



Evaluation of Halcon and VPAR on Linux with an Atom Motherboard



Content

Introduction	3
System Characteristics.....	4
Hardware System	5
Ubuntu Information	6
VPAR Application.....	7
Halcon on an Atom Motherboard.....	8
Barcode Reader	10
Measure 3D Positions	13



Introduction

Usually the 3rd party software platforms Halcon from MVTec, and VPAR from Neural Labs run on a Windows based PC, to which one or more cameras are connected. The following white paper shows how to run Halcon and a VPAR application (license plate recognition software) on an Atom based motherboard running Linux. In each application, The Imaging Source cameras capture images via either their V4L2 or GigE Vision interface.



System Characteristics

The PC board features the following components:

- MIO-2261 Intel Atom N2600/ N2800 Pico-ITX SBC
- CPU: Intel Atom Dual Core 1.6 Ghz (N2600)
- System chipset: Intel Atom N2600/ N2800 + NM10
- System memory: 4 GB, 1x 204-pin SODIMM socket DDR3 800 Mhz
- L2 cache: 1 MB on die
- BIOS: AMI EFI 16 Mbit Flash ROM
- Watchdog timer: 255 level interval timer
- Battery: Lithium 3 V/210 mAh
- Serial ATA: One SATA II interface, up to 300 MB/s
- USB: Four USB 2.0 compliant ports
- Audio: High definition audio (HD), line-in, line-out
- GPIO: 8-bit general purpose input/output
- Expansion interface: Half size Mini PCIe, MIOe
- VGA: Up to 1920 x 1200 (WUXGA)
- LVDS: Single channel 18/24-bit LVDS, up to 1366 x 768 (WXGA)
- Ethernet: Intel 82583V (GbE1), single 10/100/1000 Mbps interface
- Dimensions: 100 x 72 mm (3,9" x 2,8")
- Power requirement: Single 12 V DC Power input
- Power consumption: 0.76 A @ 12 V (9.12 W)



Hardware System



Atom motherboard with a DMK 72BUC02 camera and a VPAR dongle

The motherboard runs Ubuntu 14.04 LTS, which has been installed on a 32 GB ScanDisk memory stick. The installation was performed on a Windows system, using the "Linux Live USB Creator" software.

As the USB stick has a write speed of 10 MB/s, and a read speed of 30 MB/s, more than sufficient performance is available for the task at hand. On the contrary, the graphics output (GUI) is slow.



Ubuntu Information

Informationen
Alle Einstellungen Informationen

Übersicht
Vorgabeanwendungen
Wechselmedien
Rechtlicher Hinweis

ubuntu 14.04 LTS

Gerätename tis-halcon
Speicher 3,9 GiB
Prozessor Intel® Atom™ CPU N2600 @ 1.60GHz × 4
Grafik Gallium 0.4 on llvmpipe (LLVM 3.4, 128 bits)
Typ des Betriebssystems 32 Bit
Datenträger 27,2 GB

Aktualisierungen installieren

Netzwerk
Alle Einstellungen Netzwerk Flugzeugmodus AUS

Kabelgebunden AN
Verbunden - 1000 Mb/s

Hardware-Adresse 00:0B:AB:44:13:C7
IP-Adresse 192.168.2.25
Vorgaberroute 192.168.2.1
DNS 217.237.151.115 217.237.151.97 217.0.43.97

Optionen ...

Anzeigeräte
Alle Einstellungen Anzeigeräte

Bildschirme spiegeln (Hinweis: Kann Optionen der Auflösung einschränken)

Anchor Communications Inc 27" AN

Auflösung 1920 x 1080 (16:9)
Ausrichtung Normal
Vergrößerungsfaktor für die Menü- und Titelleisten 1

Allgemeine Einstellungen
Starter-Position Alle Bildschirme
Klebrige Ränder AN
Scale all window contents to match:
Anzeige mit den größtmöglichen Kontrollflächen

Bildschirme erkennen Anwenden



VPAR Application

The NEURALLABS VPAR application allows vehicle registration plates to be read from either images on disk, or from a live video stream. For the latter purpose, a sample application was implemented, using the 'Simple' coding sample included with the 'tiscamera' package.

