

# Grid-EYE TrackMe

People Tracking and Counting Software

User Manual

By purchase of any of the products described in this document the customer accepts the document's validity and declares their agreement and understanding of its contents and recommendations. Panasonic reserves the right to make changes as required at any time without notification. Please consult the most recently issued Product Specification before initiating or completing a design.

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This User Manual does not lodge the claim to be complete and free of mistakes.

## TABLE OF CONTENTS

<b>1</b>	<b>ABOUT THIS DOCUMENT.....</b>	<b>4</b>
1.1	PURPOSE AND AUDIENCE.....	4
1.2	REVISION HISTORY.....	4
1.3	USE OF SYMBOLS .....	4
<b>2</b>	<b>OVERVIEW .....</b>	<b>5</b>
2.1	MOUNTING INFORMATION.....	6
<b>3</b>	<b>SOFTWARE INSTALLATION .....</b>	<b>7</b>
3.1	MAIN APPLICATION.....	7
3.2	USB DRIVERS .....	9
3.2.1	<i>Windows 7</i> .....	9
3.2.2	<i>Windows 8 &amp; 10</i> .....	11
<b>4</b>	<b>SOFTWARE HANDLING .....</b>	<b>12</b>
4.1	MAIN WINDOW .....	12
4.2	COUNT LINE OPTION WINDOW.....	13
4.3	PARAMETER OPTIONS WINDOW .....	14
4.3.1	<i>Pre Filter</i> .....	14
4.3.2	<i>Interpolation</i> .....	15
4.3.3	<i>Person Detection</i> .....	15
4.3.4	<i>Person Tracking</i> .....	17
4.3.5	<i>Background Image</i> .....	18
<b>5</b>	<b>APPENDIX .....</b>	<b>19</b>

# 1 About This Document



## 1.1 Purpose and Audience

This User Manual provides details on the usage of the Grid-EYE TrackMe software. The product is referred to as “Grid-EYE TrackMe Software” or “the software” within this document.

## 1.2 Revision History

Revision	Date	Modifications/Remarks
1.0	19.01.2017	1st preliminary version.
1.1	11.10.2017	Added the driver installation steps for Windows 8 and Windows 10. Actualized some images.
1.2	20.10.2017	Actualized images and software description.
1.3	23.04.2018	Included the parameter control panel description.
1.3.1	01.06.2018	Adapted the Parameter Control Window image and description.

## 1.3 Use of Symbols

Symbol	Description
	<b>Note</b> Indicates important information for the proper use of the product. Non-observance can lead to errors.
	<b>Attention</b> Indicates important notes that, if not observed, can put the product’s functionality at risk.
⇒ [chapter number] [chapter title]	<b>Cross reference</b> Indicates crossreferences within the document. Example: Description of the symbols used in this document ⇒ <a href="#">1.3 Use of Symbols</a> .

## 2 Overview

The Grid-EYE TrackMe Software can be used together with the Grid-EYE Evaluation Kit and shows the potential of this Sensor. It demonstrates, that it is possible with an 8 x 8 pixels grid to detect, track and count persons very accurate.

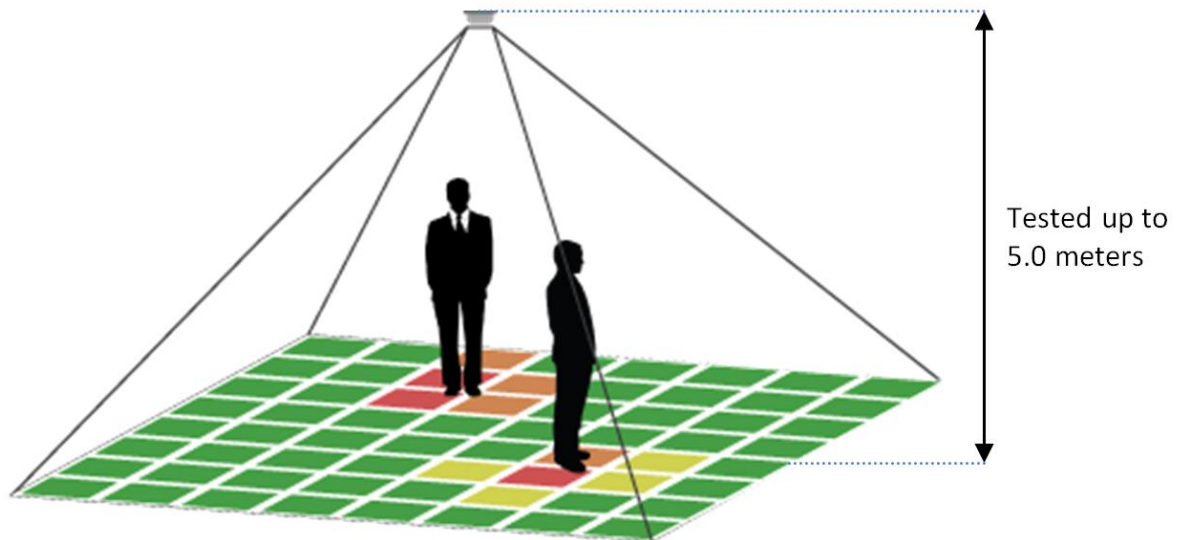
The software is also available as embedded code for integration into a microcontroller. To get the source code, please fill out the SLA, which is available on the Evaluation Kit website.

