Labs of the Department of Image Processing and Computer Graphics

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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Lab address:
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 Room</td>
<td>IR-012</td>
<td>4428</td>
<td>16</td>
</tr>
<tr>
<td>Mobile Image Processing Lab</td>
<td>IR-012A</td>
<td>4428</td>
<td>9</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 (entrance from 012A)</td>
<td>4428</td>
<td>2</td>
</tr>
</tbody>
</table>

Rules

- Labour Safety (in Hungarian) [3]
- Fire Safety (in Hungarian) [4]
### Attendance 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>
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</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]</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>
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</table>
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 [35]</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>User's Guide (in Hungarian)</td>
<td></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</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CPU: 600 MHz</td>
<td></td>
</tr>
<tr>
<td>HTC Evo3D</td>
<td>Smart phone with Android OS [36]</td>
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</tr>
<tr>
<td></td>
<td>User's Manual</td>
<td></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>HTC Hero</td>
<td>Smart phone with Android OS [37]</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>User's Manual (in Hungarian)</td>
<td></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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CPU: Qualcomm MSM7200, 528 MHz</td>
<td></td>
</tr>
<tr>
<td>HTC HD2</td>
<td>Windows Mobile Smart phone [38]</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>User's Manual (in Hungarian)</td>
<td></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>Count</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>iPhone 4</td>
<td>iOS Smart phone User's Guide (iOS4.2, iOS4.3) [39], User's Guide (iOS5) [40] Memory: 16 GB Camera: 5 Mp CPU: 1 Core 1 GHz Cortex-A8 processor</td>
<td>3</td>
</tr>
<tr>
<td>LG Optimus 3D</td>
<td>Smart phone with Android OS User's Guide (in Hungarian) [41] Memory: 8 GB (belső) Camera: Dual 5MP, autofocus, image stabilizer, LED flash (no flash for 3D) CPU: 1 GHz Cortex-A9 CPU</td>
<td>1</td>
</tr>
<tr>
<td>Nokia E52</td>
<td>Smart phone with Symbian OS User's Guide (in Hungarian) [42] Memory: 60 MB Camera: 3.2 Mp, fixed focus, LED flash CPU: 600 MHz ARM 11</td>
<td>1</td>
</tr>
<tr>
<td>Nokia N97 Mini</td>
<td>Smart phone with Symbian OS User's Guide (in Hungarian) [43] Memory: 8 GB storage, 128 MB RAM Camera: 5 Mp, Carl Zeiss Lens, autofocus, Dual LED flash CPU: 434 MHz ARM 11</td>
<td>1</td>
</tr>
<tr>
<td>Samsung Omnia II</td>
<td>Windows Mobile Smart phone User's Guide (in Hungarian) [47] Memory: 2 GB / 8 GB / 18GB Camera: 5 Mp, autofocus, Dual power LED</td>
<td>1</td>
</tr>
</tbody>
</table>
### Computer Vision Lab

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.

### Hardver equipments:

<table>
<thead>
<tr>
<th>Name</th>
<th>Model, description</th>
<th>Piece</th>
</tr>
</thead>
</table>
| JAI CB-140GE color camera [54]        | Datasheet [55]  
User's Manual [56] | 1 |

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<table>
<thead>
<tr>
<th>Name</th>
<th>Model, description</th>
<th>Piece</th>
</tr>
</thead>
</table>
| Sony Ericsson Xperia X10              | CPU: Samsung S3C6410 800MHz Smart phone Android OS User's Guide (in Hungarian) [48]  
Memory: 1GB  
Camera: 8.1 Mp, image stabilizer, HD video 720p  
CPU: 1 GHz Scorpion CPU (egymagos) | 1 |
| Sony Ericsson Xperia X10 Mini         | CPU: 1 GHz Scorpion CPU (egymagos)  
Memory: 1GB  
Camera: 8.1 Mp, image stabilizer, HD video 720p  
CPU: 1 GHz Scorpion CPU (egymagos) | 1 |
| Sony Ericsson Satio                   | CPU: 1 GHz Scorpion CPU (egymagos)  
Memory: 1GB  
Camera: 8.1 Mp, image stabilizer, HD video 720p  
CPU: 1 GHz Scorpion CPU (egymagos) | 1 |
| Sony Ericsson Vivaz                   | CPU: 1 GHz Scorpion CPU (egymagos)  
Memory: 1GB  
Camera: 8.1 Mp, image stabilizer, HD video 720p  
CPU: 1 GHz Scorpion CPU (egymagos) | 1 |
| MacBook Pro 13                        | User's Guide [52]  
Specification: Core 2 Duo  
2.66GHz/4GB/320GB/GeForce  
320M/SD | 1 |
| MacBook Pro 15                        | User's Guide [53]  
Specification: Core i7  
2.66Hz/4GB/500GB/GeForce  
GT330M 512MB/SD | 1 |

