PRACTICING FREE-VIEWPOINT TELEVISION: MULTI-VIEW VIDEO CAPTURE AND PROCESSING

Marek Domański

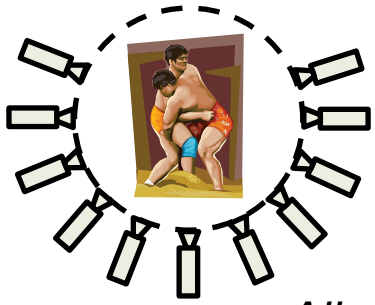
Chair (Department) of
Multimedia Communications and Microelectronics
Poznań University of Technology

The message of the presentation

Low-cost Free-Viewpoint Television

should be feasible in the next few years.

FTV processing chain



Multi-camera
video acquisition
- arbitrary camera locations !!

All views

Preprocessing

Depth estimation

All views + depths

View

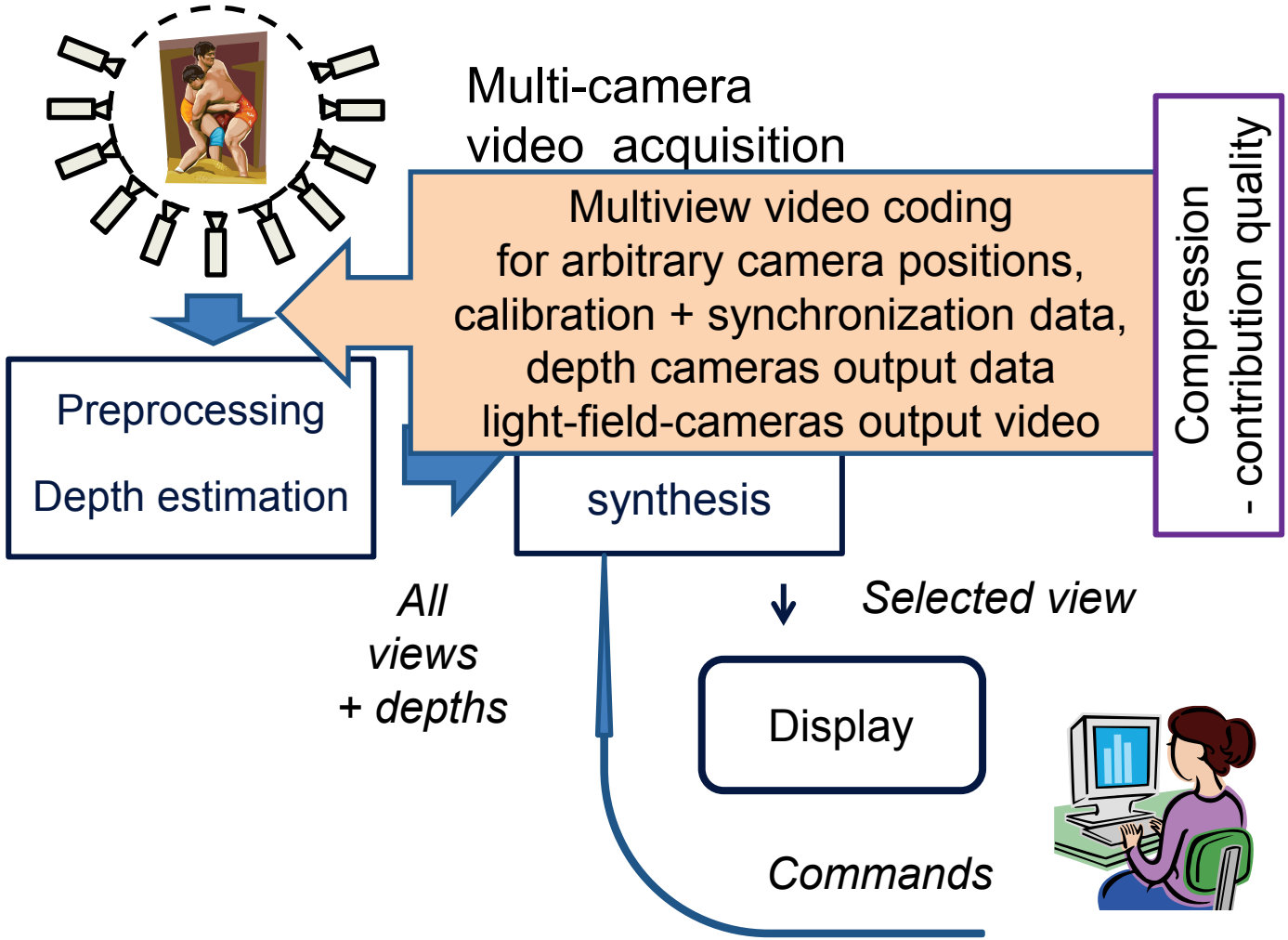
synthesis

Selected view

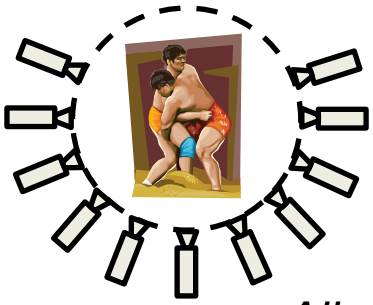
Display

Commands

FTV standardization



FTV standardization



Multi-camera video acquisition

All views

Preprocessing

Depth estimation

View synthesis

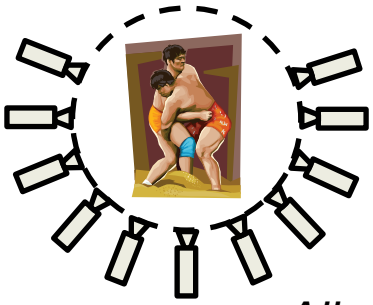
Selected view

Display

Commands

3D scene representation compression (e.g. multiview + depth + camera parameters or other?)