<https://eu.industrial.panasonic.com/grideye-evalkit>

The software is able to detect, track and count several persons at the same time. It is possible to differ between the directions a counting line was crossed. Because of that incoming and outgoing persons can be counted separately.

## 2.1 Mounting information

The Grid-EYE Evaluation Kit must be mounted in a way that the sensor is looking from above on the persons. The tracking and counting functions were tested with a mounting height up to 5 meters. This is not the limit of the algorithm. The maximum mounting Height is influenced by the filter and threshold setup. This Setup can be adapted within this software ⇒ [4.3 Parameter Options Window](#).



## 3 Software installation

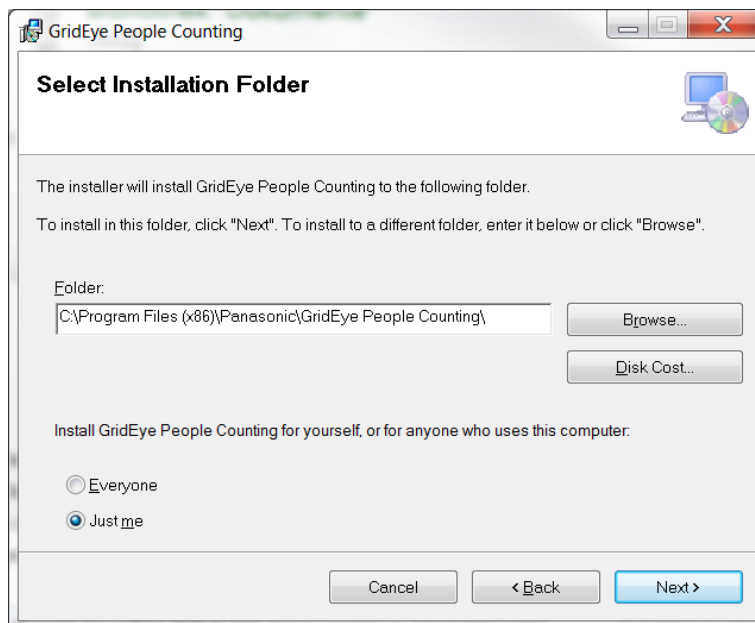
### 3.1 Main application

Please follow these steps for the installation of the software.

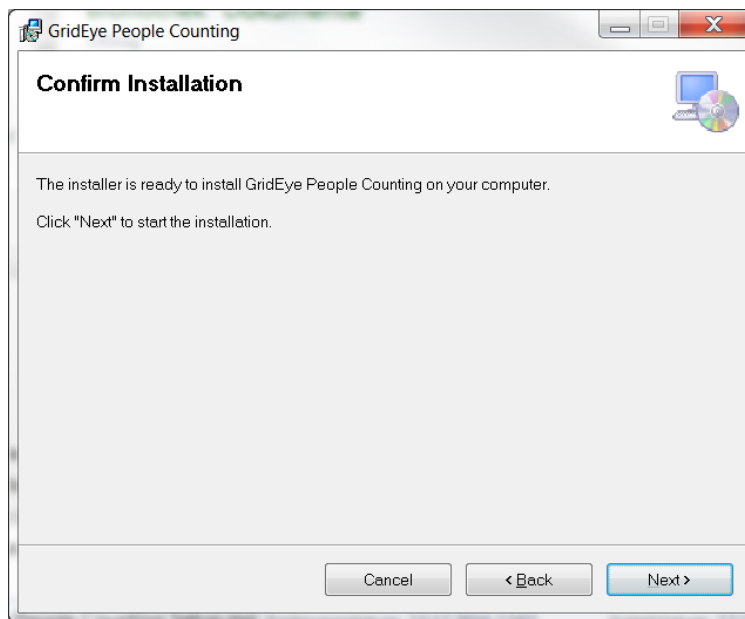
1. Double click the Installation file.
2. Click on next.



