



Technical University of Lodz
Institute of Electronics

Implementation of Computer Vision Algorithms in DirectShow Technology

Piotr Szczypiński, Paweł Pełczyński,
Dominik Szajerman and Paweł Strumiłło

IP&C, Bydgoszcz 2010

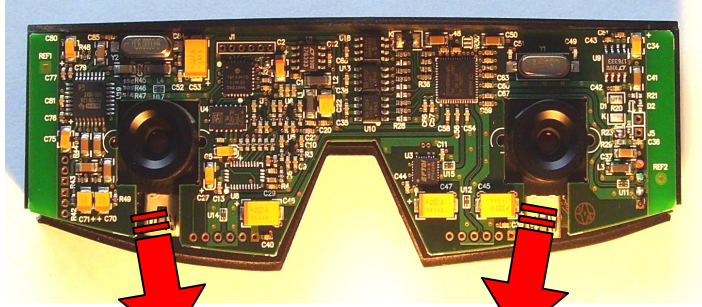


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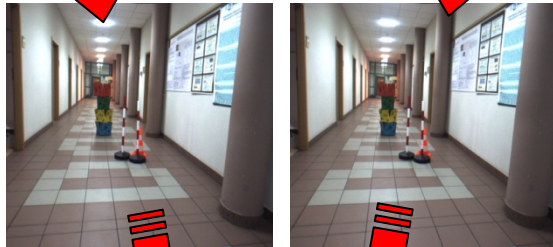


Motivation



Video acquisition

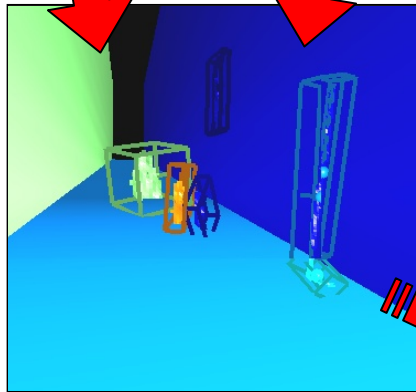
Video



Disparity map computation

Image segmentation

Object detection, localisation and tracking



Numeric description

3D sound generation

Head-related transfer functions



Audio

Projekt rozwojowy 2007-2010: R02-0013-03
Projekt rozwojowy 2010-2013: NR02-0083-10





Technical requirements

- Data synchronization
- Parallel data processing
- Modular design (flexibility)
- Hardware independence
- Diverse data types and formats



Multimedia frameworks

A **multimedia framework** is a software framework that handles media on a computer and through a network. A good multimedia framework offers an intuitive API and a modular architecture to easily add support for new codecs, container formats and transmission protocols. It is meant to be used by applications such as media players and audio or video editors, but can also be used to build videoconferencing applications, media converters and other multimedia tools.

http://en.wikipedia.org/wiki/Multimedia_framework

Windows

- Video for Windows (obsolete)
- **DirectShow (DS)**
- Multimedia Foundation (infancy)

