship as “Network” with address 192.168.2.215
  - GraphX head-track check box – allow head tracking in several GraphX modules
  - Trainee Hand Select User Interface – allows user-mode controlling of session setup screen with Kinect tracking user’s hands.
- “Gestures & Sound Effects” tab:
  - Add or remove recorded gesture files by clicking on the “plus” or “minus” buttons. After selecting a file, you will be prompted to select sound effect to accompany the gesture.
  - Detect punches checkbox – enable or disable programmed punches gesture
  - Adding a gesture with the verb “reload” will allow a reload action to happen when the gesture is recognized.
- “Speech” Tab:
  - Verbal Commands check box – enable or disable global verbal commands to control Milo Range. To edit the commands, click “Customize verbal commands” to edit the INI file. Multiple phrases per command can exist, separated by semicolon.
  - Projector speech indicators check box– enable or disable icon and text showing which verbal commands or lesson speech items are expected, and which ones were detected.
  - Adjust minimum confidence for speech recognition via the track bar.
  - Minimum seconds per word in phrase will allow filtering out explosions and shot sound effects recognition as speech. Each word in a phrase is expected to record this many seconds.

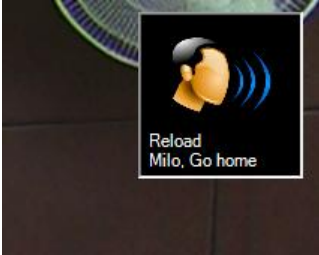
## Baton



To allow baton, enable Kinect, and assign a baton to a trainee. Latest versions of Range will automatically assign a baton when the lesson has a baton event.

## In session projector indicators

While in session, if the sensor identifies a person, an indicator will appear over videos.



Verbal commands and/or in lesson speech events phrases will appear at top right of the projected screen

## Kinect service startup

If Kinect is enabled in Range software, and the sensor is connected locally via USB, Range will automatically start the “Milo Kinect Service” process upon startup.

## User Mode / Trainee Hand Select User Interface

When in session setup, raising any hand and waving a few seconds will start an interactive menu on the projector. The user can then move his hand to hover above items visible to select folder, grapX/Video/Favorites, and start a new session. In this mode, the user can utilize voice commands to start any lesson visible by calling its name. Additional voice commands available here: Folder Up, Previous, Next, Graphics, Video, Favorites.

## Milo Kinect Service

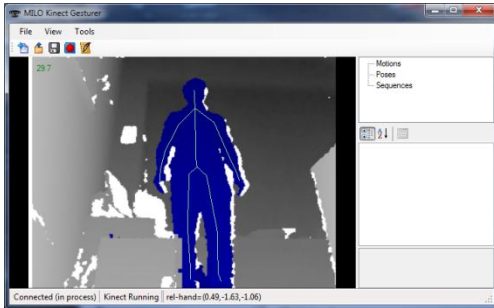
This utility allows remote or local communication between Range and Kinect.



1. If the sensor is setup locally, it will startup automatically when Range starts (if Kinect is enabled on Range)
2. If the sensor is setup remotely, you should be able to view it on the laptop screen, or remotely via tight-VNC.
3. Notice the status bar for indicator of Kinect sensor connection status. “Kinect Running” means the USB devices are properly functioning
4. At the top right, you can notice a log of activity as directed from Gesturer or Range
5. The left side of the window allows adjusting viewing angle of sensor and preview of color stream
6. Closing the window will keep the service running, unless the user clicks “Quit” button

## Milo Gesturer

This utility allows testing and creating relevant human interactions with Kinect

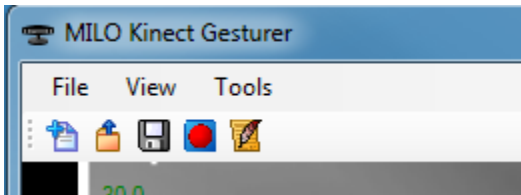


1. Status bar – at the bottom, you can identify status notification, letting the user be aware of connection to Kinect Server, or in process connection to Kinect sensor, Kinect Sensor running, and color coded notifications of identified speech or gestures
2. Toolbar – allows clearing loaded items, loading saved xml files, saving changes, capturing last skeleton activity, create sequences
3. Motions/Poses/Sequences tree and properties grid– at the top right, this allows you to select loaded items for adjustments via the property grid
4. Utility Menu - allows you to manage file operations, change view options, test speech, turn on and off programmed gestures

