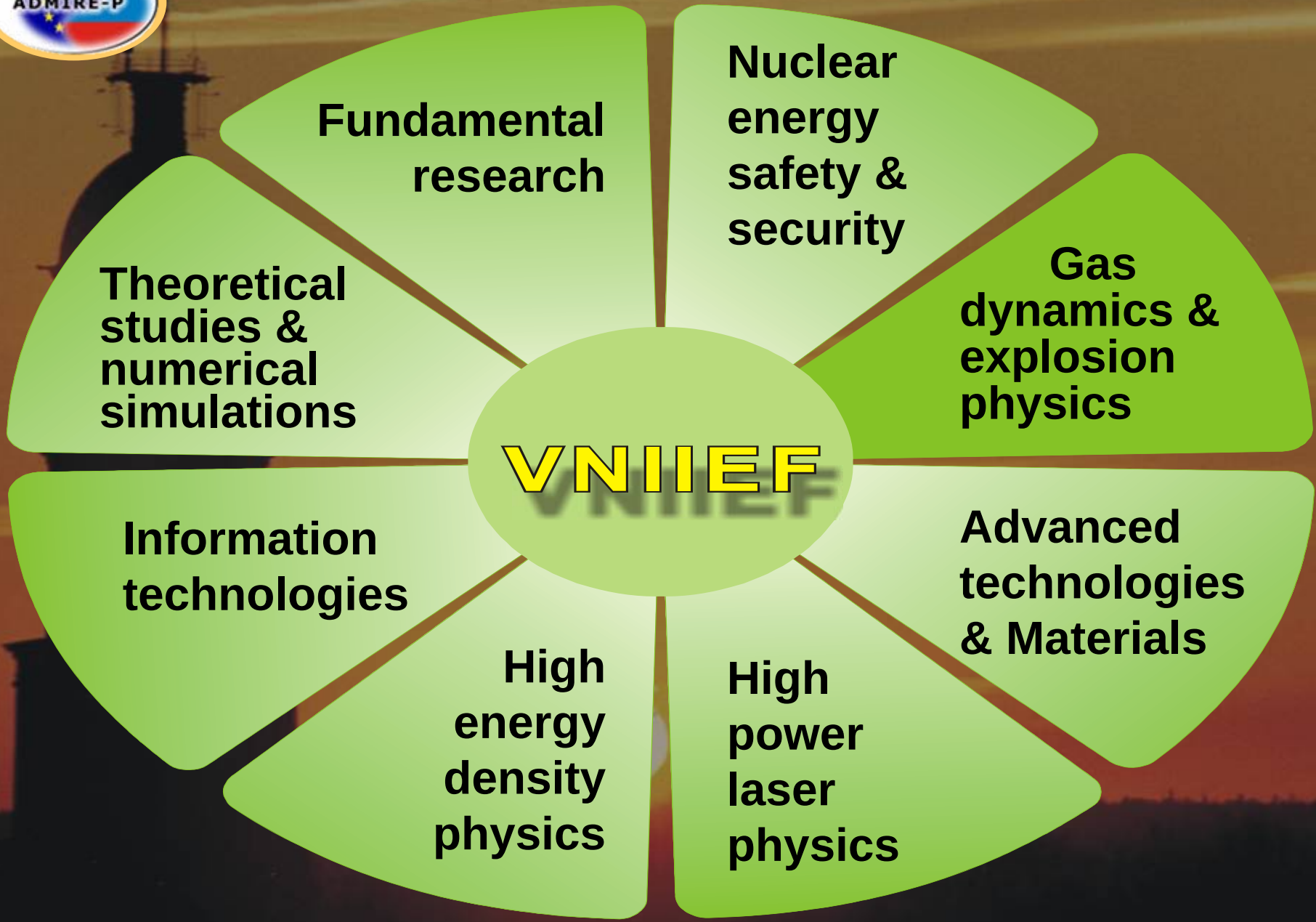
Application of Video Technologies and Pattern Recognition in Medicine

Presented by I.V. Zhukov

Russian Federal Nuclear Center -
All-Russia Scientific-Research Institute of Experimental Physics

Institute of Nuclear and Radiation Physics


Fundamental research
Nuclear energy safety & security
Gas dynamics & explosion physics
Theoretical studies & numerical simulations
VNIIEF
Information technologies
Advanced technologies & Materials
High energy density physics
High power laser physics

Intelligent Video Systems and Image Processing Laboratory (VIP Lab, since 1973)

- *nuclear and laser physics experimental images processing*
- *image processing algorithms and software development*
- *specialized hardware development and perfection*
- *video surveillance for nuclear materials safety and security*
- *utilitarian video processing algorithms (object tracking, event detection, scene analysis, spatial measurements, features extraction)*

Technological basis:

- **CBIR (Content-Based Image Retrieval)**

  software tools and demo applications developed within ISTC Project #2191.
  IST FP6 Call 5 proposal

- **SVS (Smart Vision Sensor)**

  pre-project research
  IST FP6 Call 5 proposal

CBIR – what is it?