FTV standardization



Multi-camera video acquisition

All views

Preprocessing

Depth estimation

View synthesis

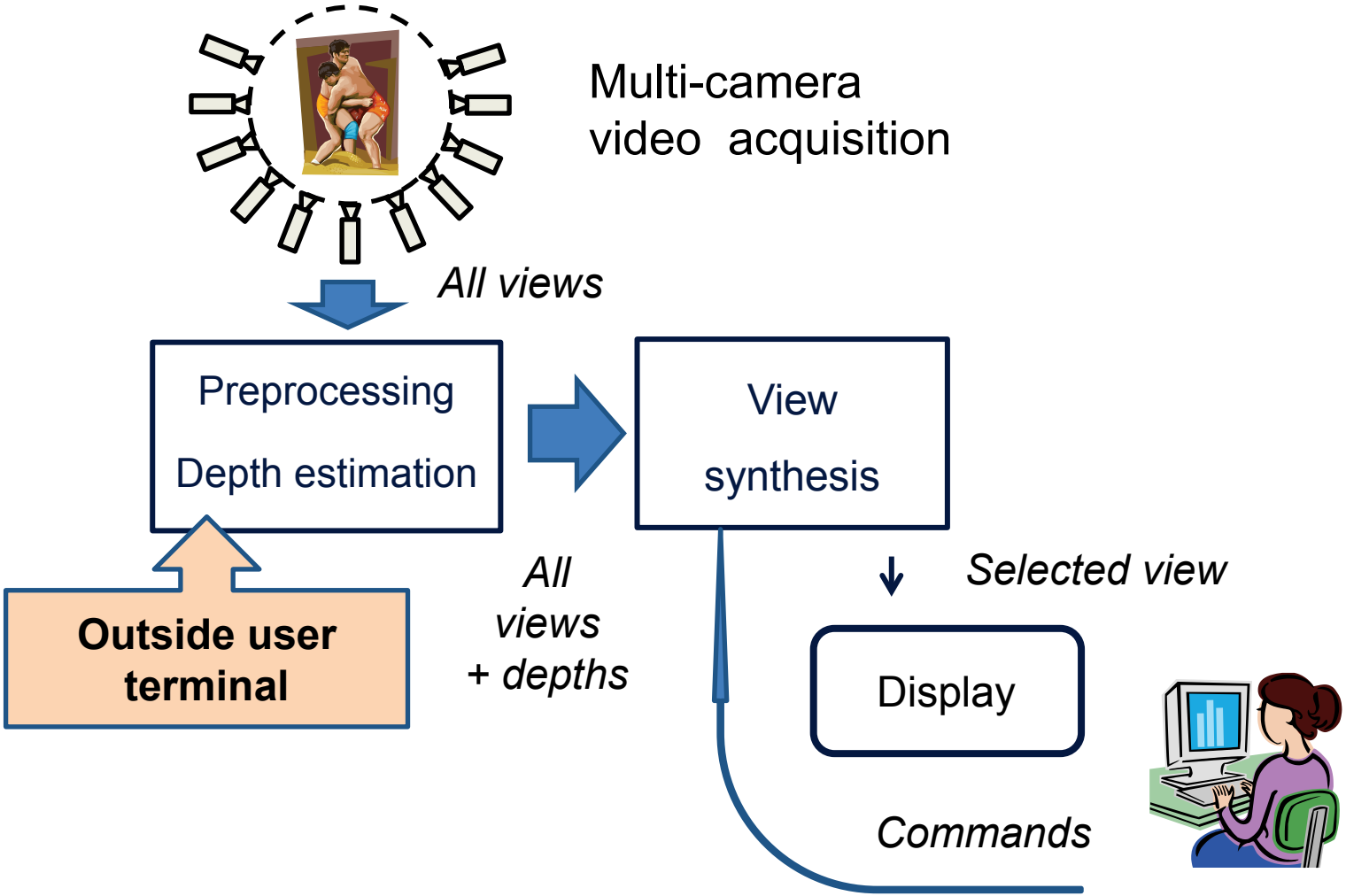
All views + depths

User – server communication

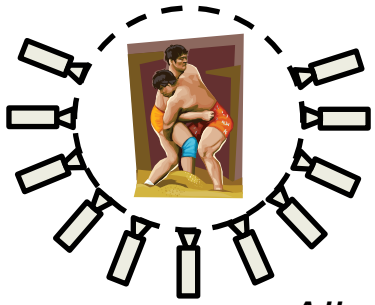
Display

Commands

FTV scenarios



FTV：view synthesis in the user terminal



Multi-camera
video acquisition

All views

Preprocessing

Depth estimation

All views + depths

User terminal

View synthesis

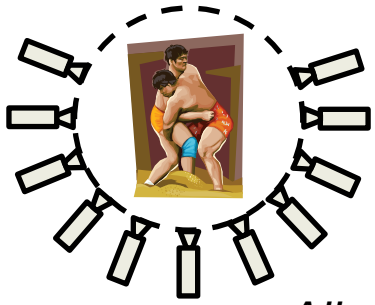
Selected view

Display

Commands

Pro:
Less delay-related problems
Con:
Large bitrate for downlink

