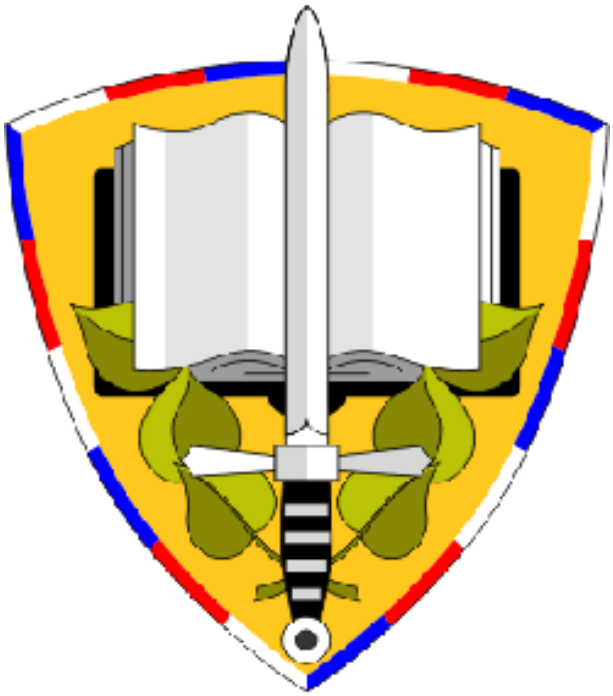
University of Defence

Faculty of Military Technology
Department of Communication and Information Systems



HomeLESS Hit Analyzer 1.1b manual

Creators:
LTC. Ladislav Hagara, Ph.D.
ssg. Miroslav Lábr

Content

1 Overview

HomeLESS Hit Analyzer is free software multiplatform home LASER shooting simulator. You need only a webcam, laser pointer or special LASER gun (LaBr-gun or some alternative) and printed paper target to enjoy safe dry LASER firing at your home for free.

1.1 Technical parameters

- Technical parameters:
  - Shooting distance: ..... Almost unlimited
  - Camera to computer distance: ..... Up to 5 meters
  - Hit resolution with target diamater 115 : ..... About 0.2 mm
- Requirements
  - Operation system: ..... GNU/Linux, MS Windows
  - Web camera: ..... VGA- 640x480 with 30 fps
- Cost
  - Program: ..... FREE
  - Special self made LaBr-gun: ..... About 50 $
  - Webcam with cabel and stative: ..... 28 $
  - Total: ..... 78 $

Figure 1.1 Complet solution of HomeLESS Hit Analyzer.

1.2 Main window description

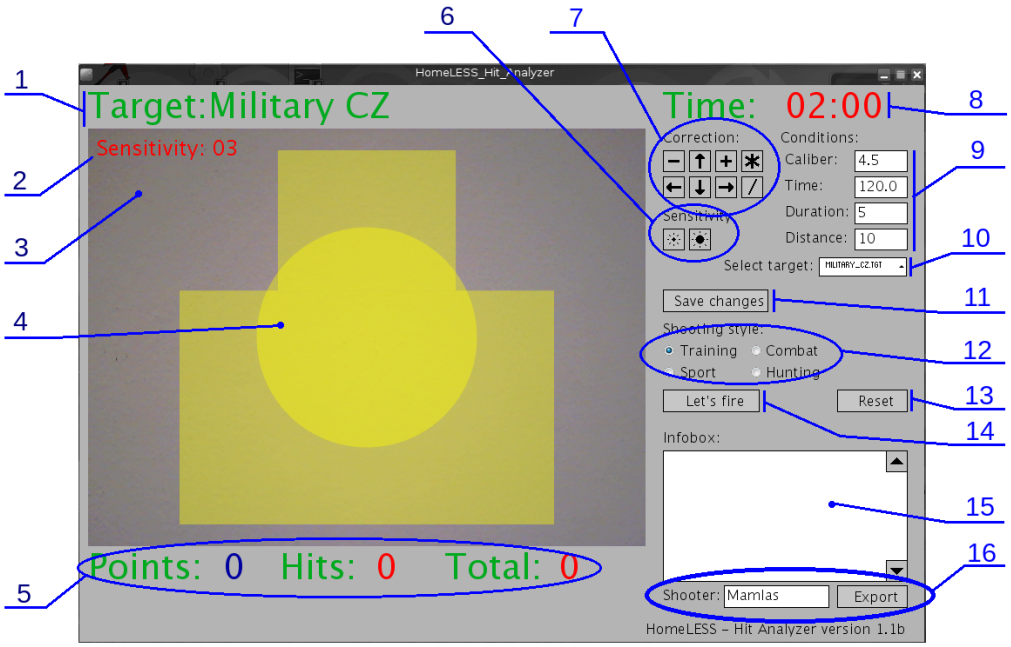
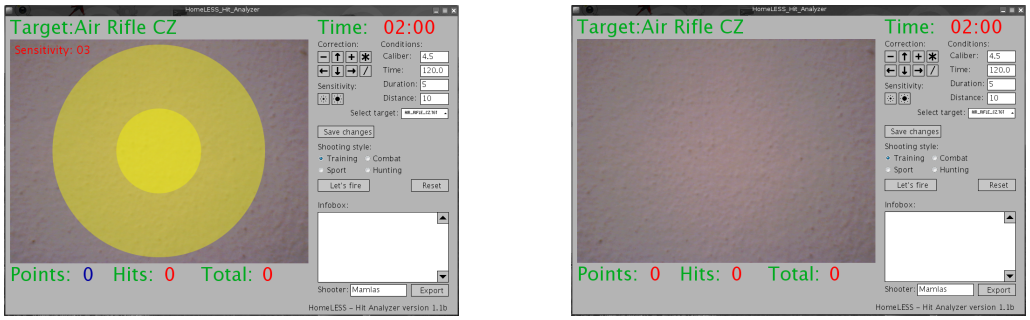