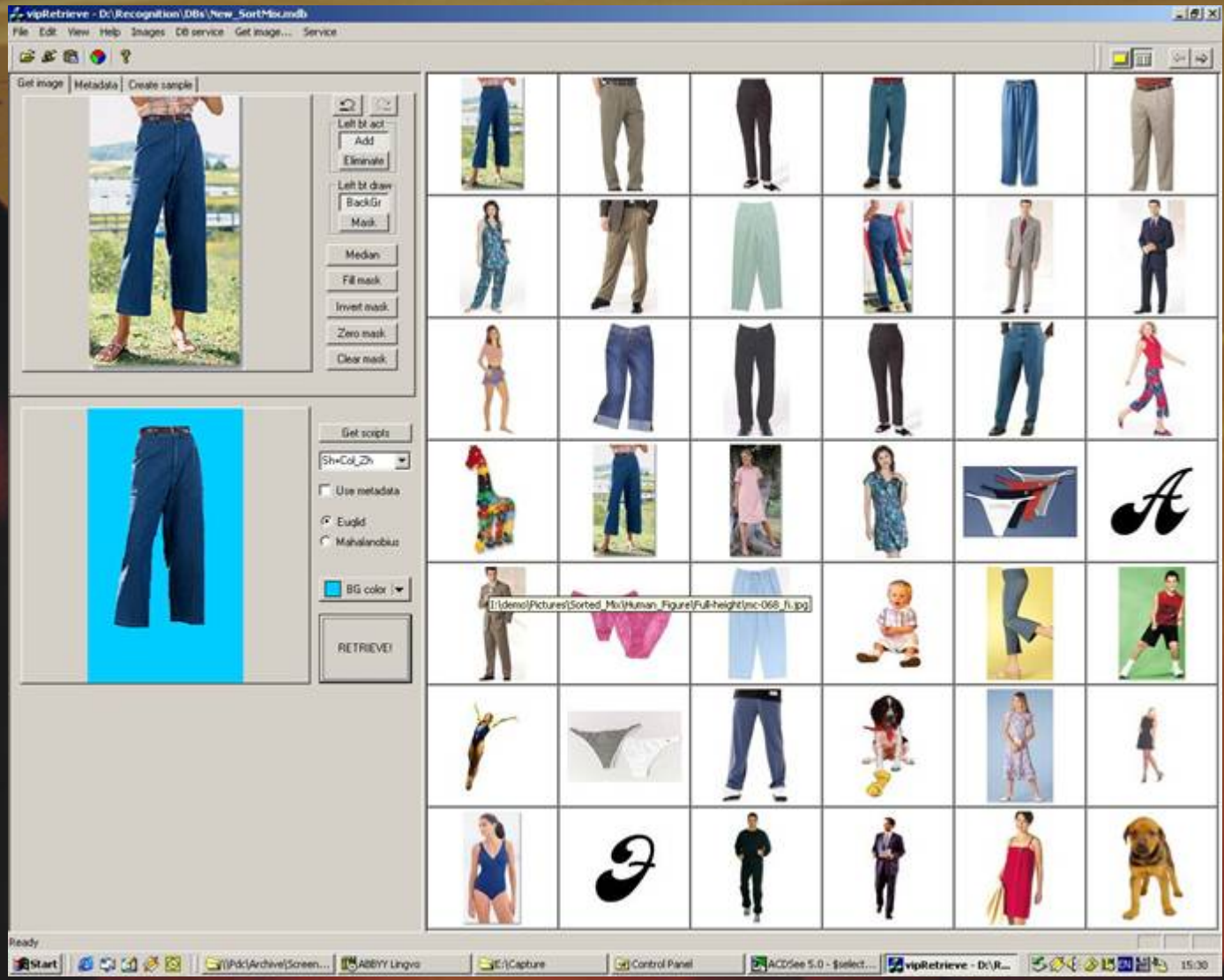
Search for images similar to given sample image, based on generic image content features (not on textual descriptors!)