FTV : view synthesis outside the user terminal



Multi-camera
video acquisition

All views

Preprocessing

Depth estimation

View

synthesis

All views + depths

Selected view

Display

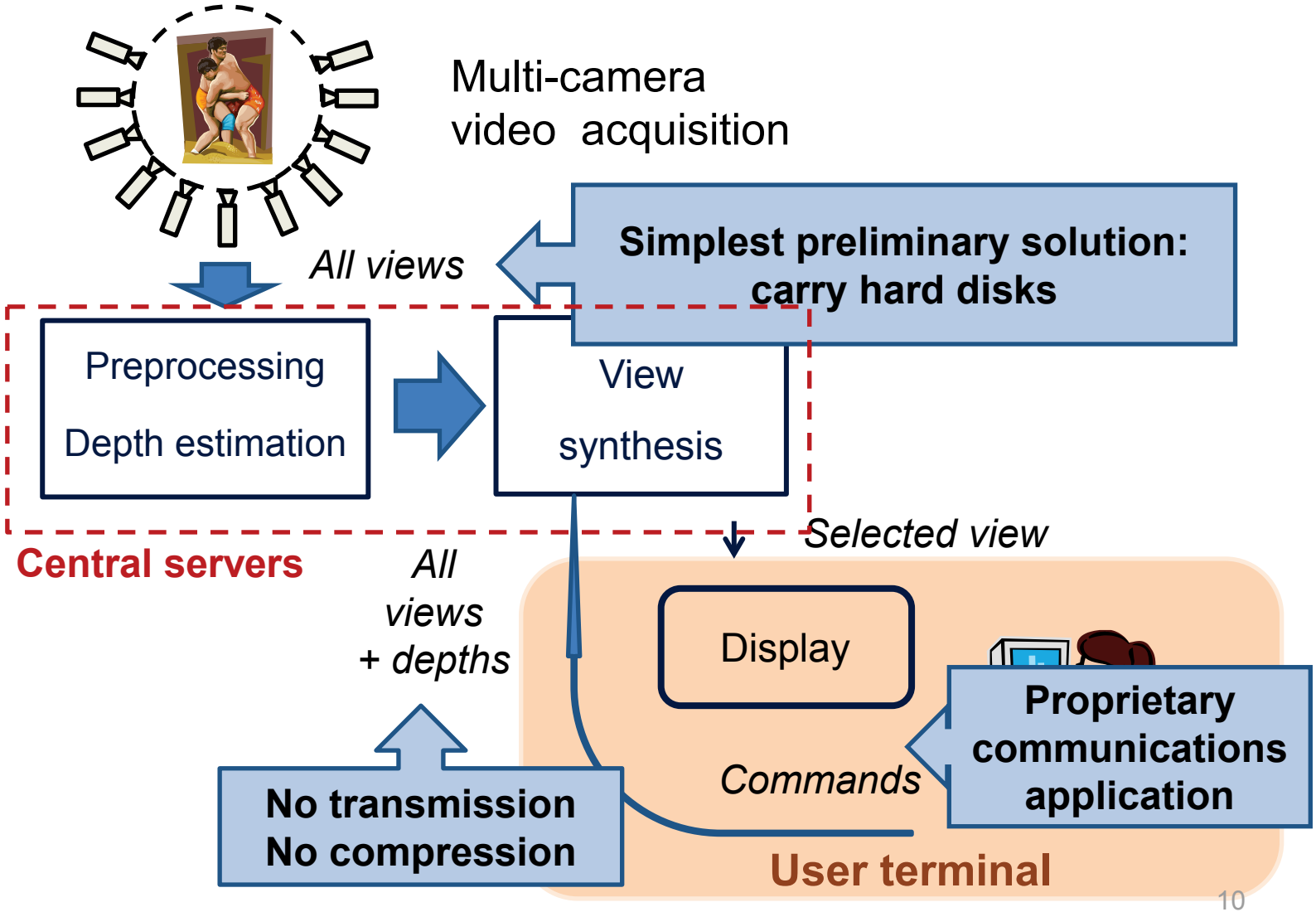
Commands

User terminal

Pro:
Downlink bitrate limited
Con:
Delay-related problems

Our work is oriented towards this scenario

FTV : simple low-cost entry system



Simple experimental system

Applications

- Sport broadcasts (like judo, wrestling, sumo, dance etc.)
- Performances (theatre, circus)
- Interactive courses (medical, cosmetics, dance etc.)
- Manuals and school teaching materials