Figure 1.2 Main window of HomeLESS Hit Analyzer.

1. Current selected target.
2. Sensitivity settings label.
3. Camera view.
4. Ghost calibration target.
5. Current status of shooting.
6. Sensitivity settings buttons.
7. Correction buttons.
8. Current time of shooting.
9. Shooting conditions.
10. Target selection combobox.
11. Save change buttons.
12. Shooting style selection.
13. Reset button.
14. Let's fire button.
15. Infobox.
16. Exporting option.

2 Modes

The program works in two modes, Configuration (Fig. 2.1a) and Shooting mode (Fig. 2.1b). At the first mode, the settings for the simulator itself (synchronization targets, evaluation method, etc.). For synchronization target is show Ghost calibration target. At configuration mode is also displayed sensitivity label and value. At shooting mode, the software detects and evaluates hits (number of shots, score, etc.). At this mode is not displayed Ghost calibration target and sensitivity label. For switch to shooting mode click on the "Let's fire" button. For return and reset values click on "Reset" button.



a) b)

Figure 2.1 Differences between configuration and shooting mode of Hit Analyzer.

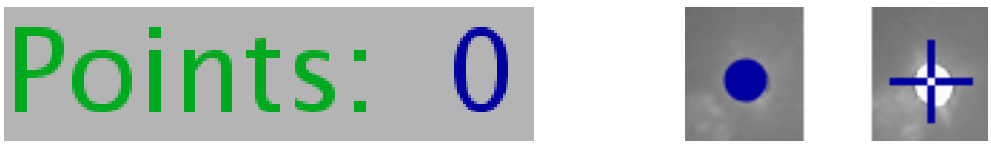
2.1 Configuration mode

At configuration mode you can set the condition of simulated shooting. Also you can testing the right settings of camera parameters. When they are set well, there will not be fake hits. If here still some fake hits, set camera parameters again (chapter 8.3 at page 15) and check lighting.

- Selecting and synchronization target for the shooting, chapter 3 at page 7 .
- Setting diameter of used caliber, chapter 4.1 at page 10.
- Setting time for shootingc, chapter 4.3 at page 11.
- Setting maximum hits for shooting, chapter 4.4 at page 11.
- Selecting shooting style, chapter 5 at page 12.
- Setting shooter's name for shooting log, chapter 6 at page 13.

2.2 Shooting mode

Current hit value is represented by green label "Points:" and blue number of current value (Fig. 2.2a). At camera view is represented by blue hit mark, dot or cross (Fig. 2.2b).



a) b)

Figure 2.2 Current hit and points.

Last hit value is represented by red number of current hit value (Fig.2.3a) instead position of current hit value. At camera view is represented by red hit mark, dot or cross (Fig. 2.3b).

a) b)

Figure 2.3 Last hit and points.

Number of hits is represented by green Label ”Hits:” and red number of current value (Fig. 2.4). Maximum hits is limited to 99.

Figure 2.4 Number of hits.

Total score value is represented by green label ”Total:” and red number of current value (Fig. 2.5). Maximum value is limited to 999 because of limit of maximum number of hits.

Figure 2.5 Total score.

Remaining time of shooting is represented by green label ”Time:” and red numbers (Fig. 2.6). Remember that time for shooting is inputted in seconds but is represented at minutes and seconds. Maximum viewed value is limited to 999 minutes and 59 seconds.

Figure 2.6 Remaining time of shooting.

3 Target's handling

3.1 Selecting the target

For selecting new target just click on the combobox and choose target what you want. After a mouseclick is target automaticaly loaded. Also, it is automatically loaded necessary Ghost calibration target.

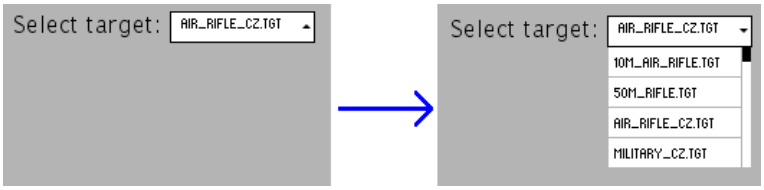


Figure 3.1 Detail of combobox for target selection.