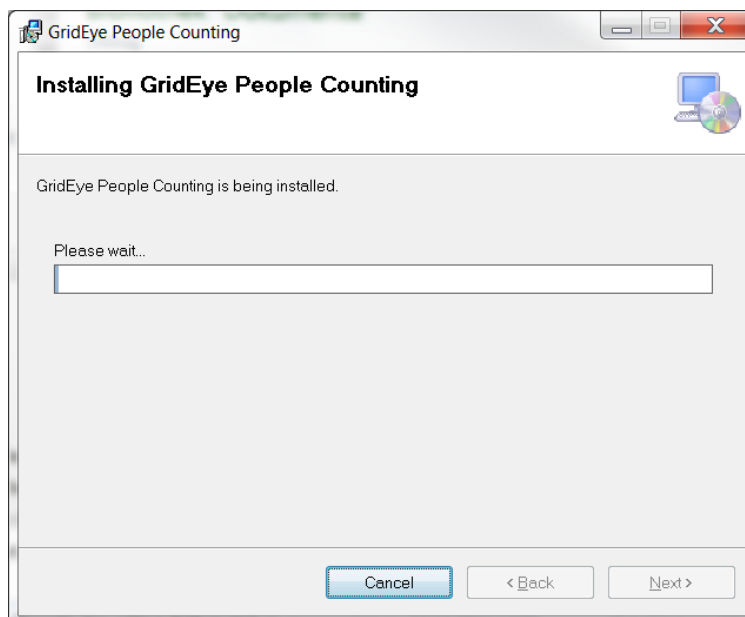
3. Choose the installation folder.