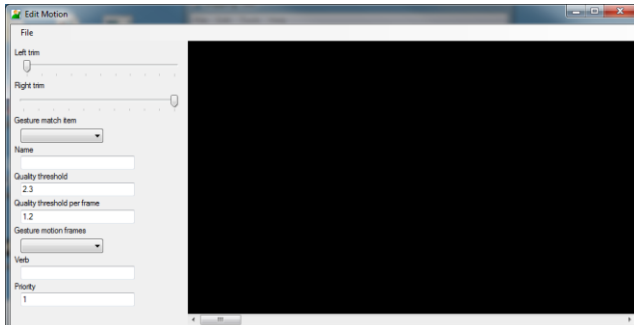
In some instances, it might be easier to present this utility on the projector for interactive action with immediate feedback. Drag the utility by clicking on its title to the extended desktop part that is visible on the projector.

## Capture skeletons

1. Stand in front of Kinect sensor and observe the identified person being color marked and his skeleton identified as a straw man.
2. Perform the activity you wish to record prior to clicking the red “Capture” button



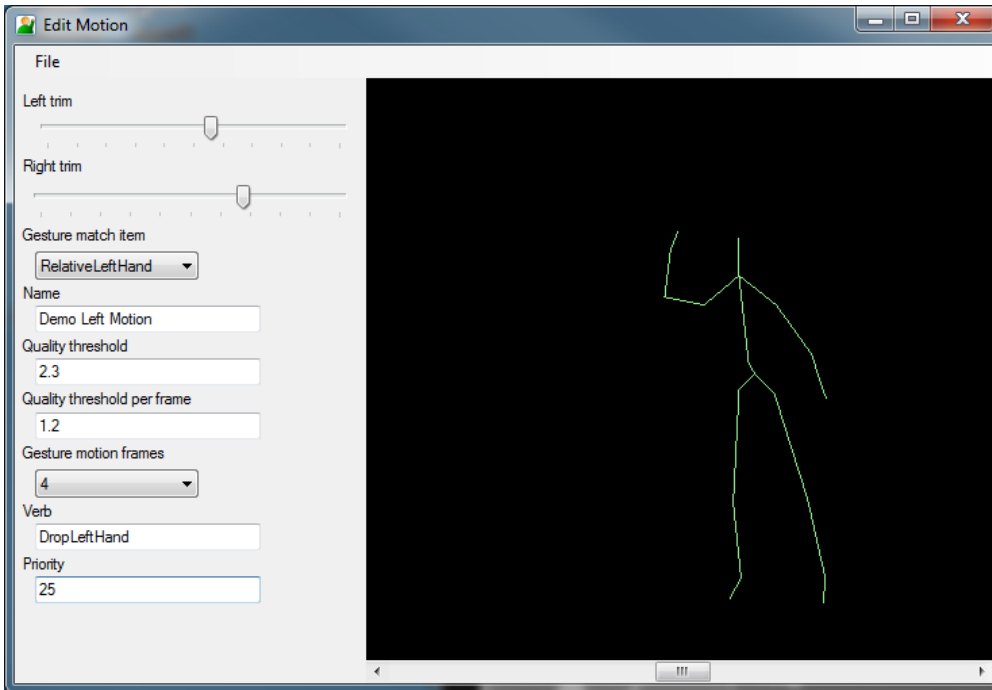
3. Once you click on the “Capture” button, the last 8 seconds of activity is saved into memory and a new “Edit Motion” window will open.



4. Use trim track bars to limit the scrollable view to motion you wish to record

5. Scroll using the bottom scroll to view specific pose you might wish to record
6. The preview area will show the straw man representation of the recorded skeleton
7. The controls visible under the trim track bar are used for hand(s) motion recording and will be described below
8. Using the file menu, you could choose record currently visible pose or entire trimmed section as hand(s) motion
9. Any saved item will be saved as an XML file, and will be loaded in Gesturer's main screen under the tree for verification. Once an item is loaded, you may try reproducing it as a Gesture