3.2 Ghost calibration target

Ghost calibration target is used for synchronization between real printed target and target inside HomeLESS Hit Analyzer. On camera view is represented by image of used target with yellow transparent color (Fig. 3.2). This image is automatically generated from used target. For square circle is loaded little different Ghost calibration target as show figure 3.3.

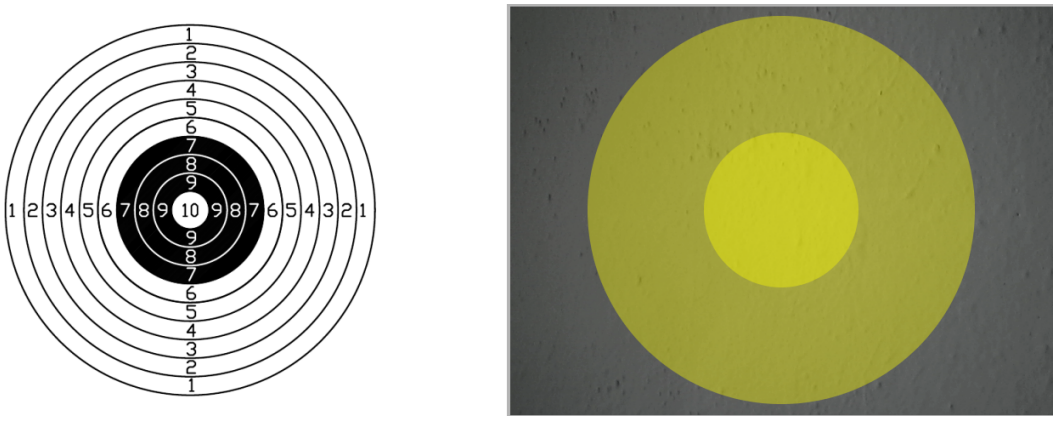


Figure 3.2 Circle target and it's ghost calibration target.

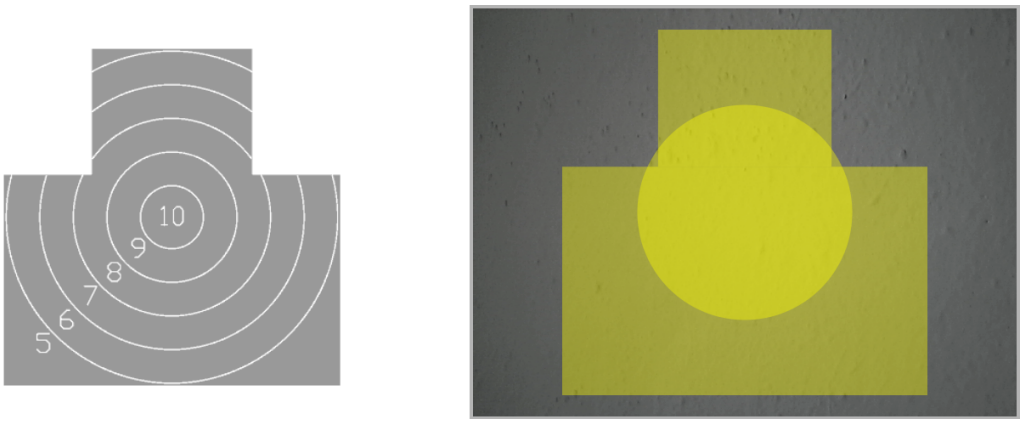


Figure 3.3 Square circle target and it's ghost calibration target.

3.3 Synchronization the target

Because the ghost calibration target is automatically centered in camera view it can no fit well at first moment. As you can see in figure 3.4a. You can fixed it by change camera position (if the real printed target is out of camera view) but better way how to fix it is the use correction buttons (They described in following chapter). For evaluation of shooting is very important to set Ghost calibration target well on real printed target as show figure 3.5a. If you do not set it well you can get wrong evaluation of hits. The result of incorrect synchronization Ghost calibration target you can see in figure 3.4b. You can see that shot missed the target, but it wrong evaluated as hit for two points. With good synchronization the same hit will be well evaluated for zero points (Fig. 3.5b).

a). b)

Figure 3.4 Bad setting Ghost calibration target.

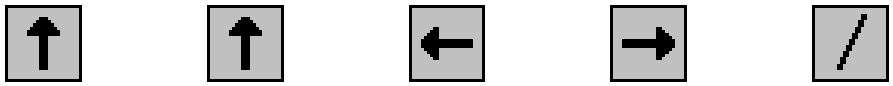
a). b)

Figure 3.5 Good setting Ghost calibration target.

3.4 Correction buttons

For easy synchronization between ghost calibration target and real printed target are used correction buttons.