4. Click on next.

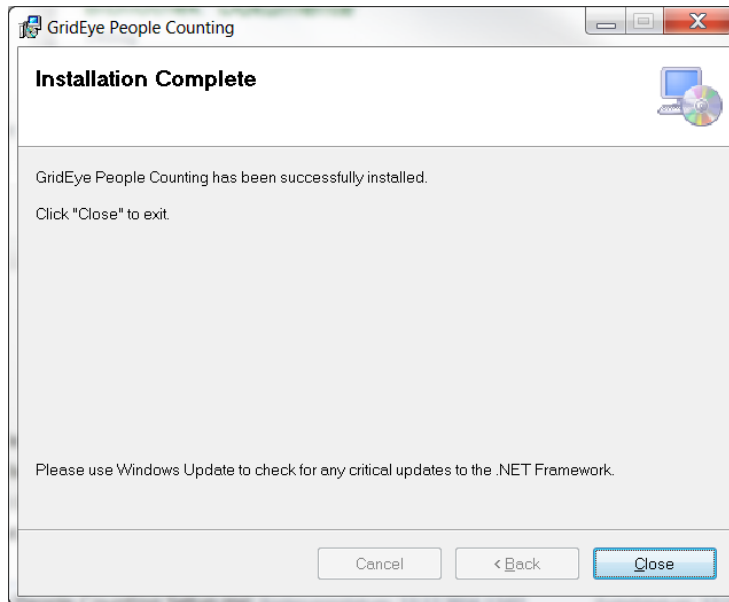


5. Wait until the installation of the software is finished.





6. After finishing the installation process, click on Close.

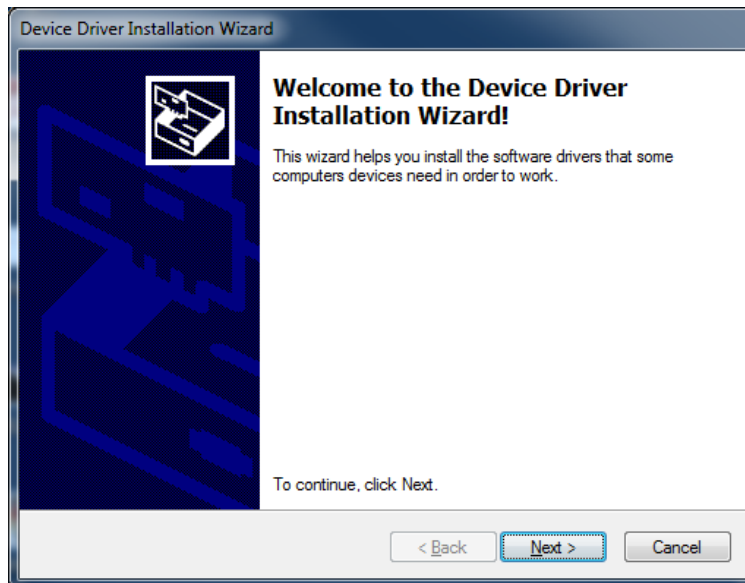


## 3.2 USB drivers

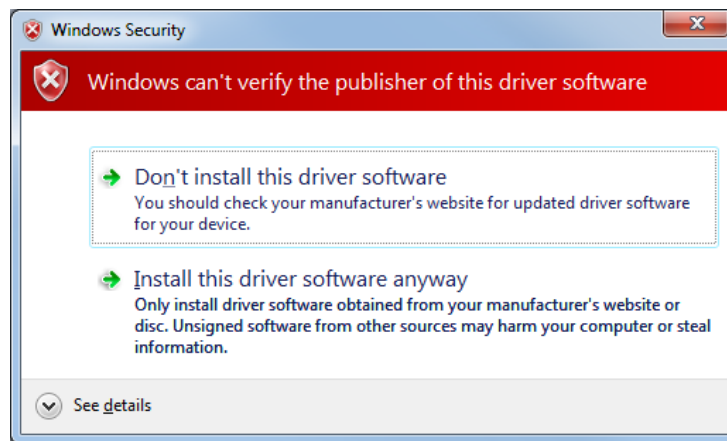
The USB driver installation process will start automatically after installing the main application.

### 3.2.1 Windows 7

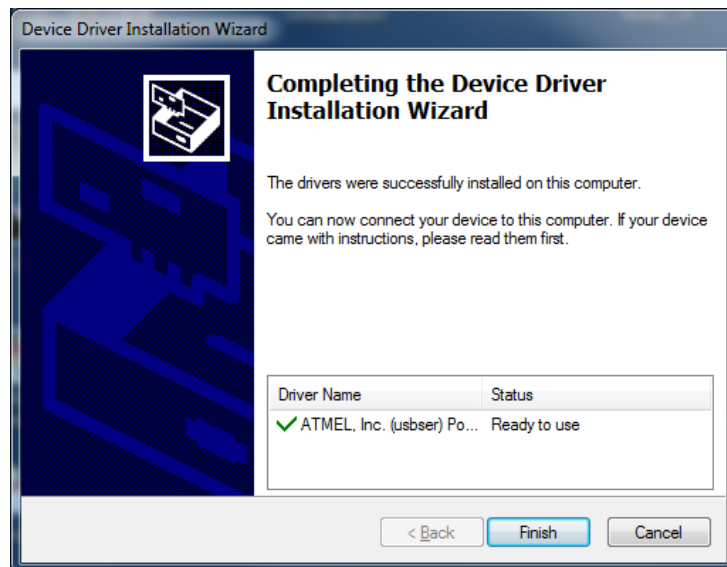
7. After this procedure the usb driver installation part will start automatically.



8. Click on next.
9. The Driver is an unsigned driver. Because of this security information will be displayed. Please click on **Install this driver anyway**.



