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Equipment installation

Connecting the equipment to a PC

An example of connecting the equipment to a computer is shown in Pic. 1.

Pic. 1 Connecting the equipment to a computer

Camera to USB 3.0 port via a USB extension cable
HDMI cable to send the image to the projector

Projector location

The projector can be placed either on the ceiling or the wall. You need to adjust the desired image size on the working wall and adjust the rectangular image from the projector using the projector menu (keystone correction). The recommended projection size and distance of the projector from the wall are shown in Pic. 4.
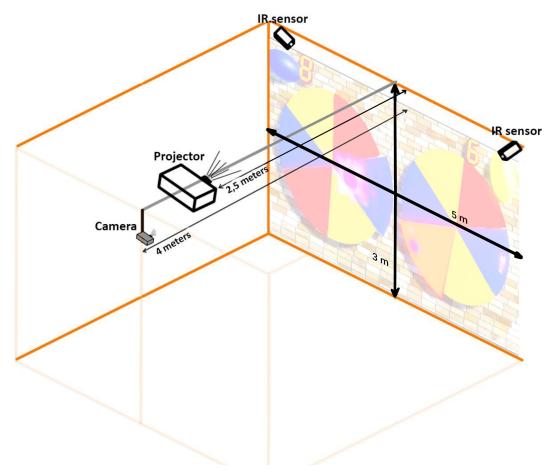
Camera location

The camera should be positioned at a distance where it covers the entire projected image from the projector. You can view the camera image with **CL-Eye Test**, which has a shortcut on the desktop. There should be no obstacles between the camera and the wall. As a rule, the camera is mounted on the ceiling (wall) through the bracket, in the center of the projected image (Pic. 2). The camera faces the wall with the image from the projector. The recommended distance of the camera from the projection wall is shown in Pic. 3.
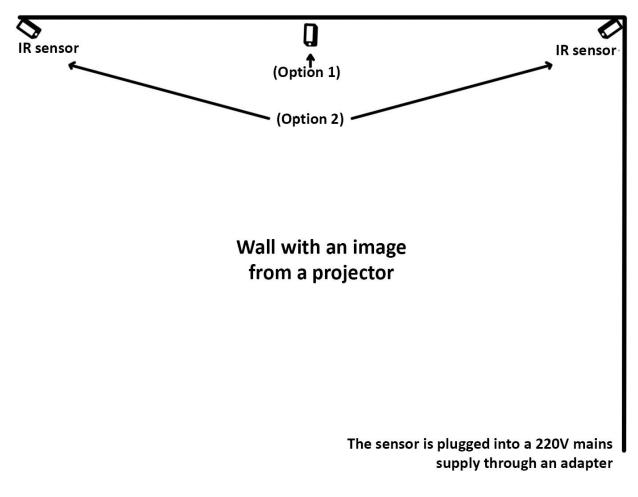
Pic. 2 Camera installation

Pic. 3 Recommendations for the installation of equipment elements

Configuring the infrared sensor

The infrared sensor is placed on the wall on which the image is projected (Pic. 4).

IR sensor

(Option 1)

(Option 2)

IR sensor

Wall with an image from a projector

The sensor is plugged into a 220V mains supply through an adapter

Pic. 4 Infrared sensor placement options

a) **Option 1.** Used when 1 sensor is present. The sensor is mounted in the middle of the projection, >50 cm from the top of the projection, on the wall below the ceiling (Pic. 5). There should be no obstacles between the sensor and the projection;

b) **Option 2**. Used when 2 sensors are present. Sensors are mounted in the upper right and left corners of the projection towards the center of the projection, on the wall (Pic. 6).

If you have the 1st sensor and it is not possible to mount the sensor according to Option 1 (it is not possible to mount the sensor at >50 cm from the top of the projection or there are obstacles between the projection and the sensor), use Option 2. Mount the sensor in one of the upper corners of the projection (Pic. 6).

The sensor is connected via an extension cord to the power supply. The power supply unit is plugged into the mains 220V. The infrared sensor is not connected to the computer in any way.

