Labs of the Department of Image Processing and Computer Graphics

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The main task of the Department of Image Processing and Computer Graphics is research and education in the scientific fields regarding visual (image) information. Our members work in various fields of medical image processing and computer vision (e.g., image reconstruction, segmentation, registration and fusion, shape representation) in collaboration with national and international research groups, and industrial partners, and publish their results in leading forums. Topics of image processing and computer graphics is represented in all levels of our higher education curricula in the form of mandatory courses, elective and special courses, as well as a complete specialization block of courses and PhD research topics. Our laboratories mainly support teaching, but can be also used in research projects.

Contacts

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University of Szeged,
Irinyi Building
H-6725, Szeged, Tisza Lajos körút 103.

Lab Units and their Phone Numbers

<table>
<thead>
<tr>
<th>Lab</th>
<th>Room</th>
<th>Tel.</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image Processing Class</td>
<td>IR-012</td>
<td>4428</td>
<td>16</td>
</tr>
<tr>
<td>Room</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile Image</td>
<td>IR-012A</td>
<td>4428</td>
<td>9</td>
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<tr>
<td>Processing Lab</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3D Lab</td>
<td>IR-012B</td>
<td>4428</td>
<td>3</td>
</tr>
<tr>
<td>Computer Vision Lab</td>
<td>IR-012C</td>
<td>4428</td>
<td>2</td>
</tr>
</tbody>
</table>

Rules

- Labour Safety (in Hungarian) [3]
- Fire Safety (in Hungarian) [4]
Attandance Register Sheets

- Fire Safety Training (in Hungarian) [6]
- Working Rules Training (in Hungarian) [7]
- Labour Safety Training (in Hungarian) [8]
- Attandance register sheet (in Hungarian) [9]

Equipments

**Image Processing Class Room**

**Hardware equipments:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Model, descriptions</th>
<th>Piece(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC</td>
<td>Intel Core i7-2600 CPU 3.4 GHz, 8 GB RAM, NVidia Quadro 600 videókártya, 500 GB HDD Windows 7 Enterprise Ubuntu 16.04 LTS 64 bit OS</td>
<td>15</td>
</tr>
<tr>
<td>PC</td>
<td>Intel Core i7-2600 CPU 3.4 GHz, 8 GB RAM, double NVidia Quadro 600 video card, 500 GB HDD Windows 7 Enterprise Ubuntu 16.04 LTS 64 bit OS</td>
<td>1</td>
</tr>
<tr>
<td>NVidia 3D Wireless Glasses Kit</td>
<td>Quick Start Guide [12]</td>
<td>3</td>
</tr>
</tbody>
</table>

**Softwares:**

<table>
<thead>
<tr>
<th>Software name</th>
<th>Operating System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adobe Creative Suite CS3 [14]</td>
<td>Windows</td>
</tr>
<tr>
<td>Android Development Tools [16] (Eclipse + ADT + SDK)</td>
<td>Linux</td>
</tr>
<tr>
<td>Blender 2.77a [17]</td>
<td>Windows/Linux</td>
</tr>
<tr>
<td>FreeGLUT + devel [18]</td>
<td>Windows/Linux</td>
</tr>
<tr>
<td>Freemind 0.9.0 [19]</td>
<td>Windows/Linux</td>
</tr>
<tr>
<td>FFTW (Fast Fourier Transform) [20]</td>
<td>Windows/Linux</td>
</tr>
<tr>
<td>GIMP [21]</td>
<td>Windows/Linux</td>
</tr>
<tr>
<td>GhostScript [22]</td>
<td>Windows/Linux</td>
</tr>
<tr>
<td>GSView [22]</td>
<td>Windows/Linux</td>
</tr>
<tr>
<td>ImageJ + plugins, Fiji [23]</td>
<td>Windows/Linux</td>
</tr>
<tr>
<td>Inkscape [25]</td>
<td>Windows/Linux</td>
</tr>
<tr>
<td>Lapack [26]</td>
<td>Windows/Linux</td>
</tr>
</tbody>
</table>
Mobile Image Processing Lab

The computing capacity, graphics, imaging, and sensor capabilities of current smartphones opened new horizons for the practical use of image processing. Since the creation of our mobile image processing laboratory in the fall of 2010, we continuously seek to follow the rapidly changing trends and keep our collection of devices up-to-date. Besides their use in the classroom, students can borrow devices for their work at home. Relevant facilities of the lab are: smartphones and tablets running Android and iOS systems, 2 MacBook Pro laptops, 2 autostereoscopic 3D devices with stereo cameras, Google Cardboard, specialized textbooks, possibility to join the Apple 'iOS Developer University Program'.