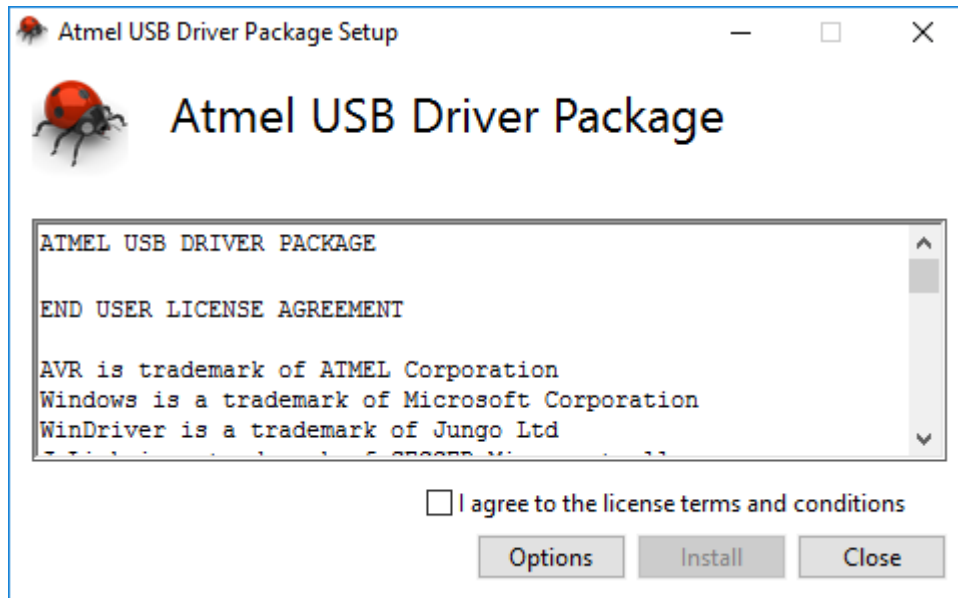
10. After the driver installation click on finish and close on the installation windows.



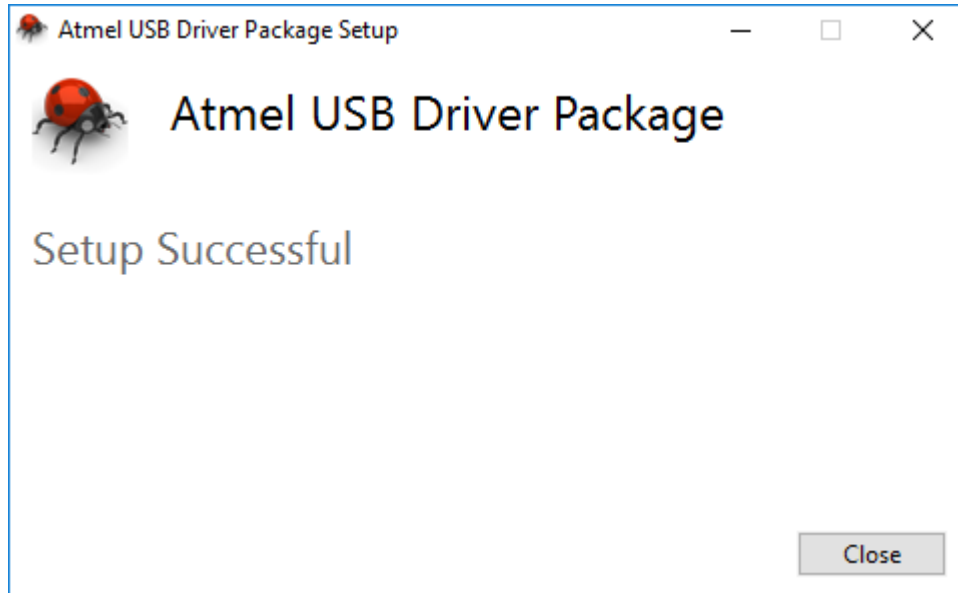
## 3.2.2 Windows 8 & 10

For Windows 8 and Windows 10 there will start a different driver installation routine.