Note: The sensors should be provided with a stable electrical supply without power surges, e.g. using a stabilizer.

front view

side view

view from below

front view from afar

Pic. 5 (Option 1) Mounting the infrared sensor on the wall

Pic. 6 (Option 2) Mounting the infrared sensor on the wall

The sensor gives a thin invisible line strictly parallel to the wall on which it is mounted. The sensor beam must be directed strictly parallel to the wall.

When installing it is necessary to achieve the direction of the sensor beam, shown in Pic. 7. The sensor beam should be positioned on the floor as close to the wall as possible (long white line on the floor), but at the same time not "bend" into the wall. The distance from the sensor to the wall is adjusted by turning the sensor head. The direction of the sensor beam can be monitored in the **CL-Eye Test** program window.

Pic. 7 Example of correct setting of the sensor beam direction

Important!

Do not allow sunlight or daylight into the viewing area of the camera. There must be no windows in the room. If there are windows in the room, the penetration of daylight must be prevented using thick curtains.
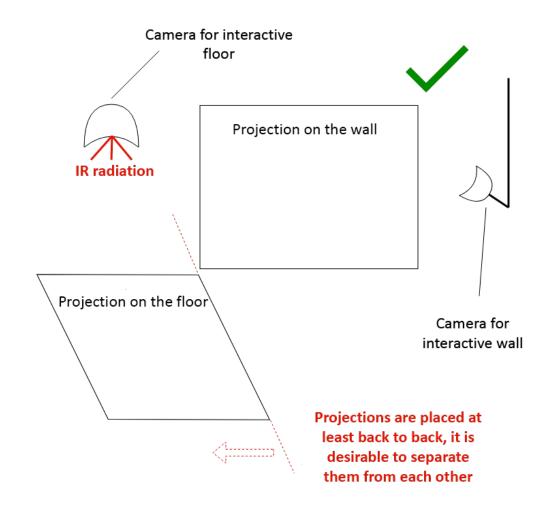
It is necessary to ensure that the system is operated in a dark room.

There must be no sources of infrared radiation, such as light bulbs or infrared illuminated CCTV cameras, in the camera's field of view (Pic. 8).
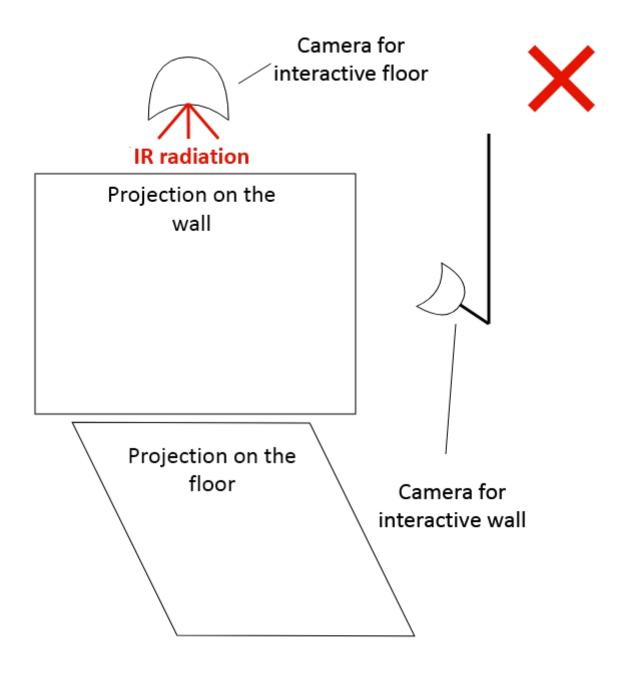
Pic. 8 Example of an IR light source - CCTV camera with built-in IR illumination for an interactive floor

The last rule must be taken into account when installing **Interactive Floor** and **Interactive Wall** systems together (Pic. 9 - Pic. 10).