Linux

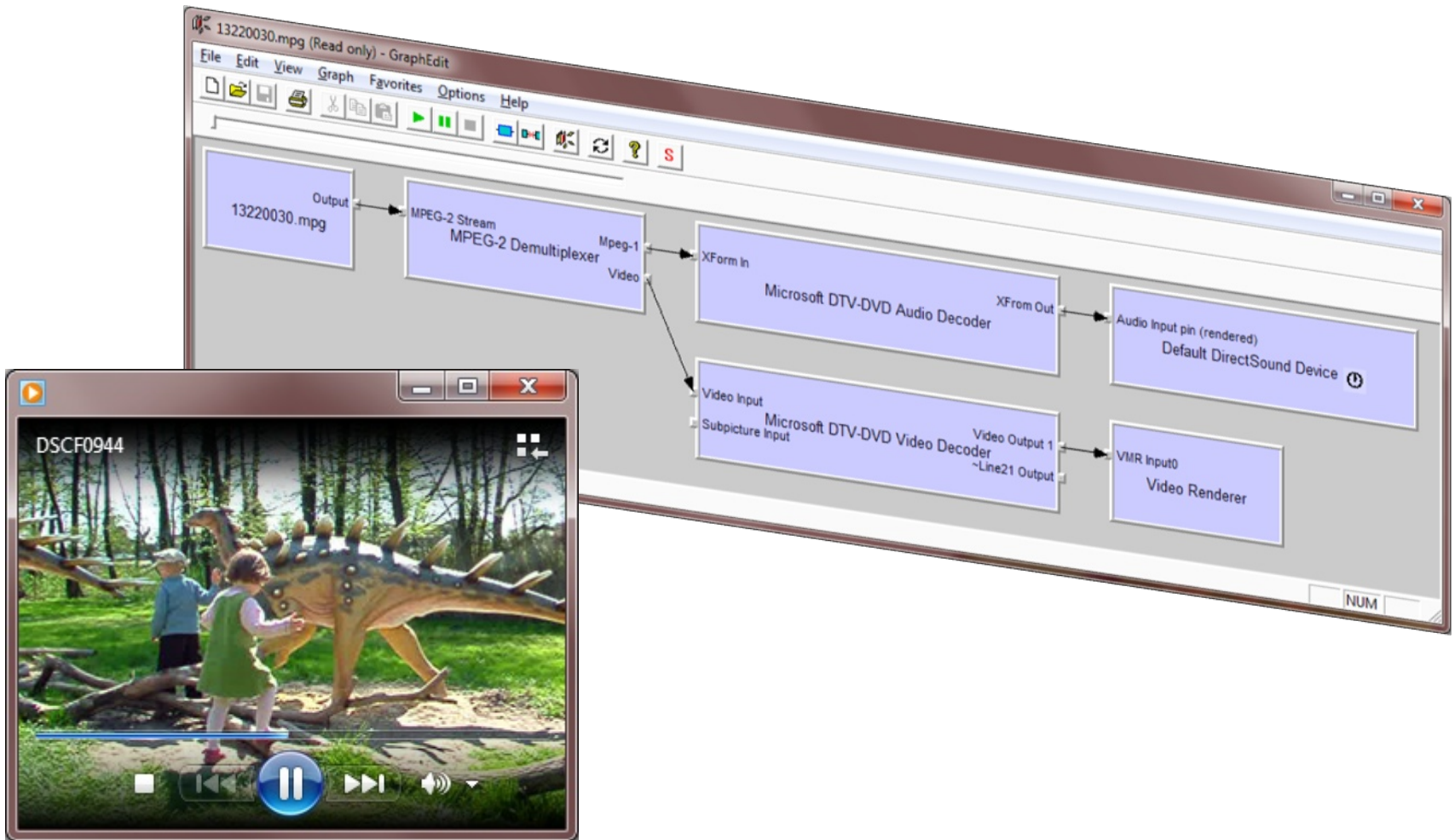
- GStreamer

Mac OS

- Quick Time



DirectShow modular architecture



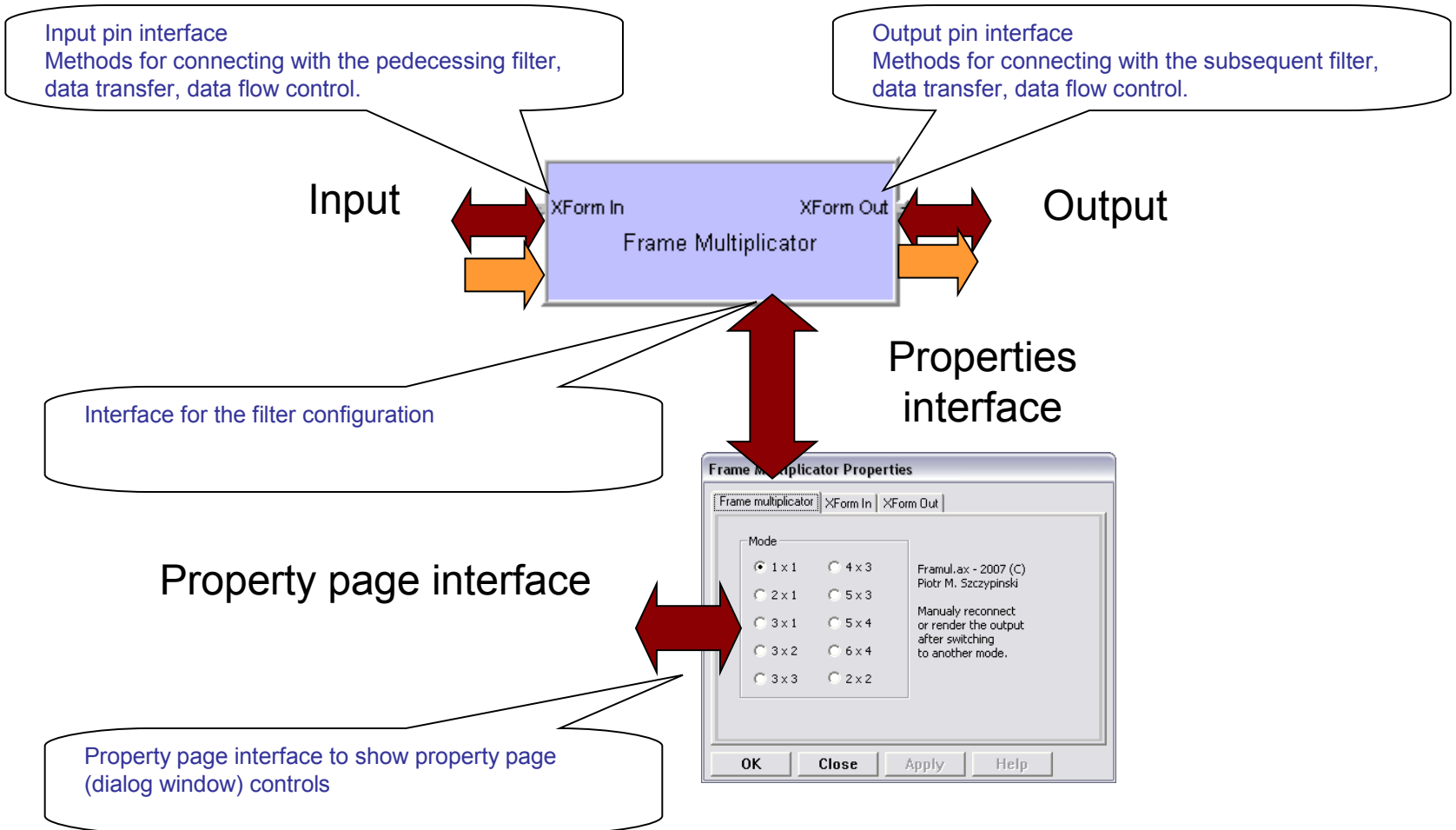


DirectShow Filter (module)

- Complex object with COM+ interfaces
- Identified by GUID and filter name
- Diverse data formats can be used
- Connected by the Graph Builder mechanism