The same for objects on images or groups (ensembles) of objects.

Features characterize

SHAPE + COLOR + TEXTURE.

Applicable to retrieval from Databases of specific medical images

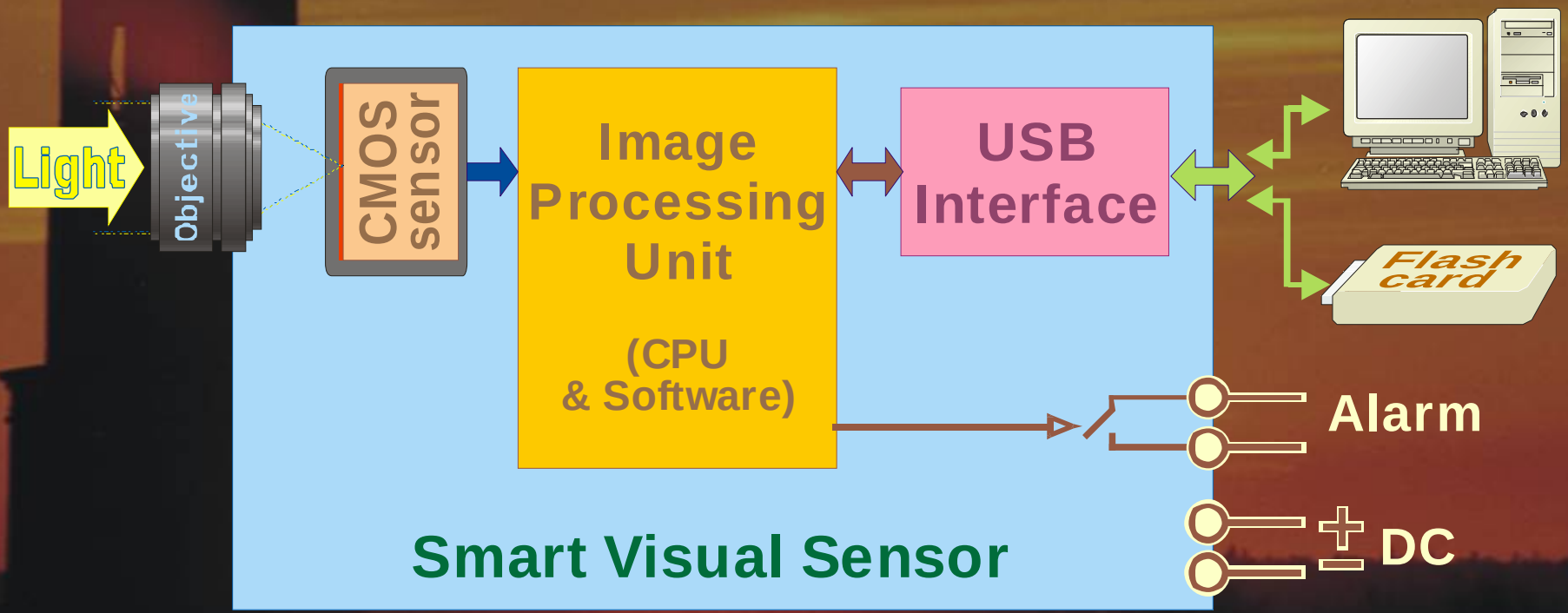


CBIR Retrieval example

SVS – what is it?

Portable camera with embedded powerful image processing capabilities

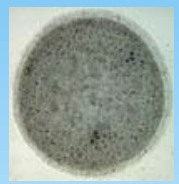
Re-configurable to run any applied image processing task



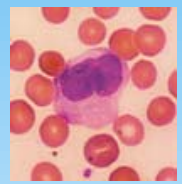
Applicable to remote medical intelligent imaging

Medical Images

X-ray



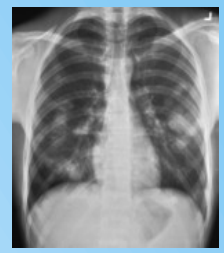
Tear cryst.



Blood cells

Blood serum cryst.