Pic. 9 An example of the correct joint installation of the Interactive Floor and Interactive Wall systems

Camera for
interactive floor

IR radiation

Projection on the
wall

Projection on the
floor

Camera for
interactive wall

Pic. 10 An example of incorrect joint installation of the Interactive Floor and Interactive Wall systems

Configuring the software

The system is a set of two programs:

 InteractiveRecognizer – a tool for recognizing human interaction with a projection;

 InteractiveLauncher – game menu for end user (check the end user guide in our website).

On the desktop, there are corresponding shortcuts to launch programs.

Step 1. Calibrating the camera

The initial setup involves calibrating the camera - aligning the projection image on the wall with the space seen by the camera. The calibration ensures that the projection responds correctly when interacting with the user.

Launch **InteractiveRecognizer**. In the lower right corner, you will see a notification that the program is running in the background (Pic. 11).

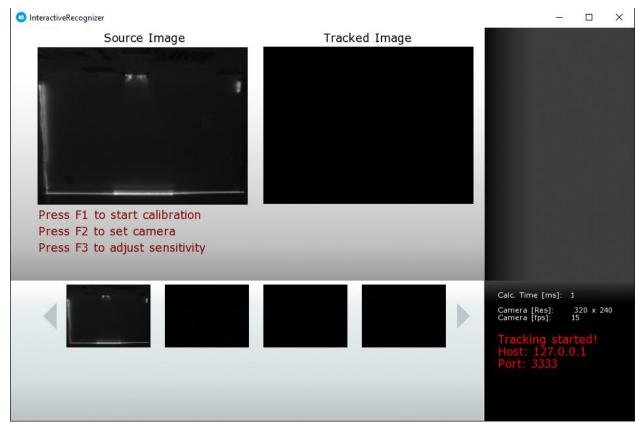<p align="center">Pic. 11 Launching InteractiveRecognizer</p>

Note: Before starting the InteractiveRecognizer program, the CL-Eye Test should be terminated, and vice versa. The video stream from the camera can only go to one of the programs at a time.

The program window visibility is controlled via the system tray. Right-click on the program icon in the tray and use the context menu to select **Open** (Pic. 12).

Pic. 12 InteractiveRecognizer context menu in the system tray

The main program window will open, as shown in Pic. 13.

Pic. 13 InteractiveRecognizer program window

On the left side of the program you can see the image from the camera (Pic. 14).

Pic. 14 Image from the camera in the InteractiveRecognizer window

Note: The camera must be positioned so that it sees the entire image of the projector, that is, each of the four corners of the projection.

Camera calibration involves aligning the space seen by the camera with the projection. In the calibration process, we tell the camera where each of the four corners of the projection is located.

By touching the projection on the wall with your hand you "break" the sensor beam, and the camera sees the touch as a white spot. It is this effect that the software uses to allow human interaction with the projection. The same effect will be used to indicate projection angles to the camera - one person touches the projection corner with his hands while the other points to the camera where the white spot appears in the point of touch with the mouse. This algorithm is repeated for indicating all four projection angles.
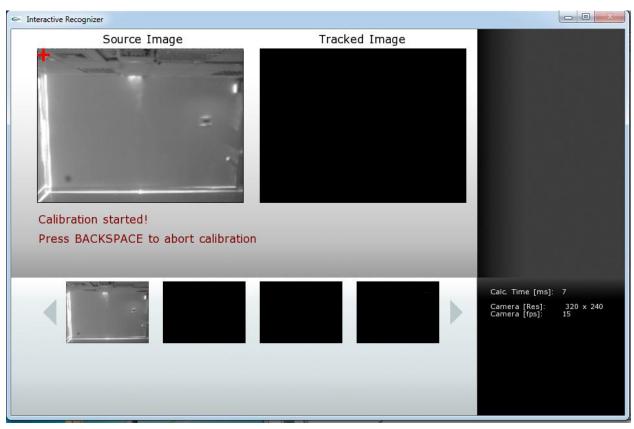
Left-click on the program window so that it is in the foreground and receives events from the keyboard.