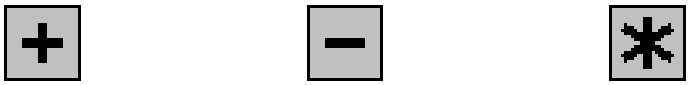
- Moving
  - For move Ghost calibration target one pixel up press button in figure 3.6a or press up arrow.
  - For move Ghost calibration target one pixel down press button in figure 3.6b or press down arrow.
  - For move Ghost calibration target one pixel left press button in figure 3.6c or press left arrow.
  - For move Ghost calibration target one pixel right press button in figure 3.6d or press right arrow.
  - For move Ghost calibration target to default position press button in figure 3.6e or press slash on numeric part of keyboard..



a). b) c) d) e)

Figure 3.6 Corection buttons for moving Ghost calibration target.

- Scaling
  - For increase size of Ghost calibration target press button in figure 3.7a or press plus on numeric part of keyboard.
  - For decrease size of Ghost calibration target press button in figure 3.7b or press minus on numeric part of keyboard.
  - For reset size of Ghost calibration target press button in figure 3.7c or press asterisk on numeric part of keyboard.



a). b) c)

Figure 3.7 Corection buttons for changing size of Ghost calibration target.

4 Shooting conditions

4.1 Caliber

In HomeLESS Hit Analyzer you insert the caliber in milimeters. Settings of the size of caliber affects the evaluation of hit. If the size of caliber is bigger than zero. The hit will be evaluated by the edge of hit . As show figure 4.1a, this hit has value for 10 points. If the size of caliber is equal to zero. The hit will be evaluated by the center of hit as show figure 4.1b, this hit has value for 7 points.

a) b)

Figure 4.1 Differences in displaying and evaluation of hit depending on the size of caliber.

4.2 Distance

For shooting at reduced distances is necessary insert a simulated distance which you want to shoot and real distance which you shoot. The difereces bewtwen this distances is show in figure 4.2. Real distance shootings is distance signed by letter A. This distance is betwen shooter and real printed target[1]). Simulated distance shootings is signed by letter B. At this distance is target in ordinary shooting (at real shooting range) and this distance is simulated by decremented target at real shootings distance (A).

In other words. The decrement target at Real shootings distance[2]) (A) equal to normal size target at Simulated shootings distance (B). In HomeLESS Hit Analyzer you insert directly the Simulated shooting distance in meters.

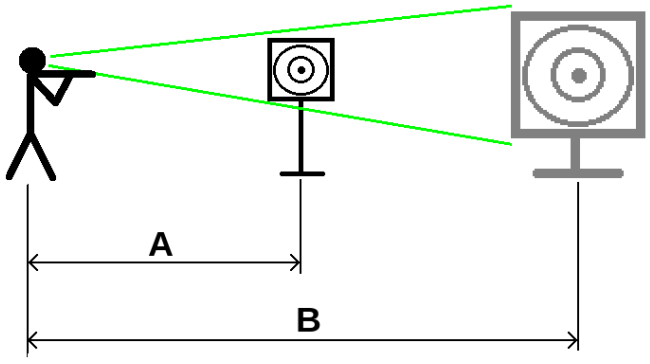


Figure 4.2 Diference betwen distances.

[1]) This target is decremented
[2]) This distance is defined in ”ha.ini” file, line 20, equal to 5 meters by default

4.3 Time of shooting

Time of shooting is important for Sport and Hunting styles (will be explained bellow). It is mean how long you can shooting. Value is inserted in seconds and displayed at minutes and seconds. Do not insert higher value than 59999 seconds (999:59) because there is problem with displaying it.

4.4 Duration

Duration of shootings means maximum possible hits at Combat and Sport style. After you reach the number of hits, shooting will be automatically stopped. Shooting will also stoped after reaching of 99 hits.

5 Shooting styles

There are four shooting styles. You can control your shooting by time or number of hits or both of them. Every shooting style provides a shooting log, except Training style. To change style use Shooting style options, figure 5.1.

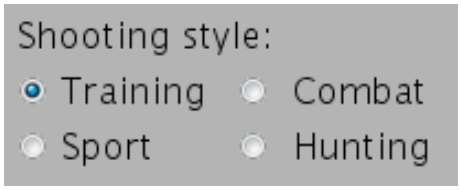


Figure 5.1 Detail of Shooting style options.

5.1 Training style

This style is for training and testing the program and LaBr-gun. There are no restriction for number of shots or time, also there is no shooting log. This style is useful when you want to shoot for fun or you have only LASER pointer.

5.2 Combat style

This style should simulated the combat shooting. There is restriction of number of hits which are declared by value of Duration.

5.3 Hunting style

This style simulated the real hunting. There is only time limit declared by value of Time.

5.4 Sport style

There are two restrictions. First is the number of hits which are declared by value of Duration. Second is the time limit declared by value of Time. This style simulated the shooting competition like ISSF competition.