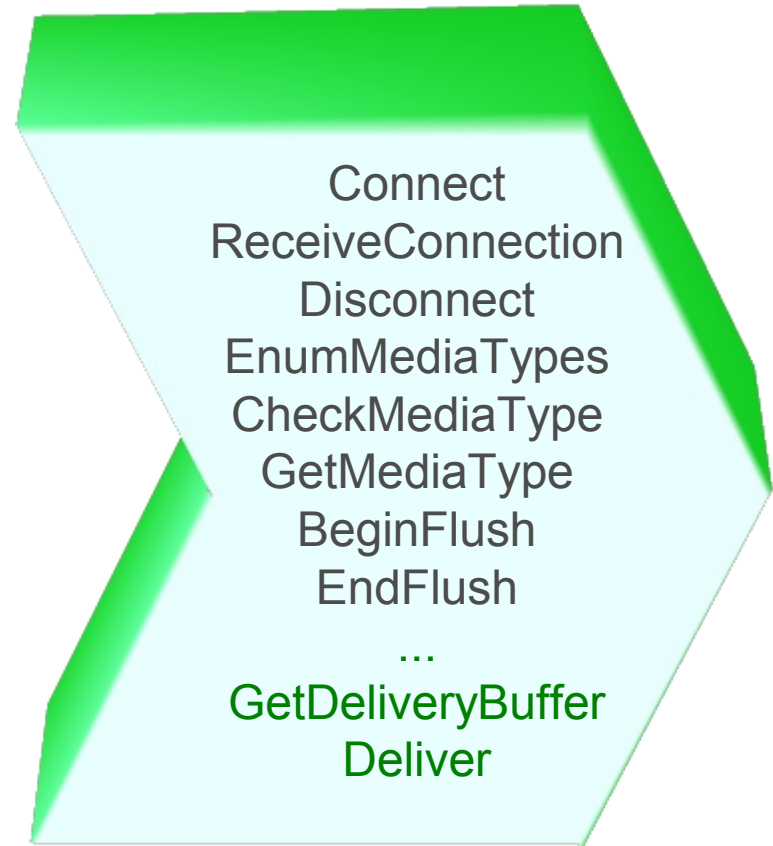
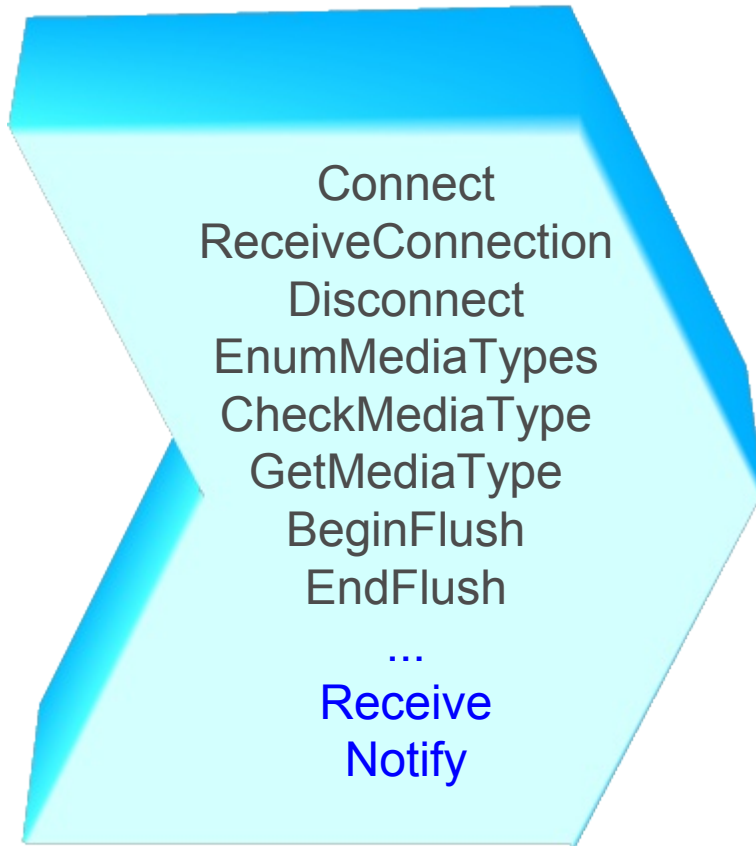
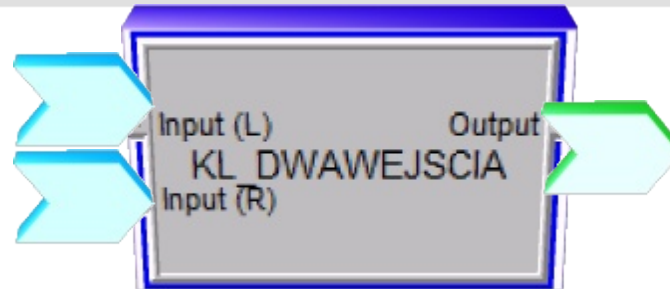