Press **F1** to start the calibration process. You will see a red cross in the upper right corner . In addition to the cross you will see under the camera image an inscription
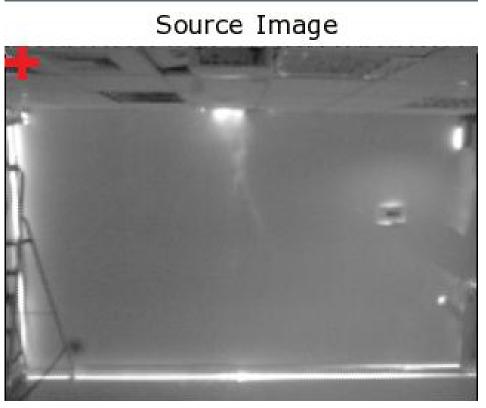
(Pic. 15)

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Pic. 15 Display a cross to indicate the projection angles

Tap the upper left corner of the projection (Pic. 16).

Pic. 16 Calibrating the upper left corner (wall)

In the camera image, you will see the touch as a white spot in the upper left corner (Pic. 17)

Pic. 17 Touch display in the camera image (upper left corner)

Left-click where the white spot appears. The cross will move, indicating to the camera the upper left corner of the projection (Pic. 18).

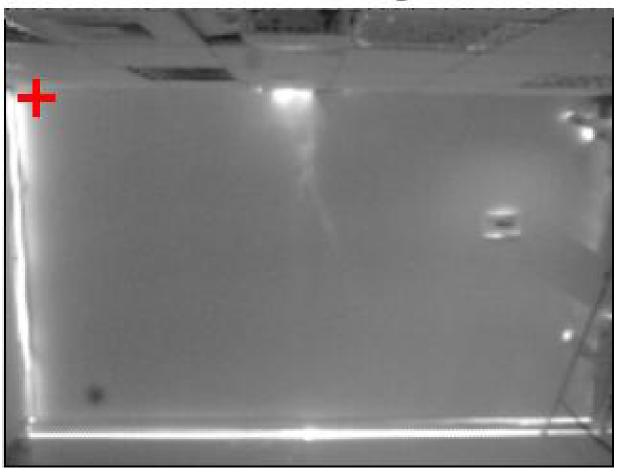**Pic. 18 Aligning the cross with the touch (upper left corner)**

Make sure that you place the crosshair exactly where the spot appears. Correct the position of the cross, if necessary, using the left mouse button.

Next, touch the upper right corner with your hand. (Pic. 19).

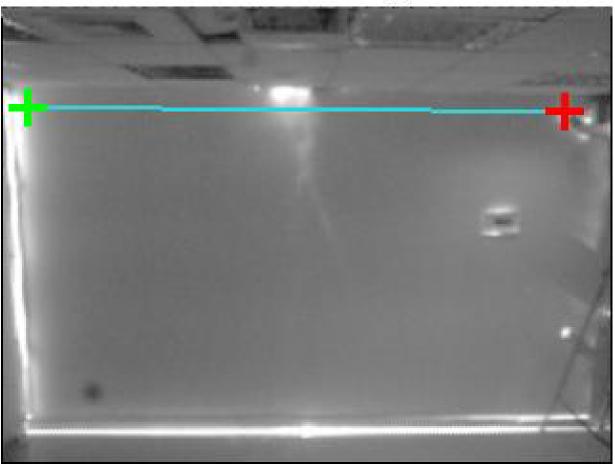**Pic. 19 Calibrating the upper right corner (wall)**

In the camera image, you will see the touch as a white spot in the upper right corner (Pic. 20)

Source Image

Pic. 20 Touch display in the camera image (upper right corner)

Press **Enter**. A new cross appears in the upper right corner, and the cross that was set before becomes green

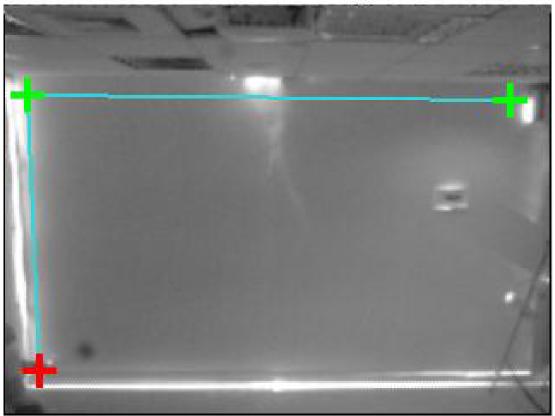Similarly to the previous step, place a red cross at the white spot (Pic. 21).