The following image demonstrates the recognition of two vehicle registration plates in one image (e.g. from two lanes). The camera image on the top left, which was captured with a DMK 72AUC02, is processed continuously by an application, which feeds each captured image into the VPAR library, and which subsequently prints found characters to the terminal window, along side runtime information on the right:

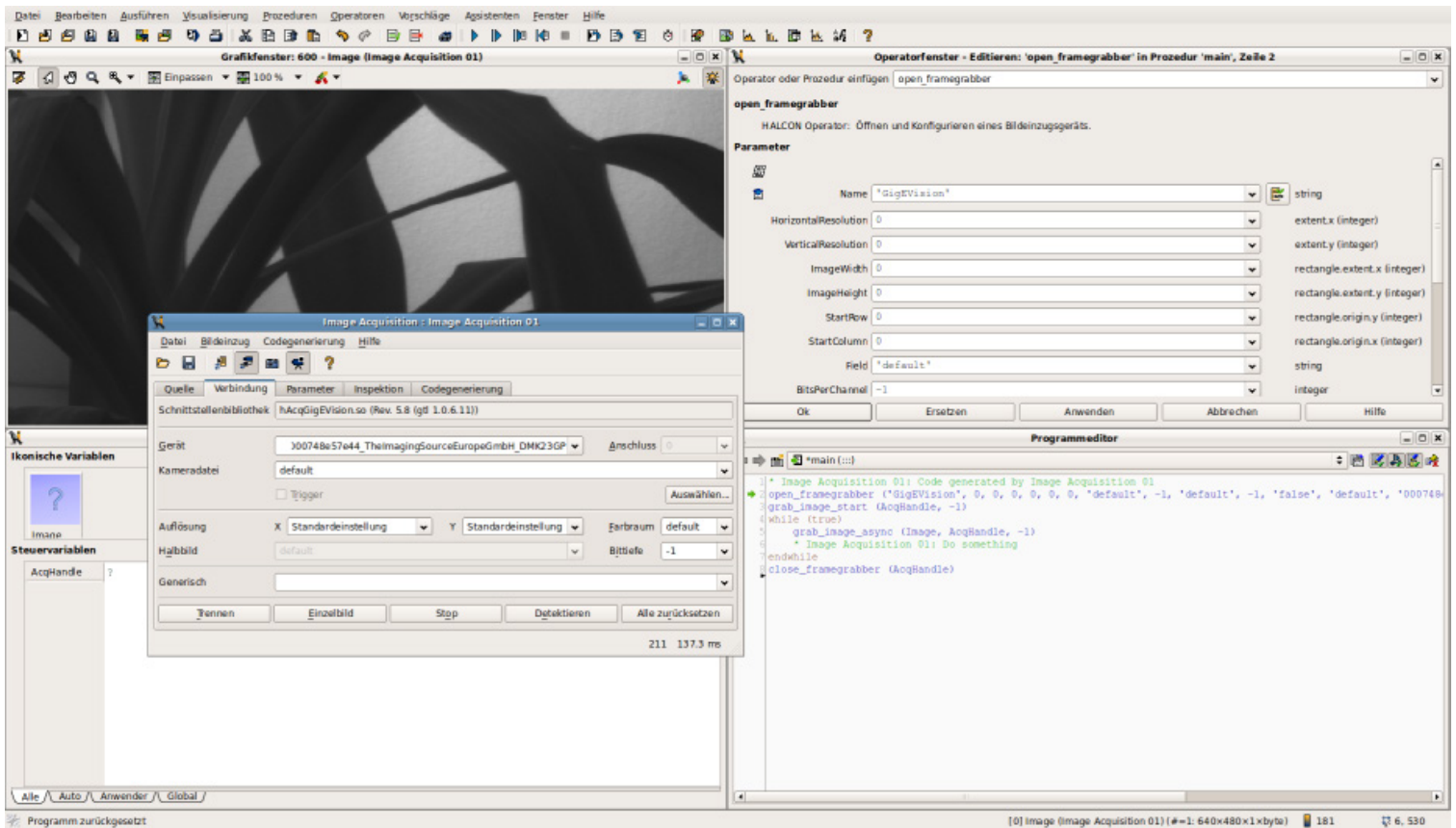


The runtime information reports that two vehicle license plate could be read in about one second. In the case of there being only one license plate in the image, the resulting processing time is about half a second. Similarly, it is possible to use a reduced ROI of 640 x 480 and read one vehicle license plate within half a second.