1. Agree the license terms and conditions and then click on Install.

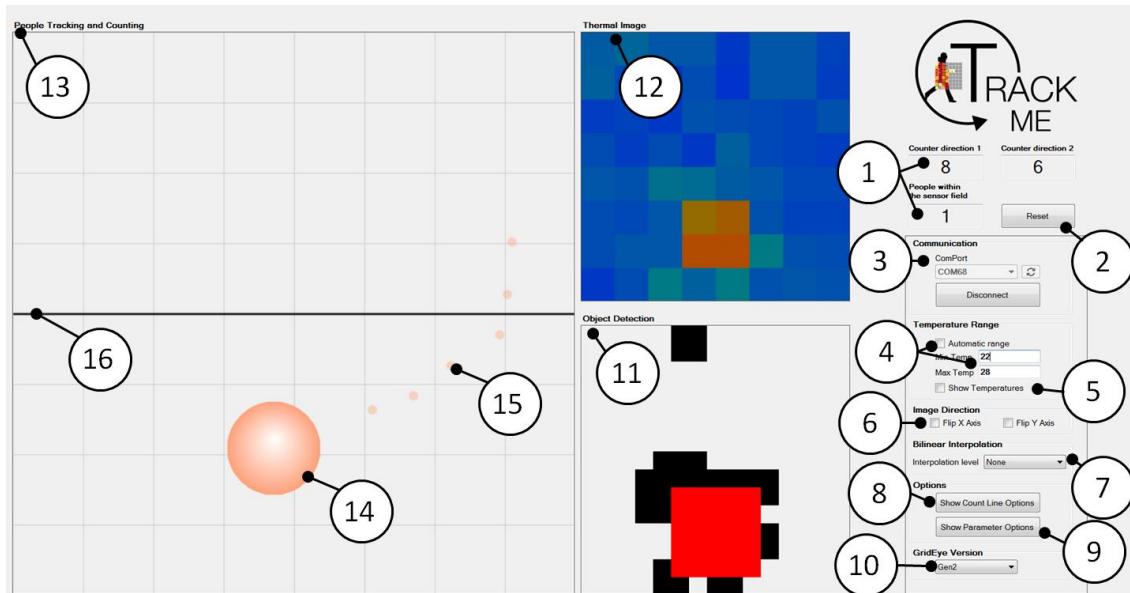


2. After installing the drivers click on Close.



## 4 Software handling

### 4.1 Main window

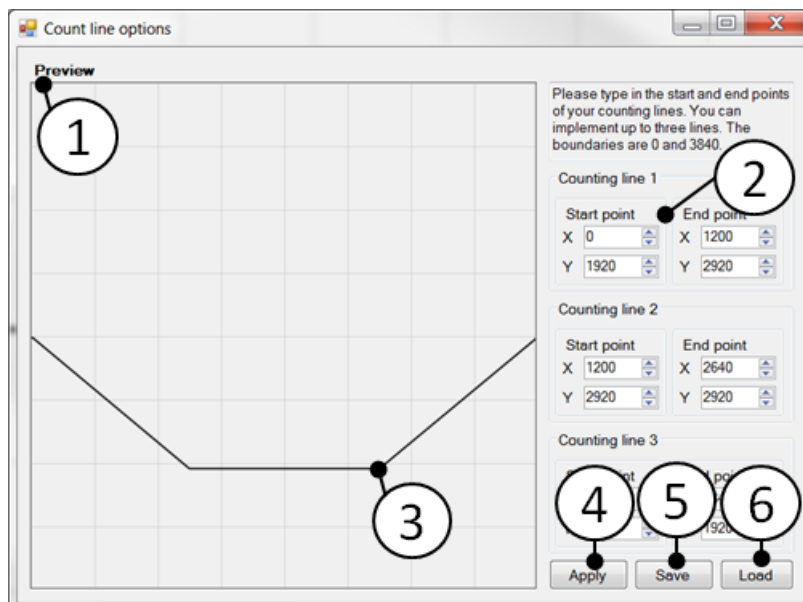


Legend:

1. Counter values and the number of persons within the sensor field.
2. The reset button will reset the whole algorithm.
3. In the communication area the com port of your GridEye Evaluation Board has to be chosen. The com ports can also be connected, disconnected and refreshed.
4. In the temperature range field can be set the boundary temperatures for calculating the colors of the thermal image. If the automatic range field is checked in, it will automatically choose the minimum and maximum temperatures and will display it in the min and max temp fields. This feature doesn't have any impact on the TrackMe algorithm. It is only for the thermal image colors.
5. If the show temperatures field is checked in, the pixel temperatures will be displayed in the thermal image.
6. Gives the option to flip the images. Changing these fields leads to a reset of the people counting algorithms.
7. With the interpolation level options the thermal image can be interpolated. It is possible to create interpolated thermal images with a resolution of 15 x 15, 29 x 29, 57 x 57, 113 x 113 and 225 x 225 pixels. Used is a special tangential interpolation algorithm which is much more realistic than a linear interpolation. This feature doesn't have any impact on the TrackMe algorithm. It is only for the visible thermal image.
8. The count line option gives the possibility to setup lines in the people count image. If a person cross that line, the counter values will increase according to which direction the line is crossed ⇒ [4.2 Count Line Option Window](#).