6 Shooting log

Shooting log (or shootlog) is record of shooting and is showed in infobox (Fig. 6.1, A). Also can can be exported from HomeLESS Hit Analyzer[1]). So you can analyze your shooting later[2]). Name of shootlog file is generated from current date, score, number of hits and name of shooter:

```
YYMMDDHHMM_PPP_HH_Name.slg
```

For example: year 2013, month 11, day 26, time 19:32, maximum points 280, maximum hits 40 and shooter's name Mamlas the shootlog file has name:

```
1311261932_280_40_Mamlas.slg.
```

6.1 Exporting

Shoot log file can be exported automatically (Fig.6.2, D) after end of shooting[3]) or manually by pressed of export button (Fig.6.2, C). Before exporting you have to rewrite name (Fig.6.2, B) of shooter (or you can let default name). Shootlog file will be saved in "shootlogs" folder in main directory of Hit Analyzer. From this file is possible to reconstruct process of shootings (Fig.6.2).

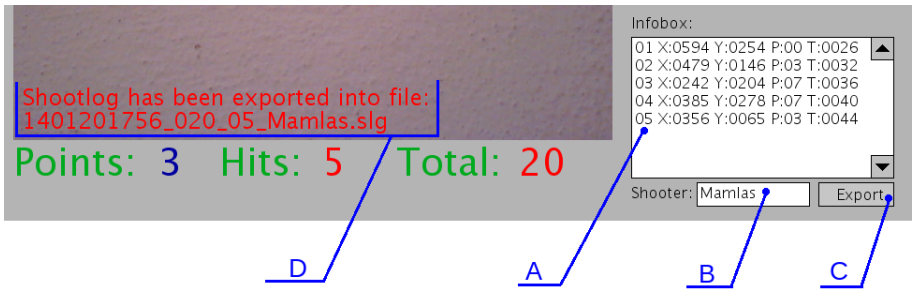


Figure 6.1 Exporting shooting log.

```
Date: 26.11.2013
Hour: 19:30
Name: Mamlas
Total: 168
Hits: 40
Average: 04.20
Time: 08:12
Caliber: 4.5 mm
Target name: Airgun CZ
Shooting distance: 10 meters
Real distance: 5 meters
Style: Sport

HomeLESS - Hit Analyzer version 1.1b
Shootlog version: 1

X:0214.5 Y:0253.5 P:09 T:0006
X:0186.0 Y:0253.5 P:08 T:0012
X:0283.0 Y:0260.5 P:09 T:0020
X:0577.0 Y:0442.0 P:00 T:0028
```

Figure 6.2 Contain of Shooting log file.

[1]) Exported file contain full record of shooting.
[2]) specialized software is under development :)
[3]) See HA ini settings, Autoshootlog option

7 Installation

7.1 Requirements

- Computer with GNU/Linux or MS Windows
- Display resolution 1024 x 768
- Webcam resolution 640 x 480 with 30 fps
- LaBr-Gun or Laser pointer
- Printed paper target (use the matte paper)

7.2 GNU/Linux installation

- Download the Hit Analyzer linpack from web page: http://homeless-eng.webnode.com
- Unpack the Hit Analyzer linpack.
- Run Hit Analyzer
- (At most of GNU/Linux distributions will be every OK, maybe you need to install Gstreamer from your repositary or handmade installation.)

7.3 Windows installation

- Download the Hit Analyzer winpack32 or winpack64[1]) from web page: http://homeless-eng.webnode.com
- Unpack the Hit Analyzer winpack.
- Download the right[2]) Java runtime enviroment (JRE).
- Install JRE.
- Run Hit Analyzer.

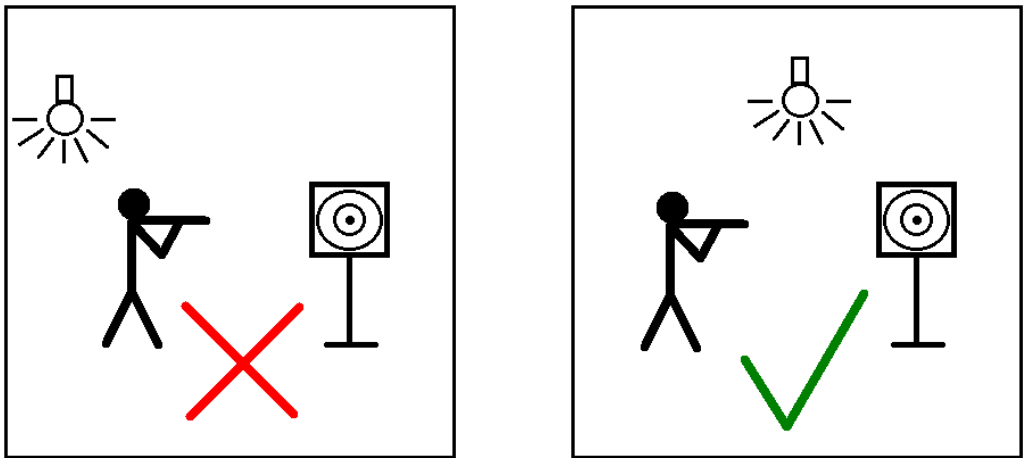
[1]) Depents on system architecture, 32bit vs. 64bit
[2]) 32bit vs. 64bit

8 Technical settings

This section describes technical settings of HomeLESS Hit Analyzer 1.1b. Here you found information about lighting, sensitivy, ha.ini file and language settings.

