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• Research Director at CNRS
• Laboratoire des signaux et systèmes (L2S)
  UMR 8506 CNRS-SUPELEC-UNIV PARIS 11
• Signals and Systems Laboratory
• Signal & Image Processing
• Inverse problems in Imaging and Computer vision
• Deterministic regularization and Probabilistic Bayesian inference for inverses problems in signal processing, imaging systems and computer vision
Vision 2020

• High speed imaging for Non Destructive Testing (NDT) and Evaluation (NDE)
• Mobile imaging and wireless transmission
• Extended color (multi- and hyper-spectral)
• Health related imaging systems
  Human body, Live cells, proteins, genes and other biological imaging challenges
• Safety related imaging systems
• Environmental (Earth, Oceans, Space) observation
• Micro and nano objects observation
High speed imaging
for Non Destructive Testing (NDT) and Evaluation (NDE)

Conventional
1/4,500 second

Laser illumination
1/40,000,000 second
(25 ns)

http://www.oxfordlasers.com/imaging/high_speed/?gclid=CL2D-uPBzaECFRYN3godJDc8ng
Mobile imaging and wireless transmission

• High resolution 2D and 3D mobile imaging
• Super-resolution and fast image processing
• Fast pattern recognition and tracking
• Fusion of GPS localization information and real time HR 2D and 3D images
• Very high speed wireless transmission
• Multi-perspective imaging
Extended color imaging multi- and hyper-spectral

- Huge need of memory and speed for 2D, 3D, 4D, 5D (4D and time), ...
- Fast image unmixing, segmentation and classification of patterns
- Fast pattern recognition and tracking
Health related imaging

- 3D real time imaging
- 3D and 4D Genomics
- Telesurgery

http://www.corticalstudios.nl/animation.html

Planmeca ProMax 3D concept


http://www.corticalstudios.nl/animation.html
Health related imaging

- Image reconstruction: Tomography (X rays, PET, SPECT, ultrasound, MRI, ...)
- Image formation: microscopy, fMRI, echography, fluorescence imaging, ...
- Cells identification and tracking
- Real time tele-surgery, endoscopy, ...
- In-vivo and in-vitro imaging and vision systems
Environmental observation

- Oceans observation
- Earth observation
- Space observation
Safety related imaging systems

- Night Vision Systems
- Thermal imaging
- Passive milimeter wave imaging
- Radar, SAR, ISAR, LIDAR, ...
Micro and Nano observation

- Biological imaging: Cells, Molecules, Proteins, Genes, ...
- Nano objects observation and manipulation

http://www.nanotech.upenn.edu/news.html

http://www.digiteo.fr/entrepot/5jaiqyqng4/5jaiqyqng4_medium.png
Conclusions

• Our community has a lot to contribute
• We need a good combination of Mathematics, Physics and Engineering skills to develop new methods for these vision problems
• Inventing new imaging systems needs good physics knowledge, good forward mathematical modeling and good inversion methods and algorithms.
• To get an overview come to my Keynote Lecture on Wednesday, May 19, 2010.