## Motions



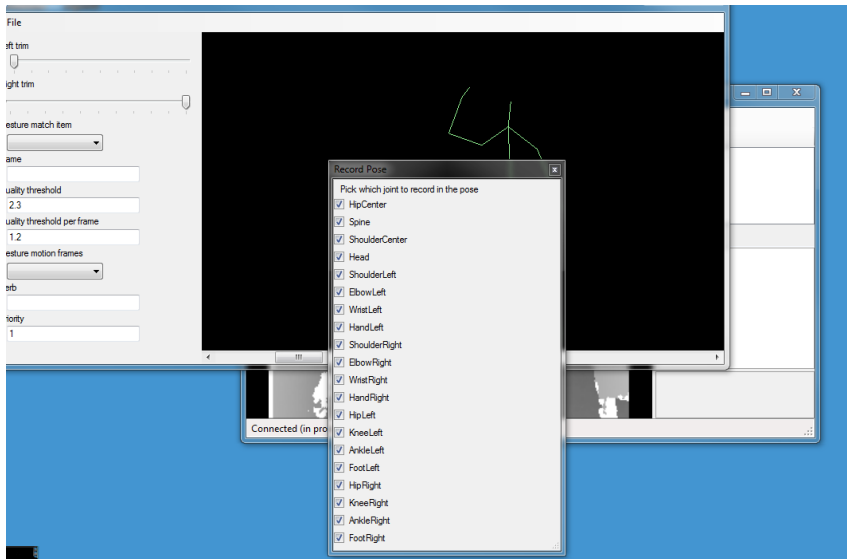
1. Trim to exactly the relevant frames of the motion you wish to record. While moving the track bar, the preview will present relevant frame from left or right
2. Pick which item to match as motion from a combo-box options of hands/wrists/left/right or both
3. Enter a name of a gesture, this will be displayed in the Gesturer status bar if detected
4. While you can change sensitivity values here, there are better left is and possibly tweaked later in the properties section of the main window
5. Pick how many frames to match motion, it is suggested to pick 3 or 4 frames, allowing for a balanced restrictive to relaxed detection ratio.
6. Enter a Verb, this is the value used later in Course Designer to trigger actions
7. Enter a priority, several gestures detected within time frame are selected by priority, higher priority number provides for preferring your custom gesture
8. From the File menu, select "Save Motion Gesture", the file is created and loaded in the main "MILO Kinect Gesturer" window
9. Person(s) can now move in front of sensor in attempt to activate the gesture

You can now modify properties of the recorded Gesture to make its detection more strict/relaxed as needed:

- a. Description – this is for information only, and can assist user in understanding saved gestures
- b. Max Quality – The higher the value, the more relaxed detection would be
- c. Max Quality Per Frame – The higher the value, the more relaxed detection would be
- d. Priority – Adjust priority over other gestures, you can load several gestures at once to try out priorities of each and how these interact

- e. Seconds – Detection of a motion is limited to %18 to %330 of the time the original gesture took. A user can tweak this value representing the number of seconds time-span the original gesture took.
- f. Verb – This is the value used by Course-Designer and Range to trigger actions, several different Gestures can have same verb, causing same sound effects or lesson branch

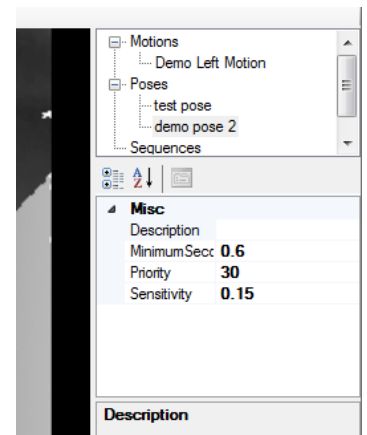
## Poses



1. Pick the frame best representing the pose you wish to record, where enough skeleton bones are visible
2. Pick "Record Pose" from the file menu
3. Enter a pose name, this will be used both as a verb and a gesture name once recognized
4. Choose where to save the file
5. A window will pop up with joints to record for this pose, ones that were not identified by the sensor will already be checked out.
6. The pose will be saved and loaded in the main Gesturer window
7. Person(s) can now move in front of sensor in attempt to activate the gesture

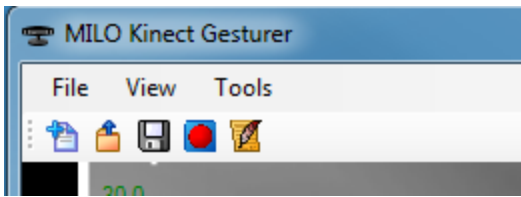
You can now modify properties of the recorded Gesture to make its detection more strict/relaxed as needed:

- a. Description – for information purposes
- b. Minimum seconds – pose is detected with the expectation of holding the position, change this value to match relevant expectation
- c. Priority - Adjust priority over other gestures, you can load several gestures at once to try out priorities of each and how these interact
- d. Sensitivity – The higher the value, the more relaxed detection will be



## Sequence

1. In the "Edit Motion" window, for each desired frame, save a pose you will use as a sequence later.
2. Either from the menu, or by clicking on the sequence button, or from the menu of the "Edit Motion" window, select to create a new pose.



3. Enter sequence name
4. Pick pose file and select “Open”
5. When several poses were selected, and no more poses are desired, click “Cancel”
6. Enter sequence file name and location
7. The sequence will be saved and loaded in the main Gesturer window
8. Person(s) can now move in front of sensor in attempt to activate the gesture

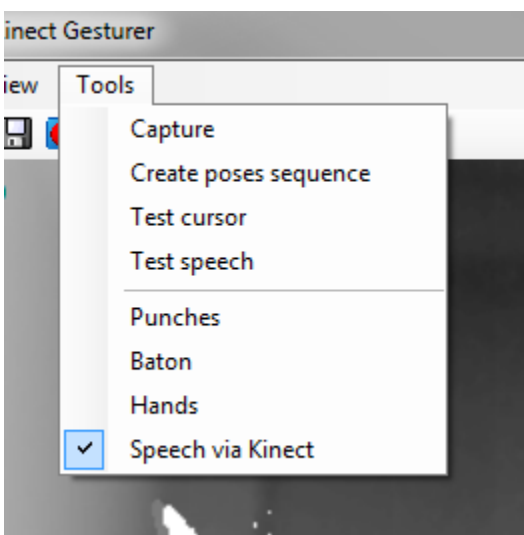
You can now modify properties of the recorded Gesture to make its detection more strict/relaxed as needed:

- a. Default Seconds – This value is used to evaluate “intensity” of gesture, often not in use in Range
- b. Description – Enter description for information purpose
- c. Maximum Seconds, Minimum Seconds – limit the time span a sequence can occur at
- d. Poses – Expand poses to adjust per pose of the sequence its properties. The “seconds” property of each pose is discarded, as poses in a sequence do not require or assume holding a position
- e. Priority - Adjust priority over other gestures, you can load several gestures at once to try out priorities of each and how these interact

## Extending programmed gestures verbs with recorded gestures

You can add recorded gestures to existing programmed ones and use the same verb, to allow extending and perhaps replacing default ones. To add more baton gestures, use the verb “Swing”. To add more punch gestures, use the verb “Punch”. To allow reloading a weapon via a gesture, add a gesture with the verb “Reload”.

## Other tools



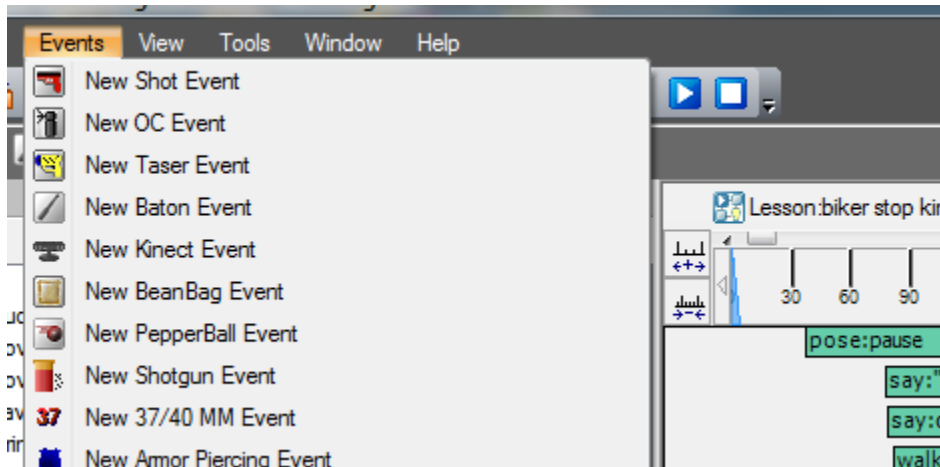
1. Test cursor – use to emulate usage of hands as cursor
2. Test Speech – verify ability of speech recognition to discern different phrases at once, before used in Course-Designer/Range
  - a. Dialog box will request you to enter phrases separated by coma