9. The parameter options allows to change basic parameters of the algorithm  
⇒ 4.3 Parameter Options Window.
10. The Software can be used for both generations of the GridEye sensor. Please note that the performance of the software is better with the generation 2 GridEye sensor.
11. The object detection image gives information about detected objects. Black pixels are object pixels. Red pixel areas are indicating a detected person.
12. The thermal image is the result of the filtered raw data of the GridEye sensor.
13. The people tracking and counting window shows the results of the tracking and counting algorithms in form of a bubble for each detected person.
14. The Bubbles are detected persons.
15. The smaller bubbles show the tracked motion history.
16. The counting line

## 4.2 Count Line Option Window



Legend:

1. The Preview Image shows a preview for the actual counting line setup.
2. A counting line has a start point and an end point. Both are described by an x coordinate and a y coordinate. The boundaries for the coordinates are 0 and 3840. Up to three counting lines can be used.
3. Previewed counting line
4. Pressing the apply button will transfer the chosen counting line options to the main window and they will be transferred to the Grid-EYE Modbus Unit. This option will be saved and if the application is closed and then reopened the last chosen line option will be used.
5. A line setup can be saved by pressing the save button.
6. A saved line setup can be load by pressing the load button.

## 4.3 Parameter Options Window

The screenshot shows the 'TrackMe Algorithm Parameters' window. It is organized into five main sections:

- Pre Filter:** Includes 'Rectangle filter length' (3), 'Median filter length' (0), 'IIR Filter Coefficient' (0.8), 'Interpolation Type' (tangential), and 'Tang. Interp. Factor' (0.35).
- Person Detection:** Includes 'DetectionThreshold' (Corner: 0.45, Side: 0.4, Center: 0.35), 'Person Labeling' (Overlap Factor: 0, Area Factor: 0.5, Temperature Factor: 0.4).
- Person Parameters:** Includes 'Automatic Control' (checked), 'Adaption IIR Coefficient' (0.995), 'Person Radius' (2), 'Automatic Parameter Calculation' (checked), 'Person Area' (10), and 'Person max Speed' (2).
- Person Tracking:** Includes 'Max Movement Distance Factor' (5), 'Min Person Distance Factor' (1), and 'Max Estimated Frames' (5).
- Background Image:** Includes 'IIR Filter Coefficient' (0.3).

### 4.3.1 Pre Filter

#### *Rectangle filter length:*

The sensor raw data is filtered by an average filter. A filter length of 3 means that the temperature of one pixel will be averaged over 3 frames to create the filtered pixel value.

The minimum value is 1.

The maximum value is 10.

The step size is 1.

#### *Median filter length:*

Additional to the average filter a median filter can be used. For example if the average filter length is 8 and the median filter length is 2, the 2 highest and lowest values will be sorted out, and the average will be calculated with the remaining 4 values.

The minimum value is 0.

The maximum value is 4.

The step size is 1.

#### *IIR Filter Coefficient:*

After the average and median filter stage there is an IIR filter stage first order. A coefficient of 0.8 means that 80% of the new pixel and 20% of the old pixel value will be used for the new pixel value.

The minimum value is 0.

The maximum value is 1.

There is no step size.

### 4.3.2 Interpolation

#### *Interpolation type:*

There are two options for the interpolation:

- Linear: It's a basic linear interpolation algorithm to calculate from the 8 x 8 temperature grid a 15 x 15 temperature grid.
- Tangential: A special interpolation algorithm which is much more realistic then the linear interpolation.

#### *Tang. Interp. Factor:*

A factor for controlling the sensitivity of the tangential interpolation algorithm. A value of 0 leads to same results like the linear interpolation.

The minimum value is 0.

The maximum value is 1.