8.1 Lighting settings

Good lighting is very important for good hit detection. For best performance must be target well lit. Best result with good hit detection is with spread light because there are not disturbing shadows. With single source of light the best solution is place the light source between shooter and target as show figure 8.1b. Never place single light source behind shooter because there are disturbing shadows and hit detection not work well (Fig. 8.1a).



a). b)

Figure 8.1 Place of single light source.

8.2 Sensitivity settings

To prevent fake hits set sensitivity level as low as possible. Only when HomeLESS Hit Analyzer doesn't detect LASER hit, set sensitivity to higher value until you get goot hit detection. The current sensitivity level value is shown in left up corner of Camera view. To rise sensitivity level value use buttons or keys PageUp and PageDown.

a) Decrease sensitivity . b) Increase sensitivity.

Figure 8.2 Buttons for sensitivity settings.

8.3 General Webcam settings

- Start the webcam configuration program.
- Go to the video capture settings.
- Set saturation to low or zero (to get monochromatic video)[1]).
- Set contrast to little more.
- Set brightness to less.
- Close the webcam program.
- Start HomeLESS Hit Analyzer.

[1]) This is not necessary but sometimes may help.

- Try LASER pointer or LaBr-gun to confirm good settings for good hit detection.
- Try to set good hit detection with sensitivity function[1]).

8.4 Webcam settings at GNU/Linux

For setting the webcam at GNU/Linux is useful program GUVCViewer. At first, select right device (Fig. 8.3, 1) to configure and check frame rate and resolution values (Fig. 8.3, 2).

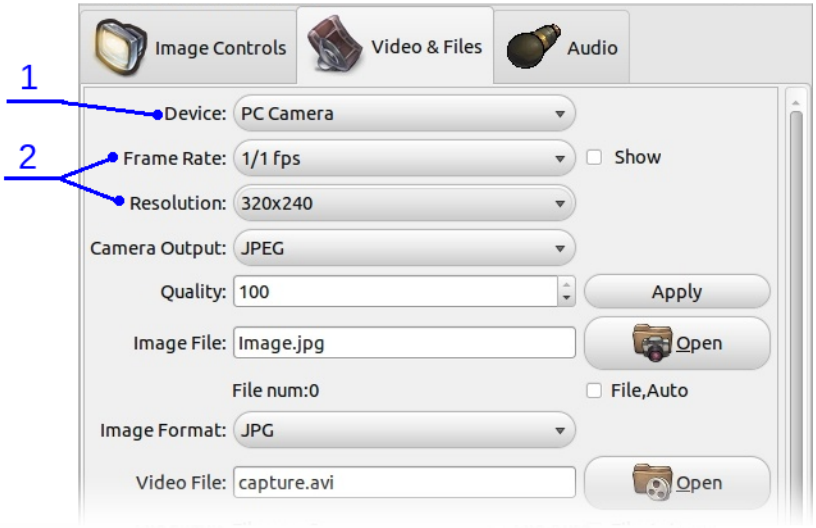


Figure 8.3 GUVCViewer, selecting right device.

Next step is disable auto white balance, set brightness to less (Fig. 8.3, 1), set contrast to little more (Fig. 8.3, 2), optionaly you can set saturation to low or zero and disable white autobalance (Fig. 8.3, 3). The right values for setting this depends on individual light condition.

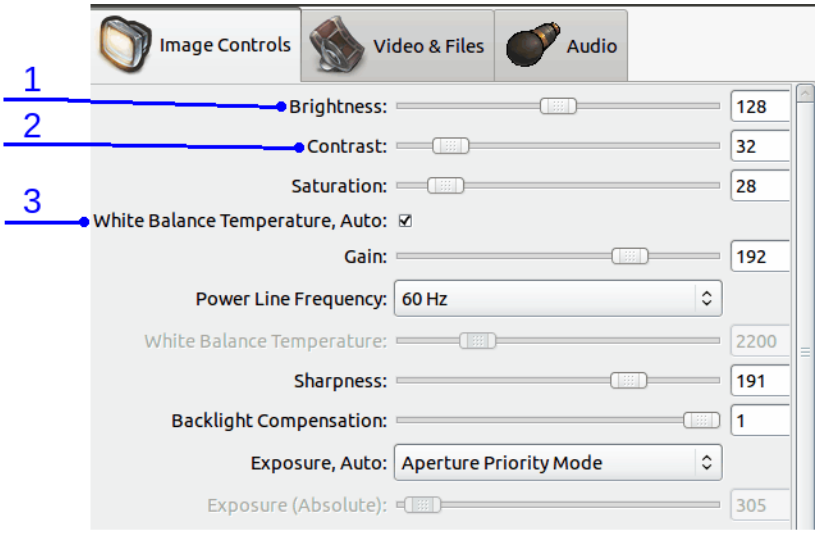


Figure 8.4 GUVCViewer, device settings.