- i. Use "\*" in front of phrase, to allow wildcard detection around phrase, for example "\*gun"
    - ii. Use "..." in middle of phrase to allow wildcard detection within phrase, for example "raise ... hands"
  - b. Enter minimum confidence level. The closer the value is to 1, the stricter detection expectation. This allows verifying custom confidence for phrases in "Kinect Events"
  - c. Enter phrases to test in a second language( default 2<sup>nd</sup> language is Spanish, both first and 2<sup>nd</sup> are adjustable via INI)
  - d. Speech recognized will be reported in the status bar as "Green" gesture, by the phrase detected
3. Punches, Baton, Hands – enable or disable programmed gestures. Hands isn't used in Range, punches and baton can be turned on and off in Range as well
  4. Speech via Kinect - test voice recognition via Kinect microphone or via default audio recording device – to allow verifying lapel microphone (for customized hardware setups)

## Course Designer Kinect Event

To integrate Kinect features with a MILO Range lesson, edit scenes and add a new Kinect Event. Left click on the events area under the timeline to pick a start time, then right click to signify end of event time. (In most cases, this will snap to end of scene – this is an option from Course Designer’s options dialog)

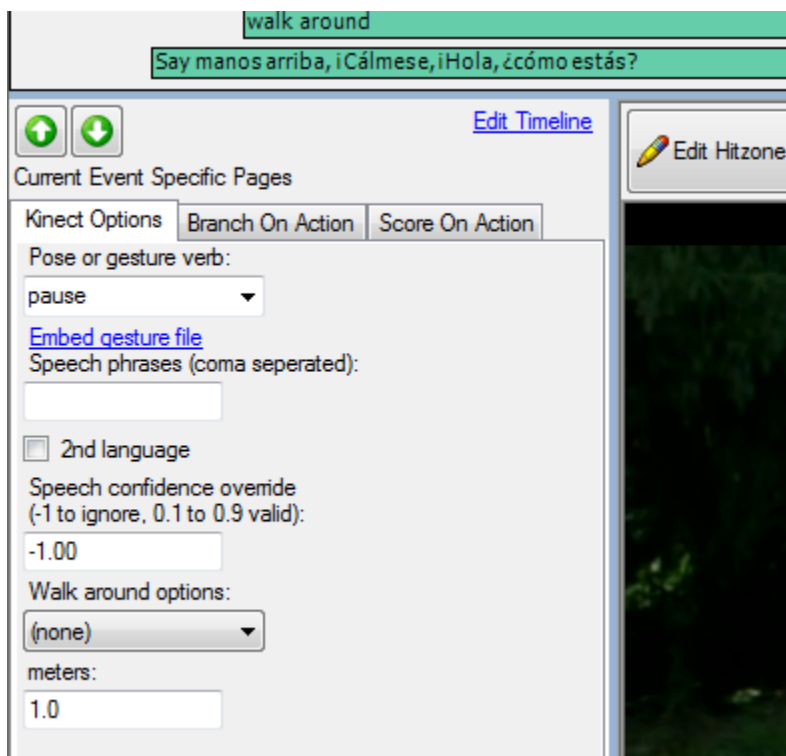


## Branch on Action

Select the “branch on action” tab to pick branch option per the event.

## Kinect event options

The Kinect Event will allow many different Kinect Features via a single event type. This event’s name will be automatically set by the options you choose in the “Kinect Options” tab of the “Current Event Specific Pages” section of the scene edit view.



### **Pose/Motion/Sequence files**

Click on “Embed gesture file” link to choose an xml file created by Gesturer. Once the file is loaded, it is embedded in the scene. The verb is automatically set, as is the name of the event for easy future reference.

### **Speech recognition**

Enter phrases separated by comma in the “speech phrases” textbox. The verb will automatically change to “Speech” and the event name will also be adjusted. Use wildcards as needed (see gesturer documentation). Select the “2<sup>nd</sup> language” check box if using the alternate language (default is Spanish).

Set confidence override to a value between 0.1 and 0.9 or to -1 to use Range’s default setting.