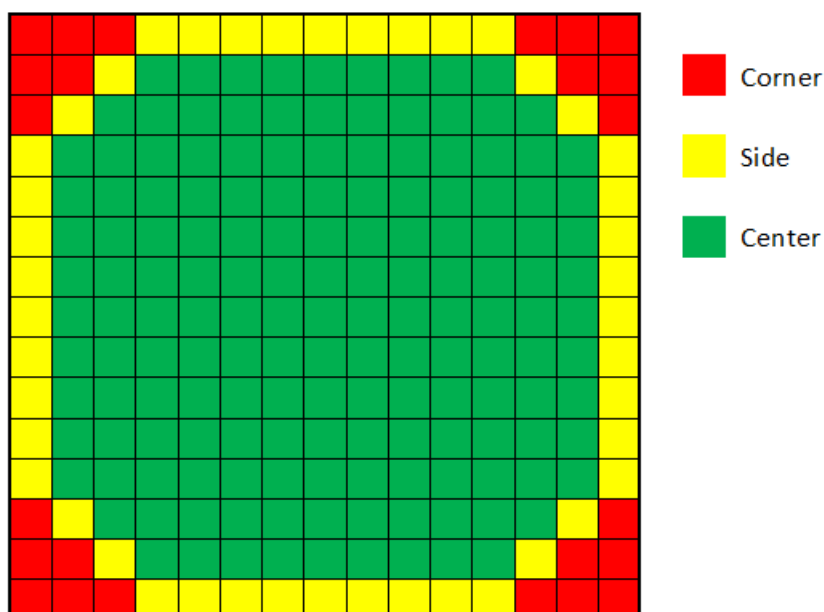
There is no step size.

### 4.3.3 Person Detection

#### 4.3.3.1 Detection Threshold

To detect an object, it is necessary that this object contrasts from the background. The three threshold values means, that when a pixel is for example 0.45 °C hotter than the background, it will be detected as object pixel.

The three different thresholds are distributed at different places within the image. Please see following picture for the distribution.



The minimum value is 0.  
The maximum value is 1.  
There is no step size.

#### 4.3.3.2 Person Labeling

##### *Overlap Factor:*

If there are two hot spots close to each other it could be, that the calculated person areas overlap each other. The Overlap Factor is the rate it is allowed to overlap. That means a value of for example 0.1 means, that 10% of the area is allowed to share between two persons. If the shared area is above the resulting threshold the second hot spot will not be considered as center for a person.

The minimum value is 0.  
The maximum value is 1.  
There is no step size.

##### *Area Factor:*

With the Area Factor, a threshold is calculated for the minimum area a hot spot has to fill out to be considered as person.

The minimum value is 0.  
The maximum value is 1.  
There is no step size.

##### *Temperature Factor:*

The Temperature Factor is used for the calculation of a threshold between the minimum and maximum temperature value. Every pixel which is below this threshold will not be considered as center point for a person.

The minimum value is 0.  
The maximum value is 1.  
There is no step size.

#### 4.3.3.3 Person Parameters

##### *Automatic Control:*

In TrackMe there is an automatic adaption algorithm included which makes the system independent from the sensor mounting height. It calculates the standard values for "Person Radius", "Person Area" and "Person max Speed" by learning from detected persons. This algorithm can be deactivated, so that fixed values can be chosen.



### *Adaption IIR Coefficient:*

The Person Parameters will be adapted over an IIR-Filter first order. The lower the value is, the faster the parameters will adapt to detected persons.

The minimum value is 0.

The maximum value is 1.

There is no step size.

### *Person Radius:*

Standard value which is used on different algorithm parts for calculation of distances and areas.

The minimum value is 0.

There is no step size.

The unit is "pixel"

### *Automatic Parameter Calculation:*

Basically the "Person Area" and the "Person max Speed" can be calculated from the "Person Radius". With unchecking the Automatic Control check field it is possible to choose fixed values for them independent from the logic relation between them.

### *Person Area:*

This is a standard value which is used for example for calculating if a hot spot is considered as a person.

The minimum value is 0.

There is no step size.

The unit is "pixel"

### *Person max Speed:*

Standard value which is used to create thresholds for checking distances between persons.

The minimum value is 0.

There is no step size.

The unit is "pixel / frame"

## **4.3.4 Person Tracking**

### *Max Movement Distance Factor:*

This factor, together with the "Person max Speed", is used to calculate thresholds for checking distances between persons.

The minimum value is 0.

The step size is 1.

*Min Person Distance Factor:*

This Factor is used to control the distance two persons have to each other without the assumption that one could hide the other one if there is no second hot spot detected.

The minimum value is 0.

The step size is 1.

*Max Estimated Frames:*

The amount of Frames a person will be held without deleting, when there is no fitting hot spot detected.

The minimum value is 0.

The step size is 1.

## **4.3.5 Background Image**

*IIR Filter Coefficient:*

The background image will be adapted to changing environment temperature. The speed of this adaption is handled by an IIR filter first order.

The minimum value is 0.

The maximum value is 1.

There is no step size.

## **5 Appendix**