Hardware equipments:

<table>
<thead>
<tr>
<th>Name</th>
<th>Model, description</th>
<th>Piece(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTC Legend</td>
<td>Smart phone with Android OS &lt;User's Guide (in Hungarian)&gt; [35]</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Memory: ROM: 512 MB, RAM: 384 MB</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Camera: 5 Mp, autofocus, flash CPU: 600 MHz</td>
<td></td>
</tr>
<tr>
<td>HTC Evo3D</td>
<td>Smart phone with Android OS &lt;User's Manual&gt; [36]</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Memory: 1 GB (internal)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Camera: Double 5 Mp, autofocus. (2D photos available with 5 Mp, 3D photos available with 2 Mp), HD video 720p</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CPU: 1,2 GHz Duo Core Qualcomm MSM8260</td>
<td></td>
</tr>
<tr>
<td>HTC Hero</td>
<td>Smart phone with Android OS &lt;User's Manual (in Hungarian)&gt; [37]</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Memory: ROM: 512 MB, RAM: 288 MB</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Camera: 5 Mp, autofocus CPU: Qualcomm MSM7200, 528 MHz</td>
<td></td>
</tr>
<tr>
<td>HTC HD2</td>
<td>Windows Mobile Smart phone &lt;User's Manual (in Hungarian)&gt; [38]</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Memory: ROM: 512 MB, RAM: 448 MB</td>
<td></td>
</tr>
<tr>
<td>Device</td>
<td>Description</td>
<td>Memory</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>iPhone 4</td>
<td>iOS Smart phone</td>
<td>16 GB</td>
</tr>
<tr>
<td>LG Optimus 3D</td>
<td>Smart phone with Android OS</td>
<td>8 GB</td>
</tr>
<tr>
<td>Nokia E52</td>
<td>Smart phone with Symbian OS</td>
<td>60 MB</td>
</tr>
<tr>
<td>Nokia N97 Mini</td>
<td>Smart phone with Symbian OS</td>
<td>8 GB</td>
</tr>
<tr>
<td>Nokia 5230</td>
<td>Smart phone with Symbian OS</td>
<td>128 MB</td>
</tr>
<tr>
<td>Samsung Galaxy S</td>
<td>Smart phone with Android OS</td>
<td>8 GB</td>
</tr>
<tr>
<td>Samsung Galaxy 3</td>
<td>Smart phone with Android OS</td>
<td>170 MB</td>
</tr>
<tr>
<td>Samsung Omnia II</td>
<td>Windows Mobile Smart phone</td>
<td>2 GB</td>
</tr>
</tbody>
</table>
The devices found in our computer vision laboratory are mostly used in teaching, but could be also used in industrial applications. They can be used for visual inspection of small objects, e.g., shape inspection, visual measurements, inspection of surface defects. We also have special optics to connect to our industrial color image camera, such as a telecentric lens with minimal perspective distortion, a pericentric lens that can map the top and side surfaces of objects into a single image, a hole inspection lens, and a rigid borescope. For visual measurements and imaging we can use structured pattern projector, background lighting and a diffuse light for uniform illumination.

**Computer Vision Lab**

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**Hardver equipments:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Model, description</th>
<th>Piece</th>
</tr>
</thead>
<tbody>
<tr>
<td>JAI CB-140GE color camera</td>
<td>Datasheet [55]</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>User's Manual [56]</td>
<td></td>
</tr>
</tbody>
</table>
Pericentric lens [57]  Datasheet & Drawing [58]  1
Boroscopic probe [59]  Datasheet & Drawing [60]  1
Hole inspection lens [61]  Datasheet & Drawing [62]  1
Telecentric lens [63]  Specification & Drawing [64]  1
Mounting clamp for telecentric lens [63]  Drawing [65]  1
LED pattern projector [66]  Edmund Optics 65-936  1
Grid (50 um, squares) [67]  Edmund Optics 65-948  1
Backlight (white) [68]  + power supply(24V)  Edmund Optics 83-874  1
Diffuse light [69]  Edmund Optics 66-808  1
Canon EF 8-15mm f/4 L fisheye zoom USM [70]  Manual [71]  1
cable + power supply +
communication kábel  Data Sheet [74]  1
12V power supply -  1

Softwares:
Software                  Operating system
JAI SDK and Control Tool [76]  Windows

3D Lab

In our 3D laboratory our students can learn about various 3D image acquisition techniques. Our lab has a MESA SR4000 time-of-flight camera, an example for a range-camera, which is the basis for the SLAM technology. This ToF camera can be used to “map” a smaller room or corridor. We also have a NextEngine 2020i 3D scanner that uses structured light to “digitize” in 360° objects fitting in a 20x20x20 cm volume. Both devices produce point cloud data that can be exported to various formats and thus can be further used in 3D modelling and/or CAD software. Our lab is also equipped with 3D monitors and glasses for 3D visualization to aid stereo perception and working with 3D objects.