[1]) Maybe you need configure webcam again.

8.5 Webcam settings at MS Windows

At fist, use the Device Manager[1]) at MS Windows and disable all other webcams on computer except webcam for HomeLESS Hit Analyzer. Settings webcam at MS Windows is similar to settings at GNU/Linux but you need program AMCap[2]). Run the AMCap and disable auto white balance (Fig. 8.5, 3), set brightness to less (Fig. 8.5, 1), set contrast to little more (Fig. 8.5, 2) optionaly you can set saturation to low or zero. Sometimes you can use useful zoom functions (if they are available).

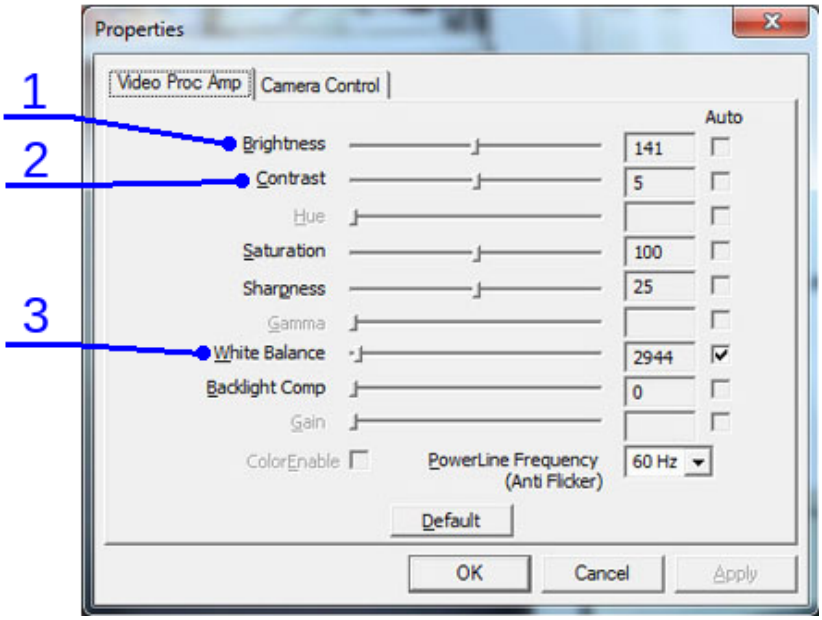


Figure 8.5 AMCap, setting video capture.

[1]) http://www.computerhope.com/issues/ch000833.htm
[2]) http://lmgtfy.com/?q=AMCap

8.6 HA ini file settings

Here is description of configuration ”ha.ini” file of HomeLESS Hit Analyzer. Values can be modified by user. Italic words are notes. Remember, if you make mistake during modifying this file and program will not work correctly. Just delete this file, HomeLESS Hit Analyzer automatically creates new one with default settings.

Webcam = 0 *Number of selected webcam, set this manualy. Numbers 0 till 5 works only at GNU/Linux version of HomeLESS Hit Analyzer. For windows version set number 6. Default value for GNU/Linux version is 0, default value for windows version is 6. Set this manualy*

Video width = 640 *X axis resolution of selected webcam, set this manualy.*

Video height = 480 *Y axis resolution of selected webcam, set this manualy.*

Sensitivity = 42 *Value of sensitivity level, set this with program.*

Style = 1 *Number of selected shooting style, set this with program.*

SLH = 1 *Enable/disable show last hit, set this manualy.*

Language = english *Name of used language pack file, set this manualy.*

Caliber = 4.5 *Value of used caliber, set this with program.*

Delay = 3 *The number of hundreds of milliseconds remaining until program start new detection of hit, set this manualy. If program detect one hit multiply, increase this value. Value of 30 equals to 3 seconds.*

Duration = 5 *Number of maximum hits during combat style or sport style, set this with program.*

Target = airgun_cz.tgt *Name of selected target, set this with program.*

Scale = 1.00 *Scale of selected target, set this with program.*

X correction = 5000 *Correction of X axis of selected target, set this with program.*

Y correction = 5000 *Correction of Y axis of selected target, set this with program.*

Time = 120 *Initial time of duration shooting during hunting and sport style.*

Prepare = 5 *The number of seconds remaining until shooting will start, set this manualy.*

Autoshootlog = 1 *Enable (1) or disable (0) automatic generate shoolog file, set this manualy.*

Shooter = Mamlas *Name of shooter, this name is used for part of name of shootlog file, set this with program.*

Simulated distance = 10 *Write the simulated distance which you want to shoot. Example for simulated shooting distance 10 meter write 10. It will not corresponding with real shooting distance. This value is important for Shootlog file, set this with program.*

Real distance = 5 *Real distance betwen shooter and target, 5 mean five meters, set this manualy.*

8.7 Changing the language

Open file english.lng[1]) and save this file with new name of language which you want (Fig. 8.6). It is very important to use UTF8 encoding. Translate and overwrite all words except the HomeLESS - Hit Analyzer version ... . Be careful with length of the words[2]). Save the file. Use UTF8 encoding. Change language in ha.ini file. Enjoy new language mutation.