Halcon on an Atom Motherboard

In the following figure, Halcon version 11.0.3.1 has been installed along with some sample images. The GUI is almost identical to the Windows version. When opening a GigE camera with the Image Acquisition Assistant, or by using a script, the screen looks as follows:





Halcon on an Atom Motherboard

Halcon samples can be started as usual and run same as on Windows:

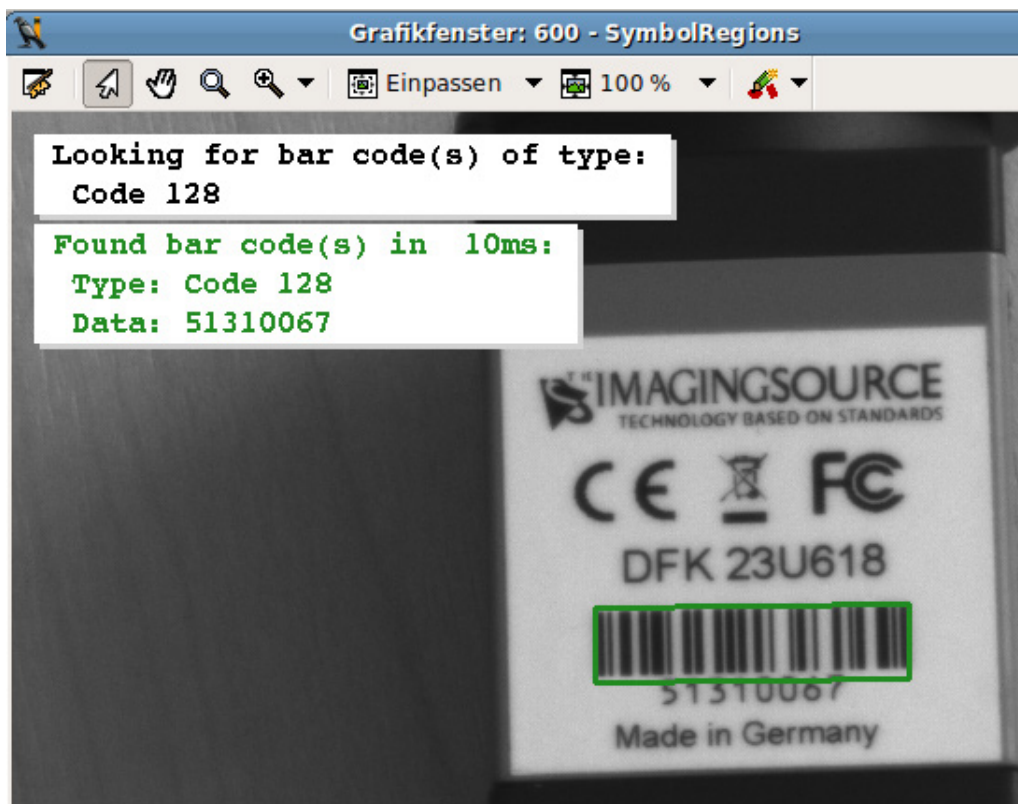
Parameter	Value
ReCreateShapeModel3D	0
CamParam	10.01221, -2791, 7.3958e-06, 7.4e-06, 308.21, 245.92, 640, 480
Width	640
Height	480
WindowHandle	600
ObjectModel3DID	?
DxfStatus	?
Index	?
RefRotX	?
RefRotY	?
RefRotZ	?
LongitudeMin	?

```
10 * This example program shows how to use HALCON's 3D-Matching
11 * to find the 3D pose of clamps that exhibit a 5 degree of freedom
12 * motion.
13 * If the 3D shape model should be re-generated within a new
14 * pose range ReCreateShapeModel3D must be set to true.
15 * In this case inspect_object_model_3d can be used to determine
16 * the desired pose range in which the 3D shape model is to be
17 * created. In all cases, however, inspect_object_model_3d can
18 * be used to visualize the 3D object model.
19 *
20 *
21 ReCreateShapeModel3D := false
22 * ReCreateShapeModel3D := true
23 *
24 * Set the camera parameters (can be obtained by using camera_calibration)
25 CamParam := 10.01221,-2791,7.3958e-6,7.4e-6,308.21,245.92,640,480
26 *
27 Width := CamParam[6]
28 Height := CamParam[7]
29 dev_close_window ()
30 dev_open_window (0, 0, Width, Height, 'black', WindowHandle)
31 set_display_font (WindowHandle, 14, 'mono', 'true', 'false')
32 dev_update_off ()
33 *
34 * Read the object model from a DXF file
35 read_object_model_3d ('clamp_sloped', 'mm', 11, 11, ObjectModel3DID, DxfStatus)
36
```



Barcode Reader

The following figures for barcode reading were captured using Halcon and a DMK 23GP031, set to VGA resolution, running on a Linux system. The results represent the average of 100 loops, comprising image acquisition and barcode reading. They were then compared to the same setup on an i7 3.4 GHz PC, running Windows 8.