Limited size of the scene

Multi-camera video acquisition

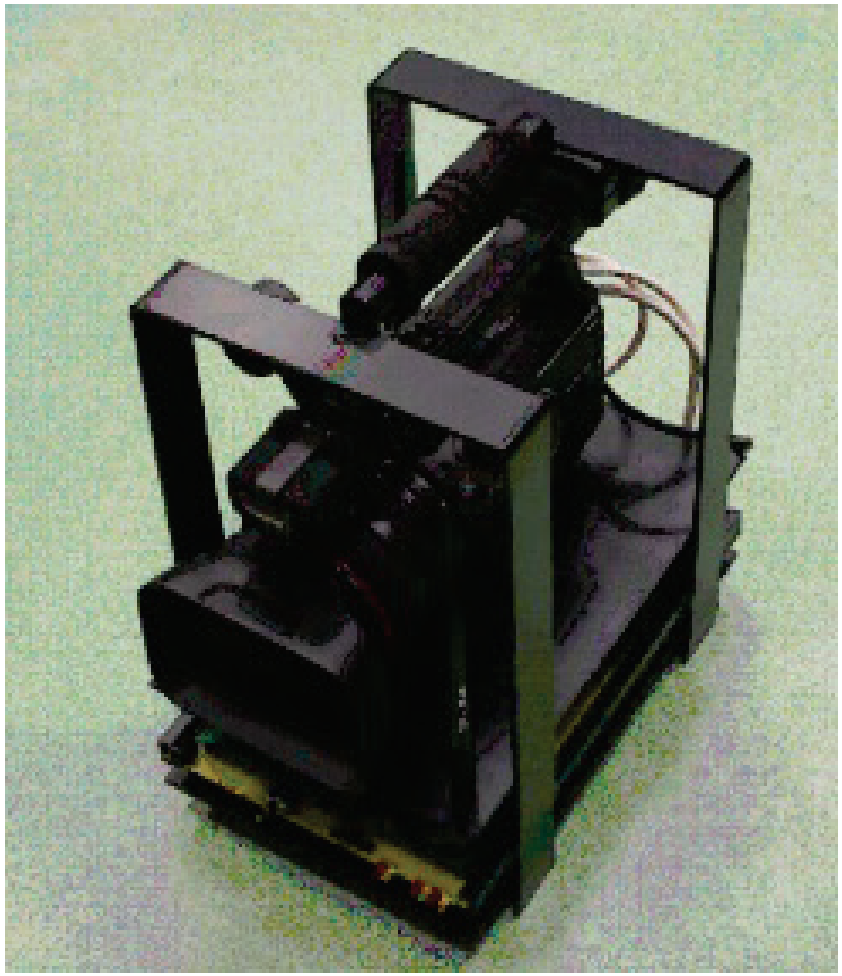
Assumptions:

- Low-cost
- Easy to operate

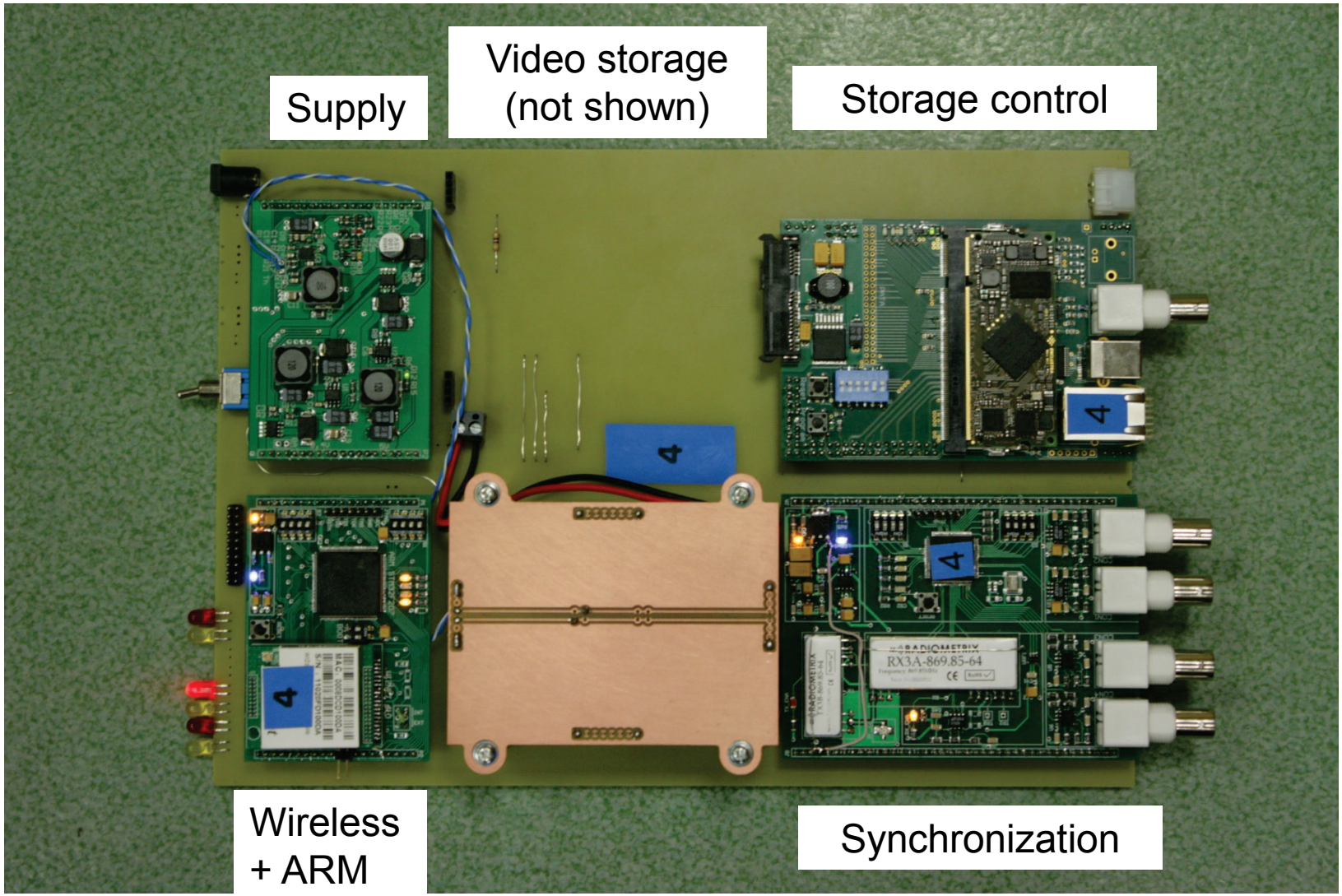
- Typical cameras – not motorized
- All cameras controlled by ONE person
- Easy setup in a real scene