[1]) Is in the languages directory

[2]) There is fixed leght for words so some words may overflow.

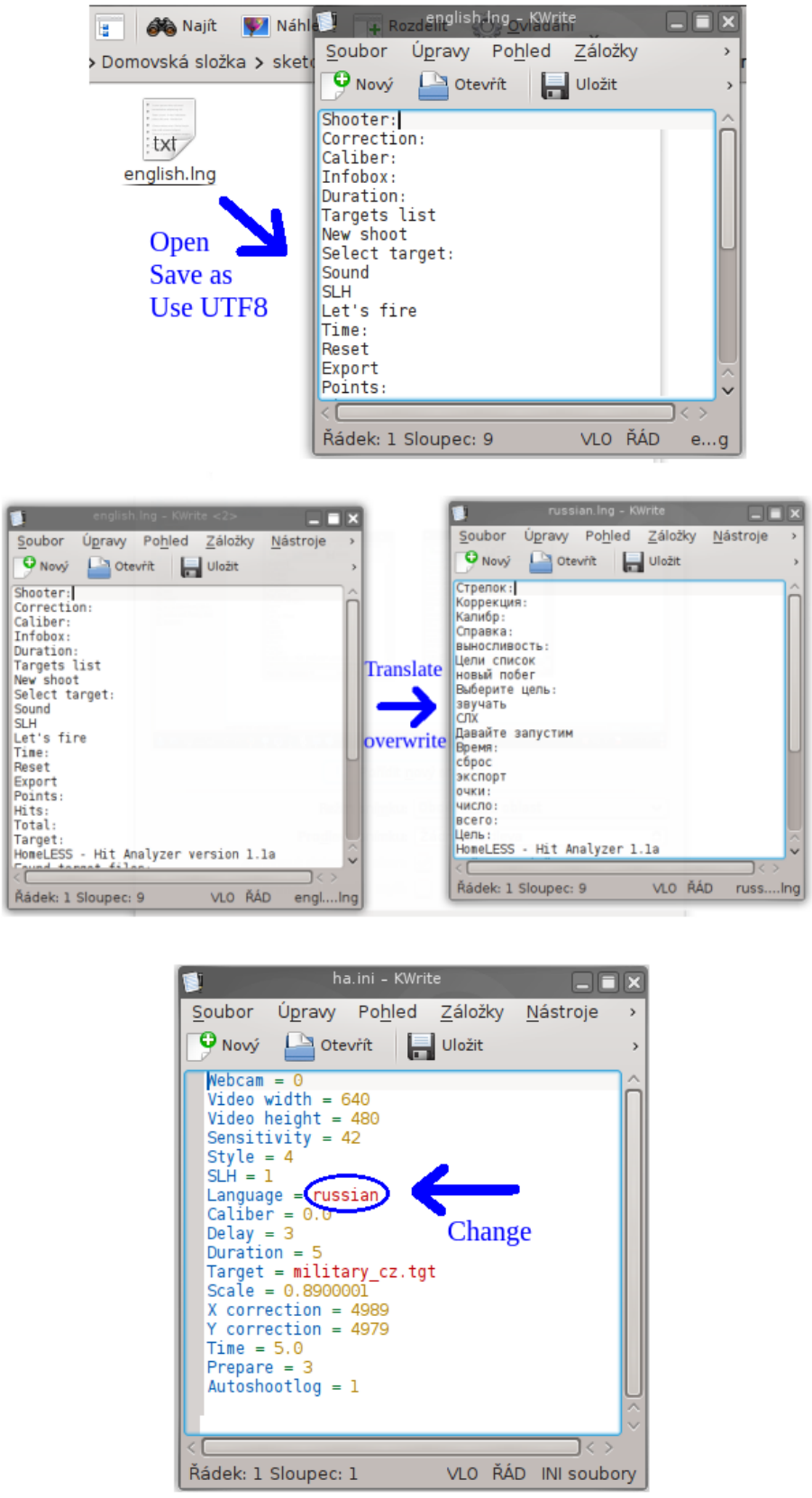


Figure 8.6 Changing the language.

9 Summary

With this manual you can use all function of HomeLESS Hit Analyzer 1.1b. This manual is downloaded from project's website[1]). See also project's Youtube channel[2]).

Important:

If you have any questions about Hit Analyzer 1.1b, drop me an email (laabicz@gmail.com, subject: HA) or ask a question at the project site.

[1]) http://homeless-eng.webnode.com/
[2]) https://www.youtube.com/user/HomeLaserShooting