[Barcode 'Code 128' on a PC board with Linux](#)



Barcode Reader

When reading an unknown barcode type, the runtime is 100 ms:



[Barcode 'auto 128' on a PC board with Linux](#)



Barcode Reader

An unknown barcode is analyzed and the barcode read in sync with image acquisition (8 ms / 120 fps):

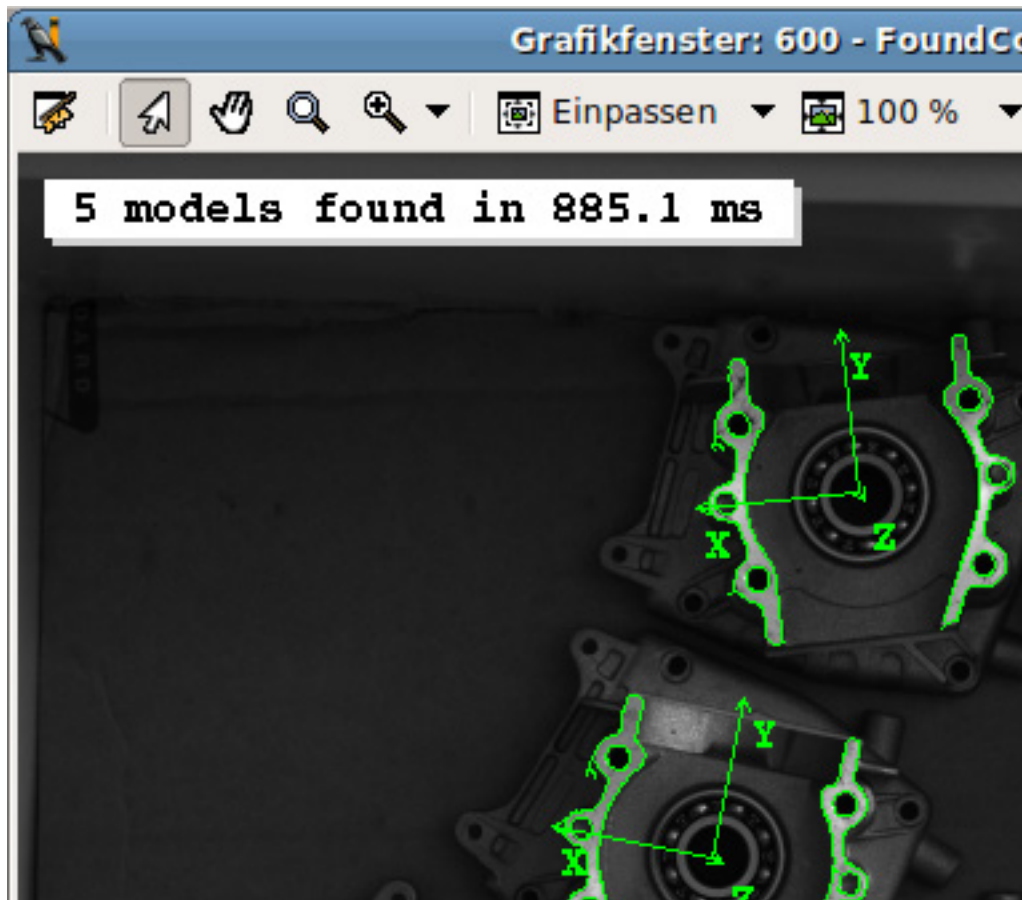


[Reference: Barcode 'auto' on an i7 / 3.4 Ghz platform running Windows 8](#)



Measure 3D Positions

The 3D positions of widgets can be determined based on Halcon's comprehensive 3D capabilities. In the following example, the position of five widgets is found in 885 ms:





Headquarters: The Imaging Source Europe GmbH
Sommerstrasse 36, D-28215 Bremen, Germany
Phone: +49 421 33591-0

North & South America: The Imaging Source, LLC
6926 Shannon Willow Rd, S 400, Charlotte, NC 28226, USA
Phone: +1 704-370-0110

Asia Pacific: The Imaging Source Asia Co. Ltd.
6F-1, No.230, Sec.3, Ba-De Road,,Song-Shan District 10555,
Taipei City, Taiwan
Phone: +886 2-2577-1228
www.theimagingsource.com

All product and company names in this document may be trademarks and tradenames of their respective owners and are hereby acknowledged.

The Imaging Source Europe GmbH cannot and does not take any responsibility or liability for any information contained in this document. The source code presented in this document is exclusively used for didactic purposes. The Imaging Source does not assume any kind of warranty expressed or implied, resulting from the use of the content of this document or the source code.

The Imaging Source Company reserves the right to make changes in specifications, function or design at any time and without prior notice.

Last update: June 2014

Copyright © 2014 The Imaging Source Europe GmbH, wp23trigo.en_US

All rights reserved. Reprint, also in parts, only allowed with permission of The Imaging Source Europe GmbH.

All weights and dimensions are approximate. Unless otherwise specified the lenses shown in the context of cameras are not shipped with these cameras.