Filter and its interfaces



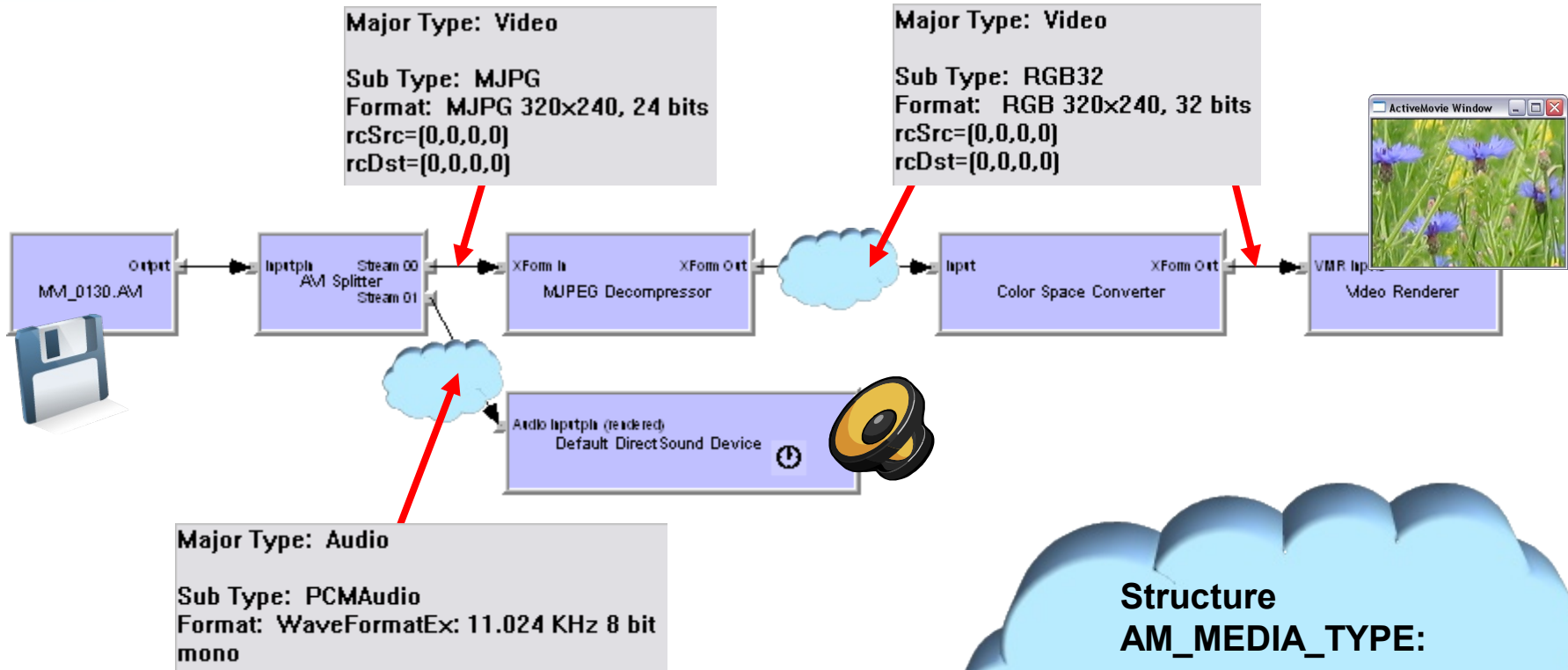


Pin interface (IPin)





Data flow and media formats



```

Structure
AM_MEDIA_TYPE:

GUID    majortype;
GUID    subtype;
GUID    formattype;
ULONG   ISampleSize;
IUnknown *pUnk;
  
```



Programming tools

Elementary

Microsoft Visual C++

(Integrated Development Environment)

Windows Platform SDK (Tools and filter Base classes)

RegSvr32 (Filter Registration tool)