### **Walk away/around**

- Select the verb “WalkAway” to create an event responding to a skeleton disappearing from the sensor’s view.
- Select the verb “WalkAround” to create an event responding to a skeleton walking left or right. Adjust left or right option in “walk around options” combo box, and set meters to a relevant number (recommended, 0.4)

### **Baton/Punch/ custom verb**

- To utilize the Baton gesture, simply add a baton event. In Range, make sure to assign a Baton and enable the Baton option in the Kinect options dialog part of Range software
- To create an event responding to a programmed punch gesture, select the “Punch” verb, without embedding a file. Make sure to enable punch gestures in Range software options dialogs.
- Gestures can be loaded via Range options, and not necessarily embedded in Course Designer. Enter any text for verbs in “Pose or gesture verb” combo box, to match custom Range setup. In Range software, load these gesture files in the options dialog where you can assign a sound effect as well.

## Appendix A - Hardware Setup

### Hit-detection Filter

Replace hit-detection legacy black IR filter with the red or golden filter you are provided with. The visible light calibration wand will not work with this filter, the latest wand with IR LED which is visible will allow you to properly calibrate. Make sure the hit-detection camera doesn't at any point see the sensor; the IR emitter on the sensor would be visible through the filter. The new filter will block the IR stream, however not the emitter itself.

### Items in "Kinect for Windows" box

Extract the following from the package:

1. Sensor
2. Power regulation dongle
3. Power-up and USB conversion cable

Connect these at relevant order; make sure to place power cable at working power outlet.

### Kinect connection and configuration

Position Kinect sensor on floor in front of projector screen.

#### Default connection

1. Connect Kinect sensor to USB port on Kinect-Server-Laptop
2. Connect the laptop to the Range desktop via Ethernet cable to the available extra Ethernet port (which is preconfigured as address 192.168.2.1)
3. Install Milo-Kinect on Range, with no service startup option in the installer's wizard
4. In Range Kinect setup dialog, select Network, the laptop's address will be applied automatically (as 192.168.2.215). Then enable Kinect in the Setup screen.
5. Installing tight-vnc is optional, and can allow remote access to the Kinect-laptop from the Range system.

#### Advanced connection

There are two options to physically connect the Kinect sensor, directly to Range computer, or to a server laptop.

#### *Connect Kinect to Server with alternative network address*

1. Connect Kinect sensor to USB port on Kinect-Server-Laptop
2. Using an Ethernet cable, connect Range computer to a preconfigured Kinect server laptop.
3. Several network configuration are possible:
  - a. Available extra network port on Range which will have been preconfigured as IP address 192.168.2.1, is directly connected to laptop which is preconfigured as IP address 192.168.2.215
  - b. Connect server to AUX port on hit-detection box, change IP address of server-laptop to 192.168.1.215
  - c. Connect to Router/switch (which could be used by Range-Anywhere tablet or Driving Force, etc.), and set IP address of laptop to match subnet. Alternatively, the switch would be configured as the 192.168.2.x subnet.
4. Install Milo-Kinect on Range computer, don't select to startup Kinect-Service automatically
5. Using Range's Kinect Options dialog from Setup screen, select the "Network" radio button and apply relevant network address of laptop
6. Install tight-vnc viewer and connect to laptop to allow remote access (for convenience)

### **Connect Kinect to Range computer**

1. Install Kinect runtime software on Range computer
2. Extend distance of Sensor from computer via up to two 16' USB extenders
3. Connect to available USB port on computer and wait for all hardware devices to install
4. Install Milo-Kinect on Range computer, don't select to startup Kinect-Service automatically
5. Using Range's Kinect Options dialog from Setup screen, select the "Local, direct USB" radio button.

### **Adjust viewing angle**

The viewing angle can be adjusted directly from Range via the Kinect setup tab at Setup-Screen while viewing the depth stream.

Alternatively, the angle can be setup directly on the service dialog while viewing the color stream:



1. Open Kinect Service window by double clicking on the Kinect icon on the taskbar. (at Laptop, over tight-VNC, or locally on Range PC based on setup above)
2. Click on "View color stream" link
3. Adjust viewing angle as seen in the screen shot so that the floor-positioned sensor can view trainees properly
4. Close the window by clicking the "X" at the top right to stop viewing color stream, the service will remain active until restart of Windows or click on "Quit"