WIRELESS CONTROL and SYNCHRONIZATION

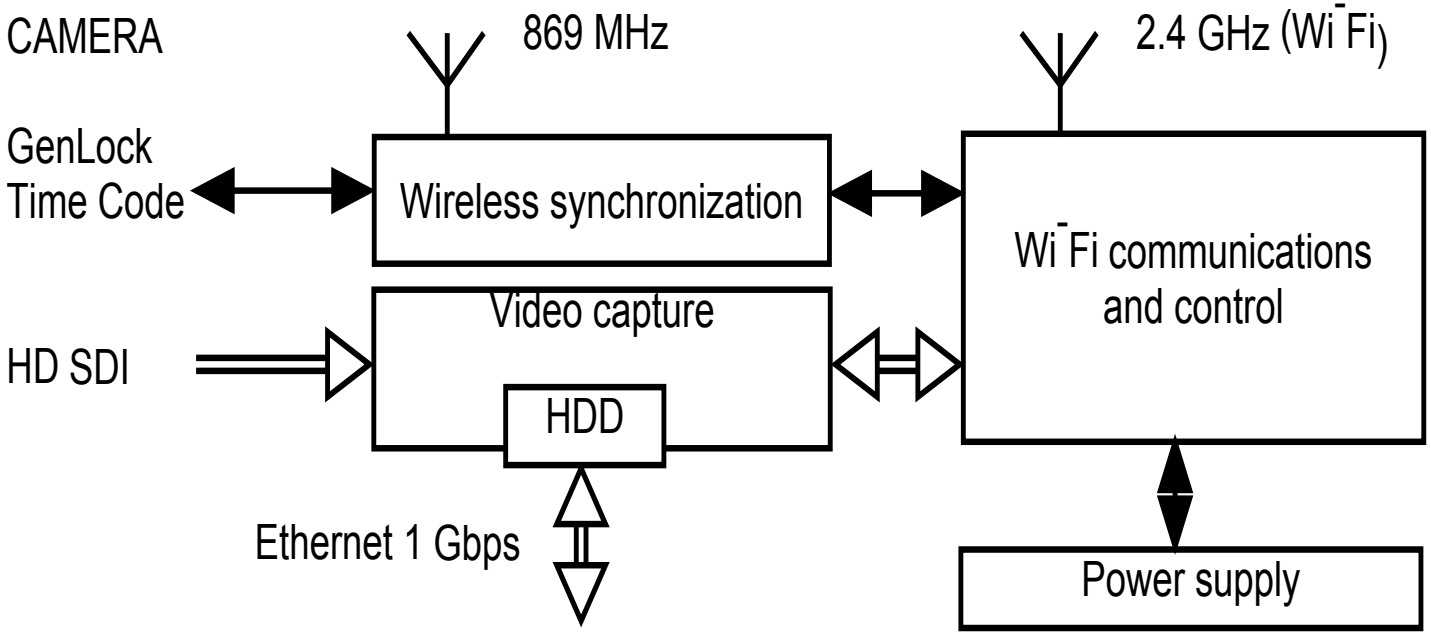
Wireless camera module



Wireless camera module



Wireless camera module



Developed and produced at
Chair of Multimedia Telekommunications and Microelectronics,
Poznań University of Technology, Poznań, Poland

Wireless camera module

Communications and control block:

- Management of the wireless network connection,
- Passing commands from the operator,
- Passing status data from other modules to the operator,
- Periodical transmission the telemetry data (Time Code, current frame number, synchronization status, battery voltage, battery charger status etc.) to the management laptop,