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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:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Model, description</th>
<th>Stock number</th>
<th>Serial number</th>
<th>Piece(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer</td>
<td>Dell XPS 8300, Note: 7L9H85</td>
<td>S30249</td>
<td>16523186311</td>
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<tr>
<td>Monitor</td>
<td>Samsung S23A750D [77], Note: 3D</td>
<td>S20309</td>
<td>0086H9MA00367V</td>
<td>1</td>
</tr>
<tr>
<td>3D glasses</td>
<td>Samsung SSG-3100GB, Megjegyzés: Monitor accessories</td>
<td>-</td>
<td>CN58BN9618236AD1 64DB745544</td>
<td>1</td>
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</tbody>
</table>
3D scanner  | NextEngine 2020i  | S0277  | 01 11 10 95682  | 1
3D scanner accessory  | NextEngine MultiDrive, Note: more pieces  | -  | 03 12 01 09798  | 1
3D scanner accessory  | NextEngine 2018, Note: AutoPositioner  | -  | 02 11 10 92448  | 1
Keyboard  | Dell, Note: hungarian  | -  | CN DY552K-70917  | 1
Mouse  | Dell  | -  | 1C5 I150 A02  | 1

### 3D Scanner accessories:

<table>
<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
<td>mounting spindle</td>
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<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>
</tr>
<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>
</tr>
<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%ae%20%202.%29%26z=17%26hl=hu](http://maps.google.com/maps?q=46.24914,20.146437%28%c3%81rp%c3%ae%20%202.%29%26z=17%26hl=hu)
esKit_QuickStartGuide.pdf
[34] http://freemind.sourceforge.net
gend_hu.pdf
2_hu.pdf
[38] http://www.inf.u-szeged.hu/en/../../sites/default/files/ipcglab/docs/hardware/SmartPhone/HTC_Hero_hu.pdf
2_hu.pdf
[40] http://www.inf.u-szeged.hu/en/../../sites/default/files/ipcglab/docs/hardware/SmartPhone/HTC_HD
2_hu.pdf
[42] http://www.inf.u-szeged.hu/en/../../sites/default/files/ipcglab/docs/hardware/SmartPhone/HTC_HD
2_hu.pdf
[43] http://www.inf.u-szeged.hu/en/../../sites/default/files/ipcglab/docs/hardware/SmartPhone/HTC_HD
2_hu.pdf
2_hu.pdf
2_hu.pdf
2_hu.pdf
[47] http://www.inf.u-szeged.hu/en/../../sites/default/files/ipcglab/docs/hardware/SmartPhone/HTC_HD
2_hu.pdf
[48] http://www.inf.u-szeged.hu/en/../../sites/default/files/ipcglab/docs/hardware/SmartPhone/HTC_HD
2_hu.pdf
[49] http://www.inf.u-szeged.hu/en/../../sites/default/files/ipcglab/docs/hardware/SmartPhone/HTC_HD
2_hu.pdf
[50] http://www.inf.u-szeged.hu/en/../../sites/default/files/ipcglab/docs/hardware/SmartPhone/HTC_HD
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http://www.inf.u-szeged.hu/en/../../sites/default/files/ipcglab/docs/vision/CB-140GE.pdf
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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
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http://www.inf.u-szeged.hu/en/../../sites/default/files/ipcglab/docs/vision/Telecentric_spec_56675.pdf
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http://www.inf.u-szeged.hu/en/../../sites/default/files/ipcglab/docs/vision-mounting_clamp_56871.pdf
[66]
[67]
[68]
http://www.edmundoptics.com/illumination/led-illumination/led-backlights/metaphase-technologies-led-backlights/83-874
[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]
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[77]
http://www.inf.u-szeged.hu/en/../../sites/default/files/ipcglab/docs/3Dlab/Samsung_S23A750D_Eng.pdf
[78]