Supplemental

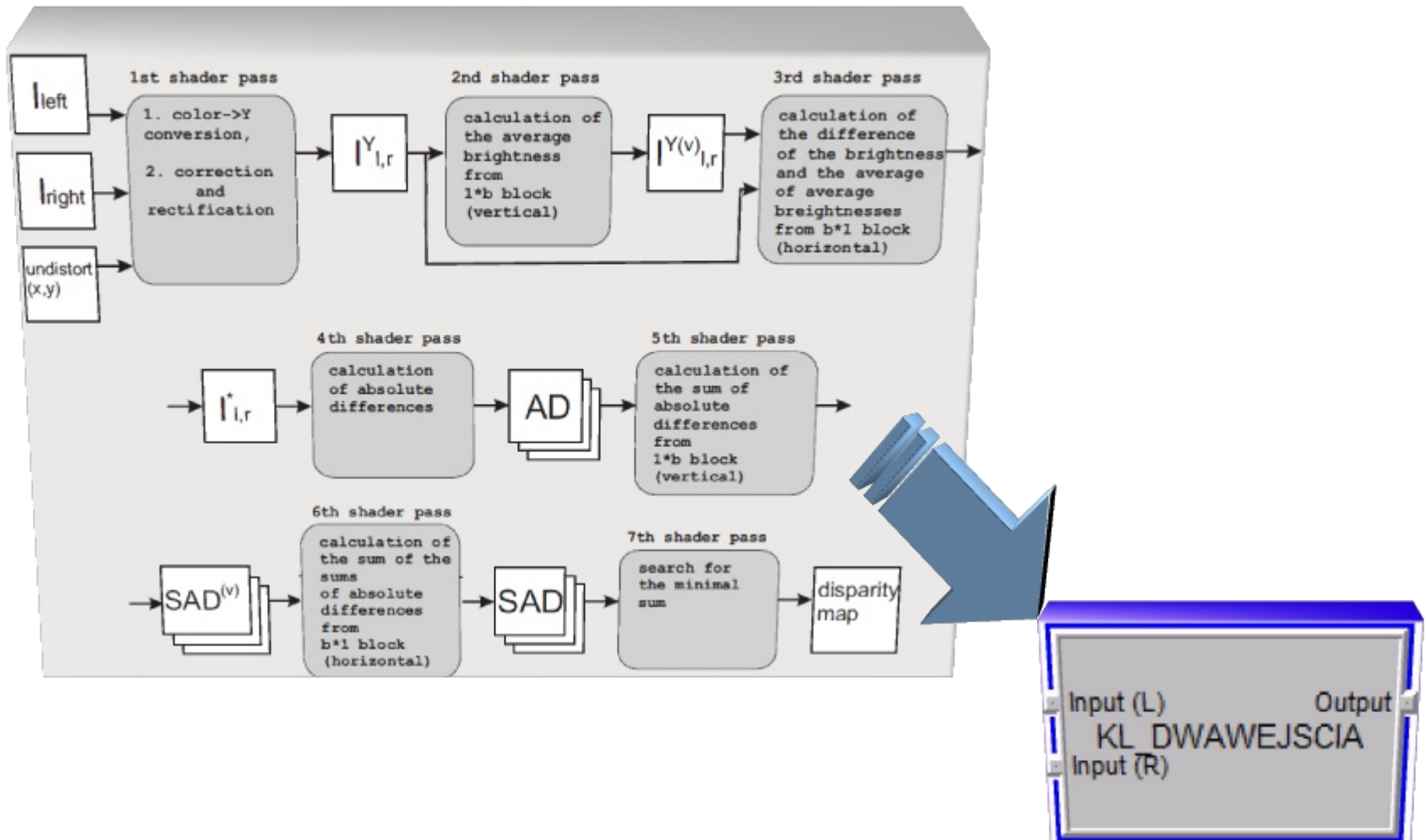
OpenCV (Image processing library)

OpenGL (3D graphics and GP GPU programming)

SLAB - Spatial Auditory Displays Lab (3D audio library)

