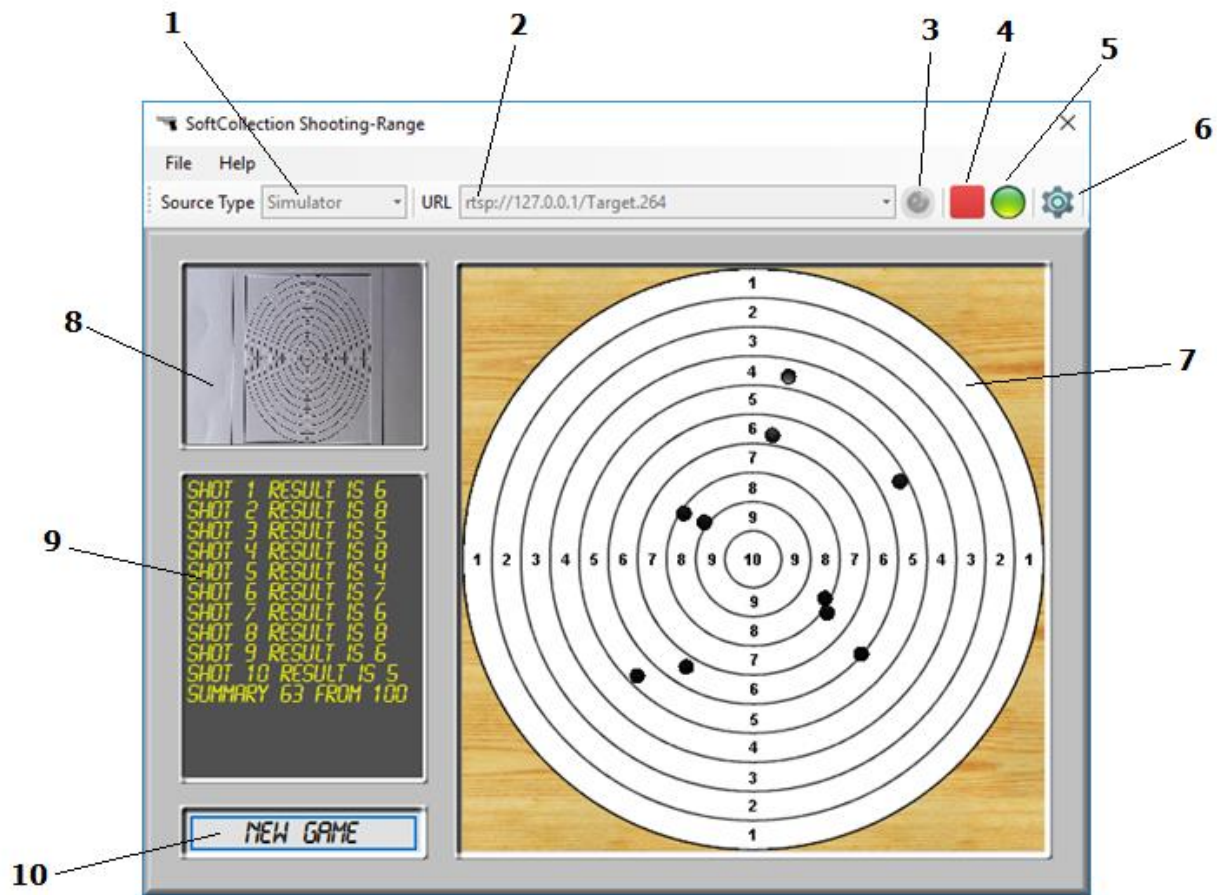


# SoftCollection Shooting-Range

SoftCollection Shooting-Range is a shooting training game.