- Monitoring the status of each camera by sending to the laptop reading low-resolution frames (128×71, 8 fps),
- Sending via Wi-Fi single full-resolution frames (calibration)

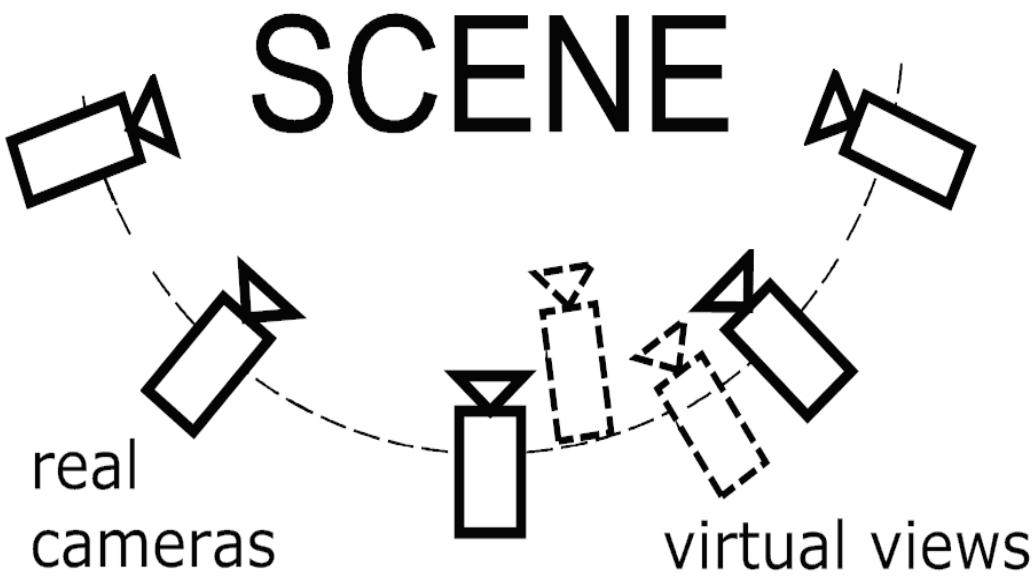
Multi-camera video acquisition

Registered test sequence Poznan Blocks

donated for MPEG for experiments

10 HD cameras, about 110-degrees circular camera arrangement,
Camera paramaters provided

Virtual view rendering



Zooming is implemented by view synthesis – in limited range

Depth estimation

- Modification of DERS
  for arbitrary camera locations

View synthesis

- Real-time implementation (stereo HD) for typical PC GPU
- Adaptation of VSRS
  for convergent cameras

References:

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