Pic. 21 Aligning the cross with the touch (upper right corner)

To go to the next step, press **Enter**. If there is an error in the previous step, you can correct the position of the cross ![cross]. Press **Left Arrow**. The last green cross ![cross] becomes active ![cross]. Correct its position and press **Enter** to go to the next step.

Similarly, touching the other corners of the projection, it is necessary to set crosses in the bottom left and bottom right corners (see Pic. 22 - Pic. 25). The sequence of installation is important, the place of occurrence of "next" crosses will tell you what corner you are calibrating at the moment.
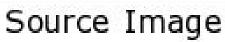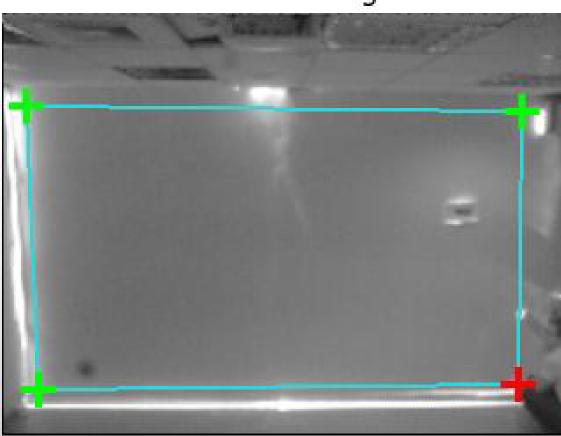
Pic. 22 Calibrating the bottom left corner (wall)

Pic. 23 Aligning the cross with the touch (bottom left corner)

Pic. 24 Calibrating the bottom right corner (wall)
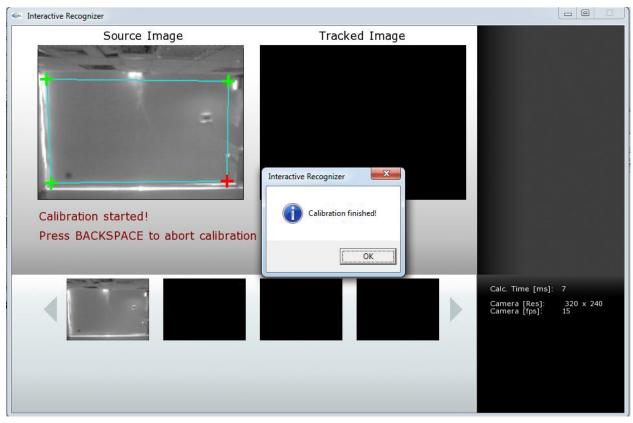

Pic. 25 Aligning the cross with the touch (bottom right corner)

The more accurately you indicate to the camera the location of the projection corners, the more accurate the projection response will be when interacting with it. However, we do allow up to 10 cm for response offsets when interacting with the projection.

From the description you can see that the camera calibration must be done by two people. One person touches the corners of the projection; the other person puts crosses in the program window with the mouse in places where white spots from touches appear.

When all four corners have been calibrated, a dialog box will open with the message **Calibration Finished!** (Pic. 26). Click **OK** with the left mouse button.
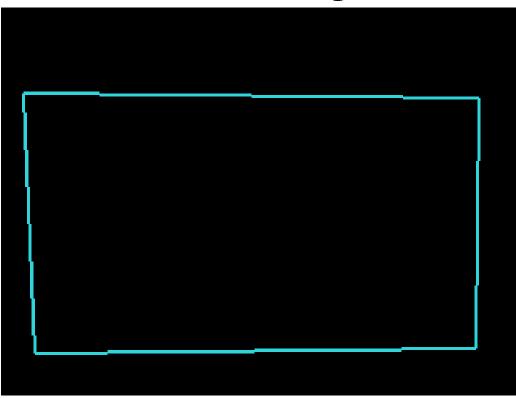