All you need is PC, Web Camera or IP Camera and Laser Gun that emits laser beam for 100 milliseconds. If you don't have such gun, you can use simulator in order to see how the game works. First of all you have to print the target. Desired PDF file can be found in **Help/Print Target** menu. When the target is ready, attach it to carton and put in front of the Camera. Camera will see the target and the laser beam that appears on it. Video Motion Detection algorithm determines where exactly on the target the laser beam appeared. Important note: because the camera is not directly in front of the target, but slightly aside, you need every time to adjust the target bounds in the settings window. You must also set bounds on beam size, so the algorithm will ignore all the changes that doesn't fit to the size. Now you must select the Source Type of the video stream (RTSP Camera/Web Camera/Simulator). When Source Type is selected, select URL for your device. If RTSP Camera is selected, you can edit the connection list for RTSP Cameras by clicking the "Edit Camera List" button. If you have Web Cam selected, use 0, 1, 2 for first, second and third Web Cameras respectively. The next step – click the connect button. When connection status led is green – you are connected. Click New Game button and play the game.



1. **Source Type.** It may be RTSP Camera / Web Camera / Simulator.  
**RTSP Camera** is an IP Camera that supports RTSP Streaming. Initially the URL list is empty. So you need to fill in the list. Click **button 3** and edit the file. After that you have to reselect RTSP Camera in Source Type list.  
**Web Camera** may also be used as Video Source.

URL for Web Cameras:

0 = First Web Camera.

1 = Second Web Camera.

2 = Third Web Camera.

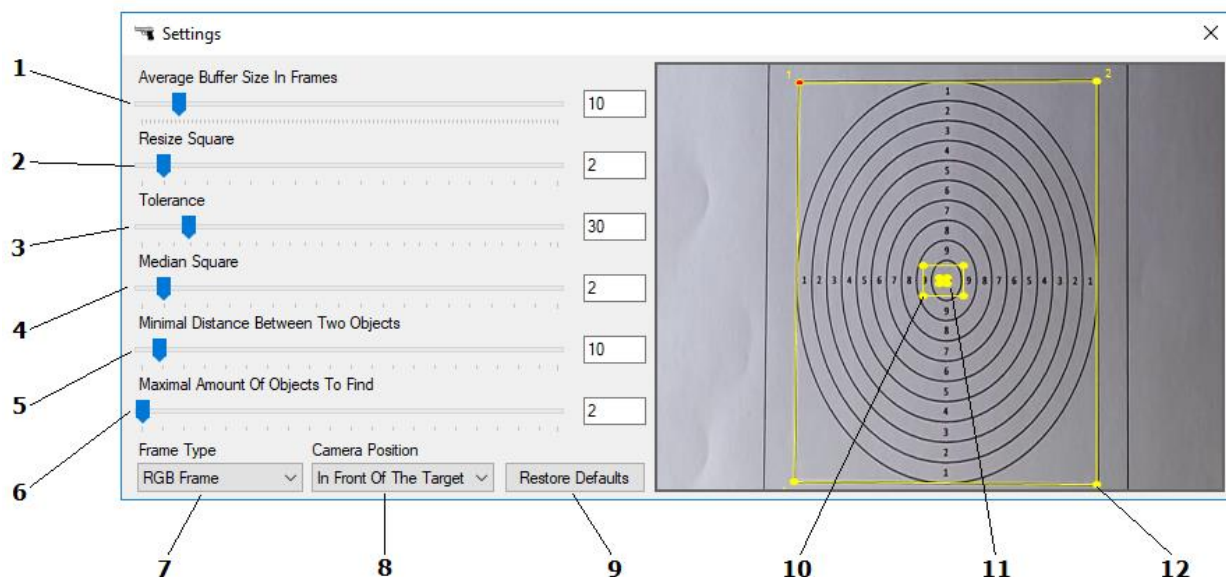
**Simulator** may be used to show how the program works.

It starts Video Server first and connects to it.

Video Server streams short shooting video.

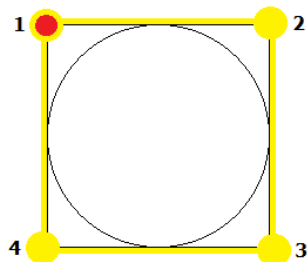
When the video ends, you must restart the video again.

2. **URL** for selected Source Type is explained above.
3. **Edit Camera List** button. Only for RTSP Cameras.
4. **Connect/Disconnect** Button.
5. **Connection Status** LED.
6. **Open Settings** Window.
7. **Target.**
8. **Live Video** from Video Source.
9. **Results** table.
10. **New Game** button. When you click on it, all the results will be cleared.