Micro-scale



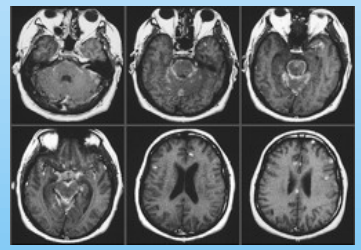
Fluorography

Angiography

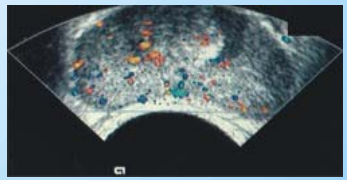
Wound care

Cardiography, EEG, etc.

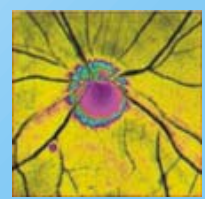
Tomography

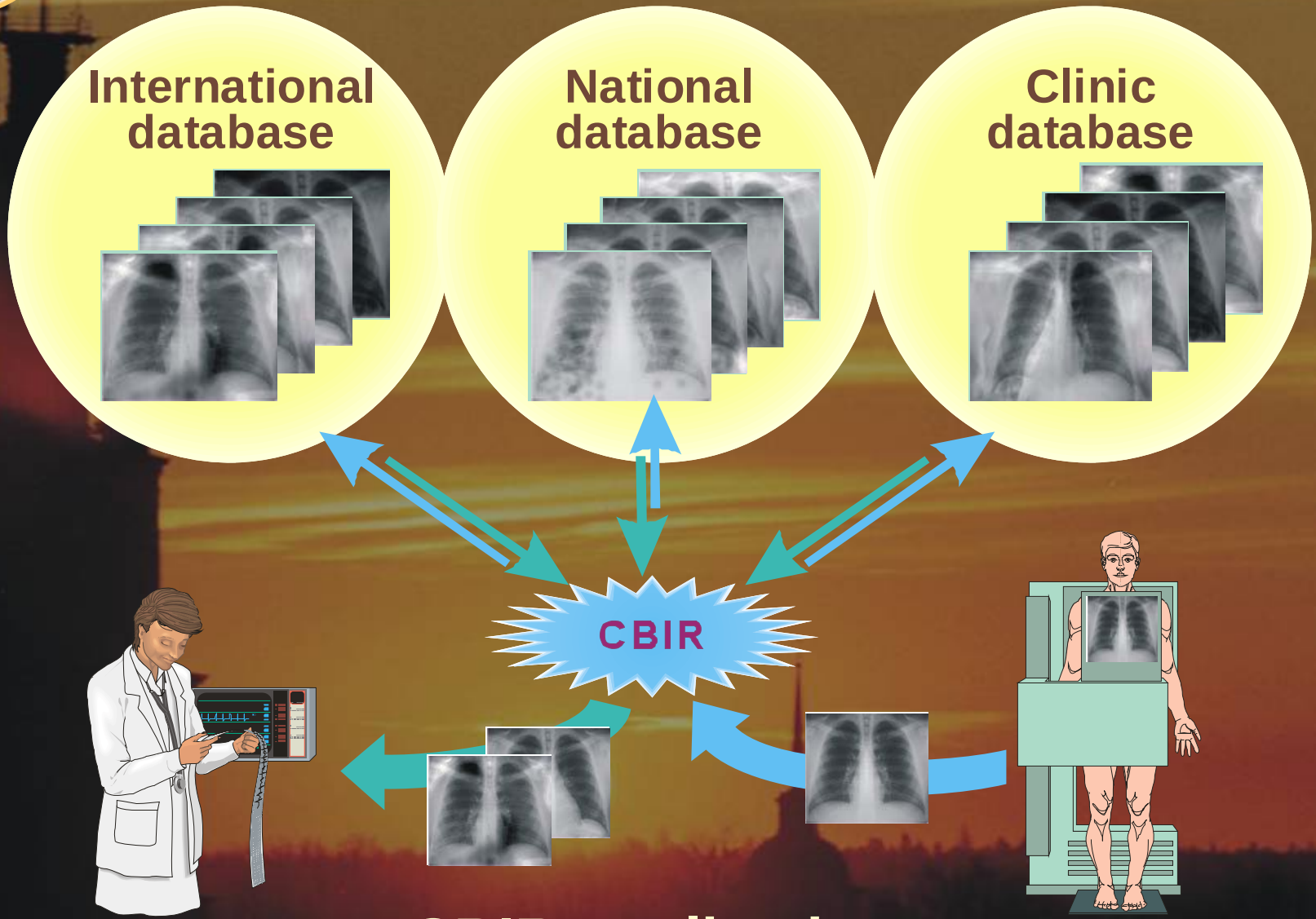


Sonography

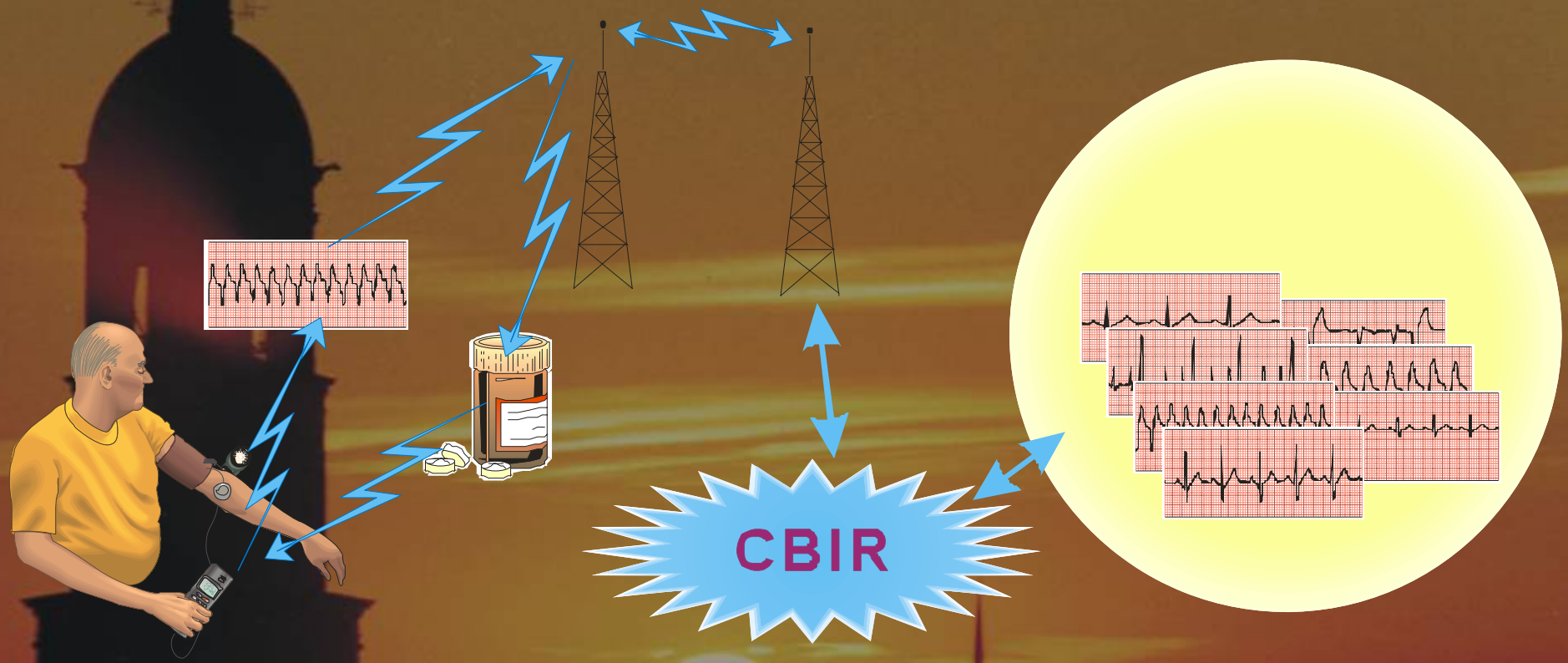


Eye-ground





CBIR application



CBIR in combination with SVS application

Innovative aspects

- *Similar epicrisis can be easily retrieved accompanied by desired metadata (treatment course, therapy results, etc.)*
- *CBIR retrieval based on Integrated biomedical data (not only images) is similar to diagnostics*
- *SVS allows Visual and other data acquisition and features calculation to form query for search just at patient location (remotely)*
- *Retrieved data delivered to a patient and/or a doctor (as assigned)*
- *Local (at medical institution) intelligent imaging, like chromosome analysis, blood cells, eyes tracking (including saccadic), etc.*

Project idea

- *SVS for broad application (hardware and software development)*
- *CBIR tools and applications development*
- *Medical applications based on CBIR and SVS*

Partner expertise required

- *Medical Imaging and image processing*
- *Medical images archiving and treatment (Databases)*
- *Mobile networking*
- *Internet-based services and applications*

Contact

Igor V. Zhukov

007 83130 44466

zhukov@vniief.ru