



1-2 February 2010
KORANET PARTNERING EVENT

Research for life-long health

J. Jay Liu
Pukyong National University
Surface Characterization using Image
Analysis and New Applications



RESEARCH CENTRE

Research Centre, Project Idea, Expertise, Partner sought, Contact Info.

- Pukyong National University (www.pknu.ac.kr/eng)
 - Located in Busan (2nd largest city in Korea)
 - 6 colleges in two campuses
 - 558 Profs., 25,000 students
 - 5 graduate schools
 - 2,400 students
 - College of Engineering
 - 22 departments
 - 230 profs., 11,400 students



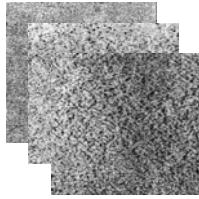


PROJECT IDEA

Research Centre, Project Idea, Expertise, Partner sought, Contact Info.

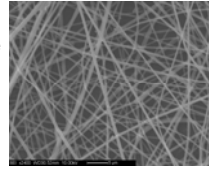
- Surface (or image of material surface)
 - Reveals Important **physical/mechanical properties** that affect **materials' function & performance**

Steel alloys



- Surface topology
- Magnetic properties
- Etc

Nanofiber membrane



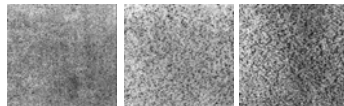
- Surface functionality
- Mech. performance (Permeability, ...)
- Etc



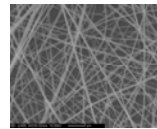
PROJECT IDEA

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- Current practice
 - Manual classification into distinct classes
 - Manual measurements



Excellent Medium Bad



- Interfiber porosity
- Fiber diameter
- Fiber/pore dia. distribution

- Shortcomings
 - **Time & labor demanding !**
 - **Inconsistent !**
 - **Not suitable for handling stochastic nature !**

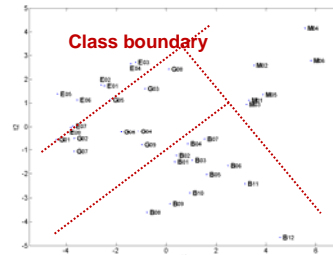
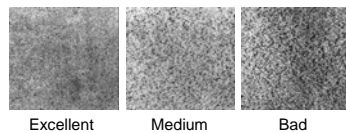




PROJECT IDEA

Research Centre, Project Idea, Expertise, Partner sought, Contact Info.

- Surface characterization via numerical estimation
 - Tools: WTA & Subspace Projection



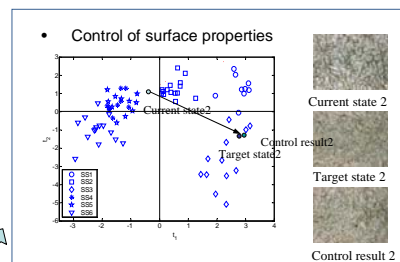
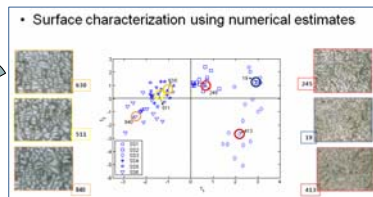
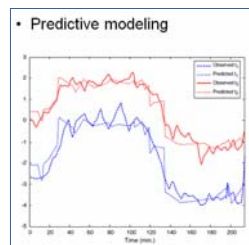
- Advantages
 - Fast, accurate & consistent
 - Ideal for representing continuous & stochastic nature
 - Image source independent (SEM, X-ray, Ultrasound, ...)
 - Enables data integration (combining all pieces of information)



PROJECT IDEA

Research Centre, Project Idea, Expertise, Partner sought, Contact Info.

- Modeling and control
 - Using numerical estimates





PROJECT IDEA

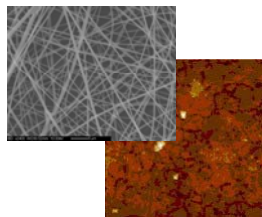
Research Centre, Project Idea, Expertise, Partner sought, Contact Info.

- New Applications

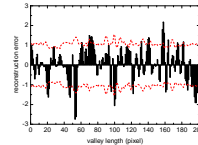
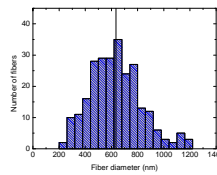
- Nano-material characterization

- Development of full automatic vision system for estimating key properties.

SEM/TEM/AFM/...
image



- Interfiber porosity
- Fiber diameter
- Fiber/pore dia. distribution
- Surface topology
- etc



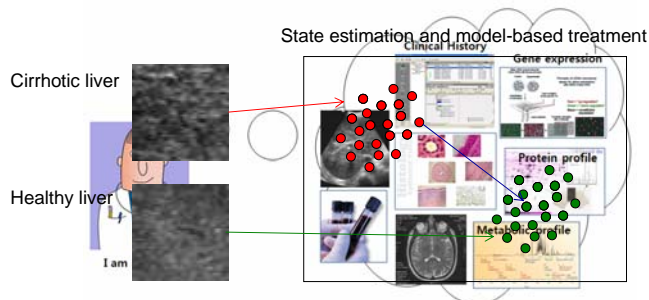
PROJECT IDEA

Research Centre, Project Idea, Expertise, Partner sought, Contact Info.

- Computer-aided diagnosis & treatment in Medicine

- Numerical Estimation of disease progression/status
- Modeling of patients' response to treatment
- Mode-based treatment of disease

By integrating and analyzing data from all sources.





EXPERTISE

Research Centre, Project Idea, Expertise, Partner sought, Contact Info.

- Summary of my expertise
 - State estimation, modeling, and control of chemical/biological processes & products using:
 - Multivariate statistics
 - Machine learning
 - Chemometrics
 - Image analysis
 - Image/Signal processing



PARTNER SOUGHT

Research Centre, Project Idea, Expertise, Partner sought, Contact Info.

- Partners with following expertise sought
 - Dynamics, identification and control of biomedical systems
 - Optimal model-based design of experiments for model identification
 - Material Characterization using SEM/TEM/AFM/...
 - Diagnostic radiology
 - Laboratory medicine
 - Metabolomics





CONTACT DETAILS

Research Centre, Project Idea, Expertise, Partner sought, Contact Info.

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