Pic. 26 End of calibration process
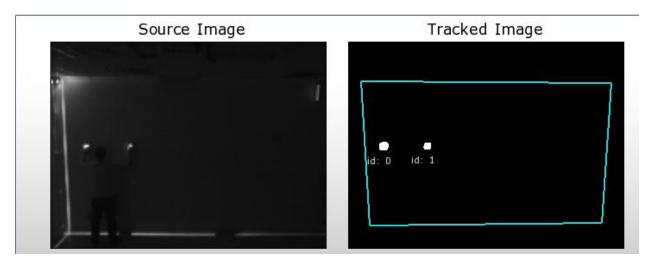
Step 2. Setting the projection response

In the right window of the program you will see the polygon specified during calibration, which represents the projection on the wall (Pic. 27). This window displays the white spots selected by the program from the camera, which are used to interact with the projection after processing. The program considers as correct touches only those spots which appear in the specified polygon.

Tracked Image

Pic. 27 Calibration result, polygon with projection

Next, make sure that the software correctly recognizes the user's interaction with the infrared sensor. Touch the wall with both hands with the projection as shown in Pic. 28. You should see two white spots at the touch points with numbers (**id**) assigned to them.

Pic. 28 Checking the correctness of touch recognition

If when touching spots does not assign an **id** or spots are absent at all, you should increase the camera sensitivity (recall that you should focus on spots inside the polygon with projection - outside the polygon spots are not taken into account, the program does not assign them an **id**).

Press **F3** to adjust the sensitivity. You will see a slider to adjust the sensitivity (Pic. 29)

Pic. 29 Sensitivity adjustment slider

The adjustment algorithm is described below:

1) Move your hands away from the wall with the projection so they do not cross the sensor line;

2) Using the left (right) mouse button, increase (decrease) the value of the **Gain** parameter by **5 points.** You can also move the slider with the mouse;

3) Wait 2-3 seconds after changing the slider value;

4) Place your hands against the wall so that they are crossed by the sensor line (similar to Pic. 28). Check that the conditions are met (Pic. 28);

5) If the conditions are met, press **ENTER** to complete the sensitivity setting. Otherwise, go back to step 1 of algorithm.
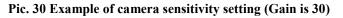
When you increase (decrease) the sensitivity, you will see how the brightness of the image from the camera changes and the contours of a person become distinguishable. This may cause noise (the presence of white spots, not related to the sensor line breaking by touching the projection) and the system reaction due to its appearance.
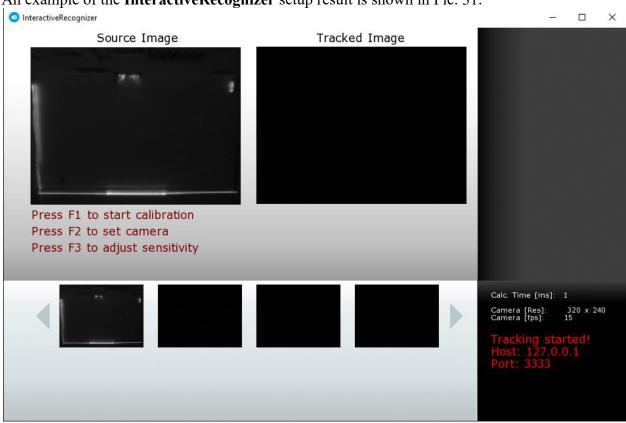
The factory default sensitivity setting (a **Gain** setting of **0**) is the most optimal in terms of the balance of noise and usable signal (touch response). If you increase **the Gain,** the probability of noise increases. We recommend following the above algorithm, increasing the sensitivity in small portions from the bottom up and checking the result at each iteration. If the conditions are met, the sensitivity adjustment should be completed.