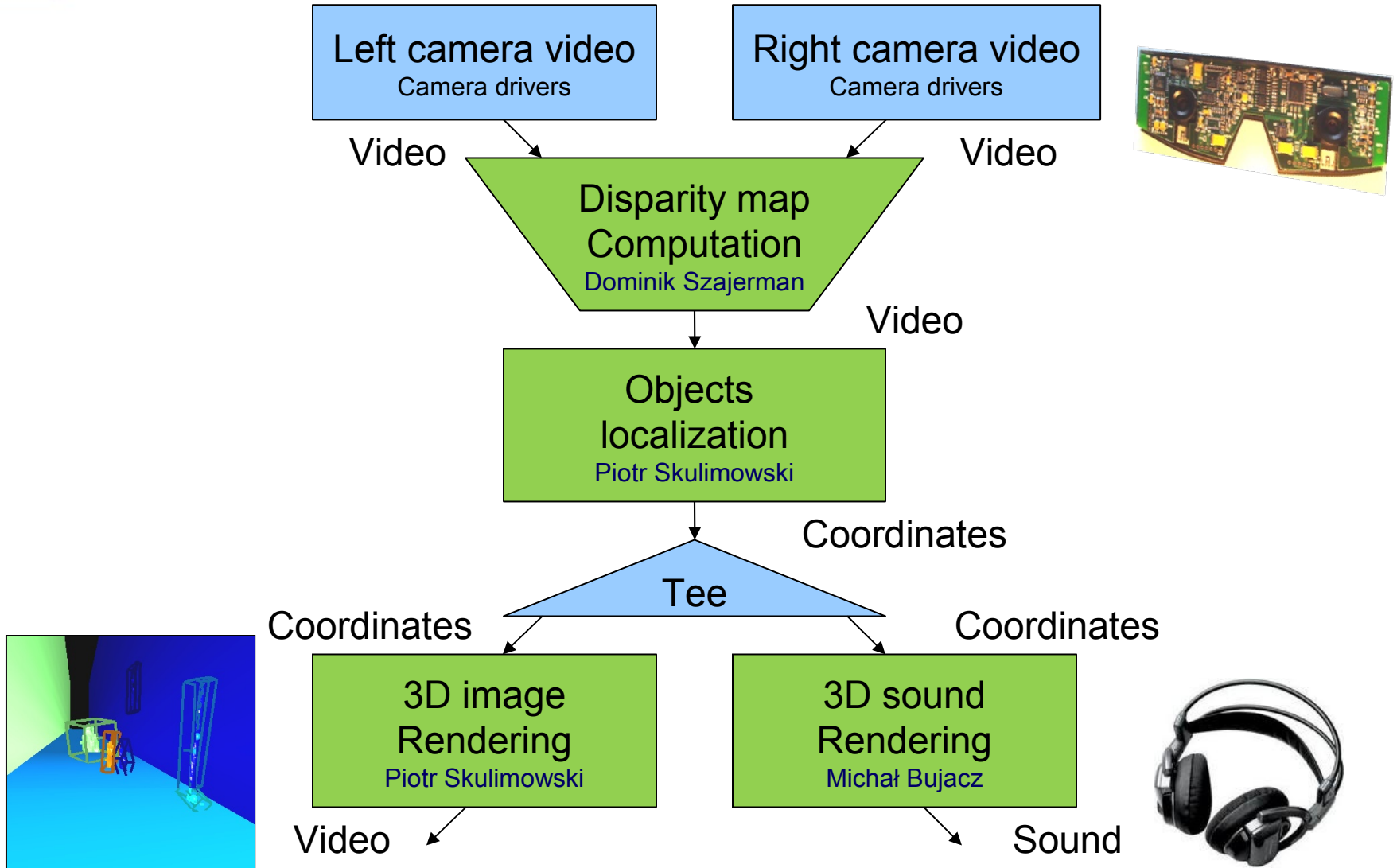


GP GPU Programming



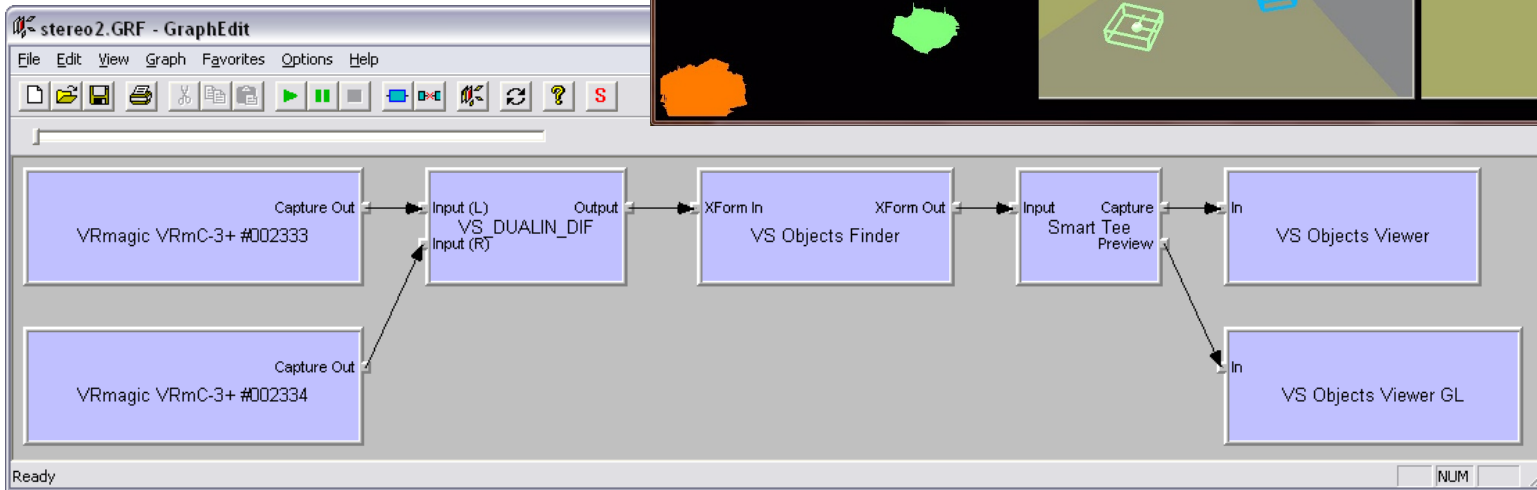
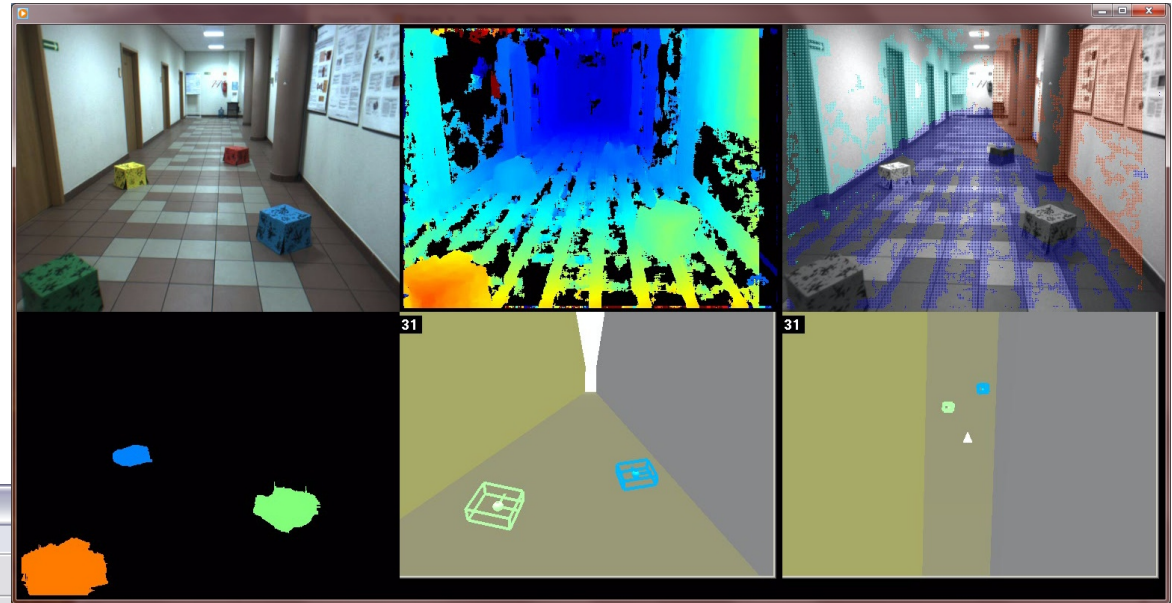


System Configuration





Results





Conclusions

- Problems solved by means of DirectShow
 - Synchronization of video from two cameras,
 - Definition of the object description format,
 - Implementation of GPU processing in DS filter,
 - Conversion between media types,
 - Collaborative work labour saving.