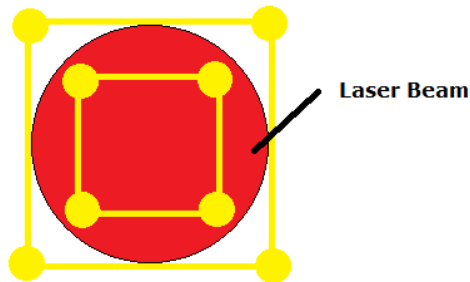


In **Settings** Window you must calibrate your video.

It is very important to adjust outer (12) polygon so it will coincide with the square that contains the targets outer circle (as shown at the picture below). We need this to be able to determine the proper location of the laser beam on the target. Also very important to set polygons red point numbered 1 over top left corner of the square mentioned above. Point 2 must be over top right corner. Point 3 must be over bottom right corner. Point 4 must be over bottom left corner. Otherwise nothing will work!



You must also adjust the rectangles 10 and 11. Rectangle 10 is maximal accepted laser beam size. Rectangle 11 is minimal accepted laser beam size. This will filter out big changes like turning on light in the room, and small changes like camera noise.



1. **Average Buffer Size in Frames.** If this parameter grows up, the quality and precision also better, but memory consumption significantly increases.
2. **Resize Square.** If resize square grows up, CPU usage decreases but precision gets down.
3. **Tolerance.** This parameter shows how much pixel must be changed in order to be considered as logic change.
4. **Median Square.** If median square grows up, noise decreases but precision gets down.
5. **Minimal Distance Between Two Objects.** If this parameter too big many different small objects will be considered one large object.
6. **Maximal Amount Of Objects To Find.** How many objects the algorithm must search for.
7. **Frame Type.** Show Frame of the selected type.  
 RGB Frame: Fully colored frame.  
 VMD Frame: Grayscale resized frame.  
 Average Frame: Frame that is an average frame of all the frames that currently in the buffer.  
 Difference Frame: Difference frame between Average Frame and Current Frame.  
 Tolerance Frame: Black/White frame. Pixels that considered as changed are white, others are black.  
 Median Frame: Black/White frame. Noise reduction.
8. **Camera Position.** Where camera is physically placed.  
 If in front of the target – nothing changed.  
 If behind the target – then target flipped horizontally in memory during result calculation.
9. **Restore Defaults.**
10. Maximal accepted laser beam size. (You can move these squares freely).
11. Minimal accepted laser beam size. (You can move these squares freely).
12. Target Border bound polygon.

## Laser Gun

Now, when everything is ready, all you need is the Laser Gun.

You have two options:

1. You can try to find Laser Gun Toy in online shops. There is no standard Laser Gun that compatible with our needs. So you need to look for a gun with weak red laser (like in Laser Pointers) that blinks once for 100 milliseconds after button is pushed.
2. You can make the Laser Gun yourself. If you decided to go to this option, you must take into account that dealing with lasers may be dangerous so you must understand what you do and despite I will give some tips, **you will do it at your own risk.**

You will need the following parts: **Laser Diode, Capacitor, Batteries Holder Case** and **Switch.**

It is very important **not to use strong laser** because it is useless for this game, but will cause harm to camera matrix and eyes. **Electrolytic Capacitors may also be dangerous**, so you must pay attention that you don't confuse + and -.

**Laser Diode** may be for example: 650nm 6mm 3V 5mW Laser Dot Diode Module Red Copper Head Mini pointer.



**Capacitor** may be about 3300uF, 6.3V.



**Batteries Holder Case may be** Batteries Holder Case 2 AAA Batteries Box



**Switch** may be KW12-3 Micro Roller Lever Arm Normally Open Close Limit Switch



The idea is to connect capacitor to the battery so it will be charged and afterwards disconnect it from battery and connect to the laser diode. Capacity of 3300uF is enough for laser diode to be on for 100 milliseconds. You can see full circuit below.