Noise is also caused by infrared radiation in the camera's field of view, which shines off human contours, initiating extra white spots unrelated to touching the projection. Sometimes the source of infrared radiation can be a projector with a powerful light flux, installed too close to the wall with a projection.

The example of work of the program with the parameter **Gain** equal to **30**, is presented on Pic. 30. Note that the camera image has become brighter, the white spots from touching have increased in size, but at the same time the contours of the person have become visible.
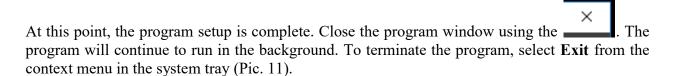

Pic. 30 Example of camera sensitivity setting (Gain is 30)

An example of the **InteractiveRecognizer** setup result is shown in Pic. 31.

Pic. 31 Window with correctly configured InteractiveRecognizer program

At this point, the program setup is complete. Close the program window using the . The program will continue to run in the background. To terminate the program, select **Exit** from the context menu in the system tray (Pic. 11).

The **Configuring the software** assumes to be performed only during the initial setup after the system elements have been installed correctly.

All software settings are retained. **However, if you move the camera or projector relative to each other,** you will need to perform **Step 1. Calibrating the camera** again.

Technical support

Troubleshooting

Projection does not respond to touch
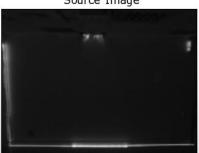
1) Make sure, **InteractiveRecognizer** is running in the background (there is a program icon in the system tray (Pic. 11));

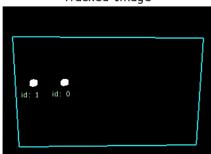2) Open the program window. Make sure that the left window of the program displays video from the camera. If you see an image , or a black square, it means there is no connection to the camera. You should terminate **InteractiveRecognizer** using **Exit** from the context menu (Pic. 12), connect the camera to the **USB 3.0** port of your computer, restart the program and check the video presence;

3) Make sure that the infrared sensors are plugged in and configured correctly. In the left window of the program you should see a clearly visible sensor line parallel to the wall . Approach and touch the projection. In the right window of the program you should see white spots corresponding to your touches . If you do not see the sensor line and there are no white spots when you touch the projection, then the infrared sensors have failed - over time the infrared LED may burn out, which weakens the brightness of its line of light. Try to

increase camera sensitivity (Pic. 30)**.** If there are no positive results, contact technical support;

4) Check that the camera is calibrated (there is a turquoise polygon in the right program window),

. If it is not available, calibrate the camera – пункт **Step 1. Calibrating the camera**;
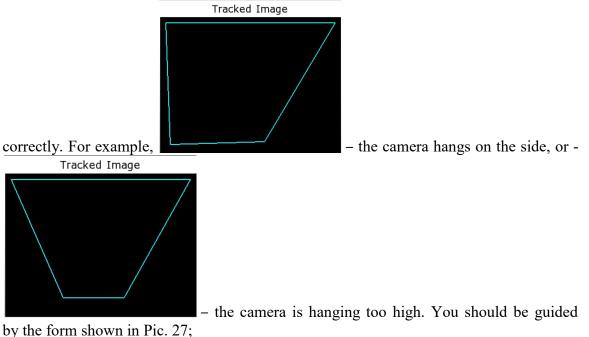
5) Check if the program is paired with games and effects (there is an inscription

in the lower right corner of the program). If it is not available, contact technical support.

Projection responds to touch with a large offset

When we operate the system, we lay down a tolerance for response offsets up to 10 cm in size when interacting with the projection. However, there are a number of provisions that must be observed to ensure a correct response:

1) Make sure that the camera is hovering at the level of the vertical axis of symmetry of the projection on the wall, that is, in the middle of the projection and about 40 cm below the top edge of the projection (Pic. 3). If the calibration results in a polygon with a strong deviation from the rectangular shape, you can conclude that the camera is not mounted correctly. For example, – the camera hangs on the side, or - – the camera is hanging too high. You should be guided by the form shown in Pic. 27;

2) Make sure that the sensor line is as close to the wall as possible.