Hardver equipments:
Name                  Model, description                  Stock number  Serial number  Piece(s)
Computer              Dell XPS 8300, Note: 7L9H85j                       S30249  16523186311  1
Monitor               Samsung S23A750D [77], Note: 3D           S20309  0086H9MBA00367V  1
3D glasses            Samsung SSG-3100GB, Megyejyzés: Monitor accessories  -  CN58BN9618236AD1  64DB745544
### 3D Scanner accessories:

<table>
<thead>
<tr>
<th>Name</th>
<th>Piece(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>mounting spindle</td>
<td>2</td>
</tr>
<tr>
<td>alap</td>
<td>2</td>
</tr>
<tr>
<td>mounting clamp</td>
<td>2</td>
</tr>
<tr>
<td>black rubber kit (5 pieces)</td>
<td>1</td>
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<tr>
<td>orange plastic</td>
<td>1</td>
</tr>
<tr>
<td>palm tree model</td>
<td>1</td>
</tr>
<tr>
<td>connecting cable</td>
<td>1</td>
</tr>
<tr>
<td>special mounting set (3 pieces)</td>
<td>1</td>
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<tr>
<td>felt tipped pen set (4 pieces)</td>
<td>1</td>
</tr>
<tr>
<td>Setup DVDs</td>
<td>4</td>
</tr>
</tbody>
</table>


Links:

1. [http://maps.google.com/maps?q=46.24914,20.146437%28%c3%81rp%c3%a1d%20t%c3%a9r.%29&z=17&hl=hu](http://maps.google.com/maps?q=46.24914,20.146437%28%c3%81rp%c3%a1d%20t%c3%a9r.%29&z=17&hl=hu)
[29] http://www.vision.caltech.edu/bouguetj/calib_doc
[34] http://www.wxwidgets.org/
[38] http://www.inf.u-szeged.hu/en/../../sites/default/files/ipcglab/docs/hardware/SmartPhone/HTC_HD2_hu.pdf
[40] http://www.inf.u-szeged.hu/en/../../sites/default/files/ipcglab/docs/hardware/SmartPhone/iphone_iOS5_user_guide.pdf
[52]
http://www.inf.u-szeged.hu/en/../../sites/default/files/ipcglab/docs/hardware/MacBook_Pro_13_en.pdf
[53]
http://www.inf.u-szeged.hu/en/../../sites/default/files/ipcglab/docs/hardware/MacBook_Pro_15_en.pdf
[54]
[55]
http://www.inf.u-szeged.hu/en/../../sites/default/files/ipcglab/docs/vision/CB-140GE.pdf
[56]
http://www.inf.u-szeged.hu/en/../../sites/default/files/ipcglab/docs/vision/Manual_CB-140GE.pdf
[57]
http://www.opto-engineering.com/pericentric-lenses.html
[58]
http://www.inf.u-szeged.hu/en/../../sites/default/files/ipcglab/docs/vision/PC12030HP.pdf
[59]
http://www.opto-engineering.com/boroscopic-probes.html
[60]
http://www.inf.u-szeged.hu/en/../../sites/default/files/ipcglab/docs/vision/PCBP012.pdf
[61]
http://www.opto-engineering.com/hole-inspection-lenses.html
[62]
http://www.inf.u-szeged.hu/en/../../sites/default/files/ipcglab/docs/vision/PCHI012.pdf
[63]
[64]
http://www.inf.u-szeged.hu/en/../../sites/default/files/ipcglab/docs/vision/Telecentric_spec_56675.pdf
[65]
http://www.inf.u-szeged.hu/en/../../sites/default/files/ipcglab/docs/vision/mounting_clamp_56871.pdf
[66]
[67]
[68]
[69]
[70]
http://www.usa.canon.com/cusa/consumer/products/cameras/ef_lens_lineup/ef_8_15mm_f_4l_fisheye_usm
[71]
[72]
http://www.mesa-imaging.ch/
[73]
[74]
http://www.inf.u-szeged.hu/en/../../sites/default/files/ipcglab/docs/vision/SR4000_Data_Sheet.pdf
[75]
[76]
http://www.jai.com/en/support/jai_sdk_and_control_tool
[77]
http://www.inf.u-szeged.hu/en/../../sites/default/files/ipcglab/docs/3Dlab/Samsung_S23A750D_Eng.pdf
[78]
http://www.inf.u-szeged.hu/en/../../sites/default/files/ipcglab/docs/3Dlab/scanner-techspecs.pdf