eMersion: Exploration of a New Paradigm for Web-Based Training

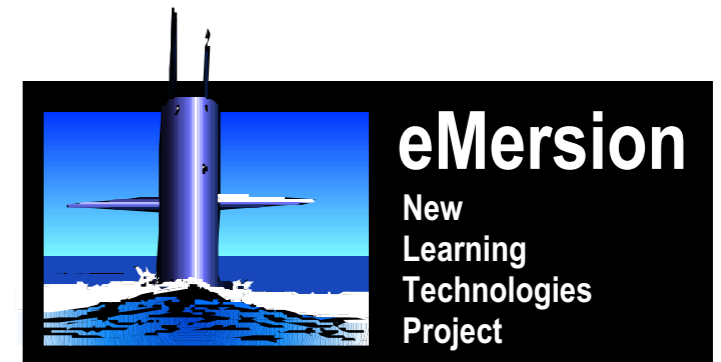CHRISTINE VANOIRBEEK   MEDIA RESEARCH GROUP

DENIS GILLET   DISTRIBUTED REAL-TIME SYSTEMS GROUP

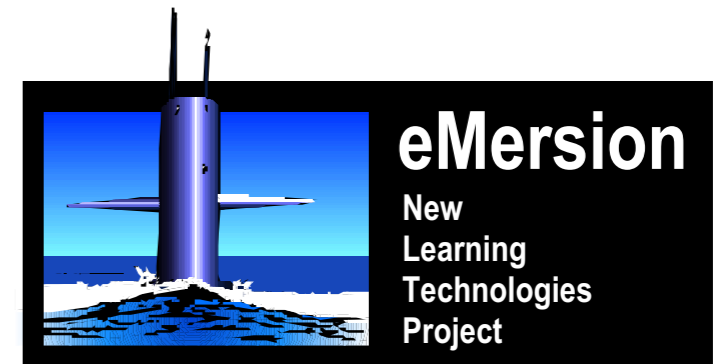SWISS FEDERAL INSTITUTE OF TECHNOLOGY LAUSANNE (EPFL)

http://eMersion.epfl.ch

eMersion
New
Learning
Technologies
Project

Outline

- ◆ **Introduction**

- ◆ **WBT Systems**

- ◆ **Document Technology**

- ◆ **The eMersion Project**

- ◆ **Two New Interaction Metaphors**

- ◆ **Deployment of pedagogical Modules**
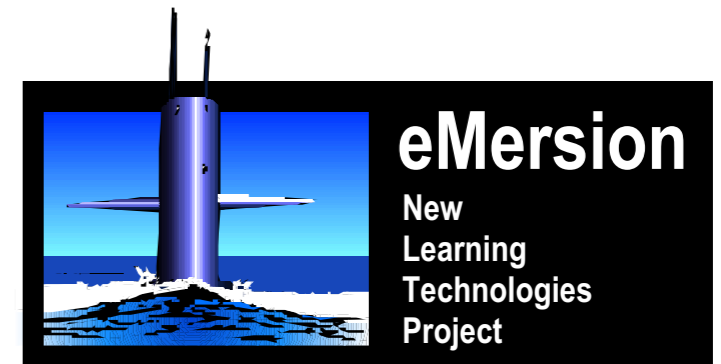
- ◆ **Concluding Remarks**

Introduction

Trends in High Education

◆ **Learn to learn,**
   to collaborate and
   to communicate

◆ **Acquire a mastery of the rigor,**
   the complexity and
   the interdisciplinarity

◆ **Stimulate the creativity,**
   the autonomy and
   the entrepreneurship

Introduction

Learner-Centered Education

◆ **Learn to learn,**
> **to collaborate and**
> **to communicate**

◆ **Acquire a mastery of the rigor,**
> **the complexity and**
> **the interdisciplinarity**

◆ **Stimulate the creativity,**
> **the autonomy and**
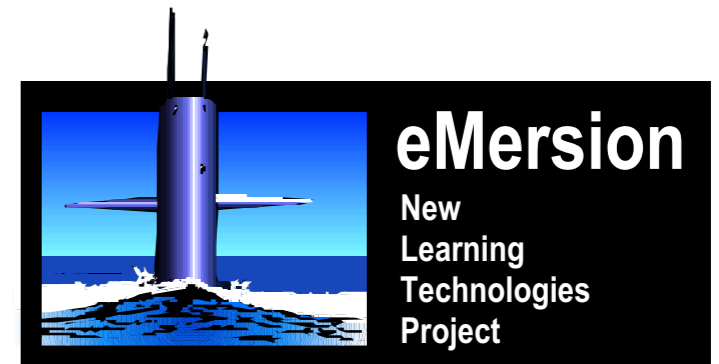> **the entrepreneurship**

Objective
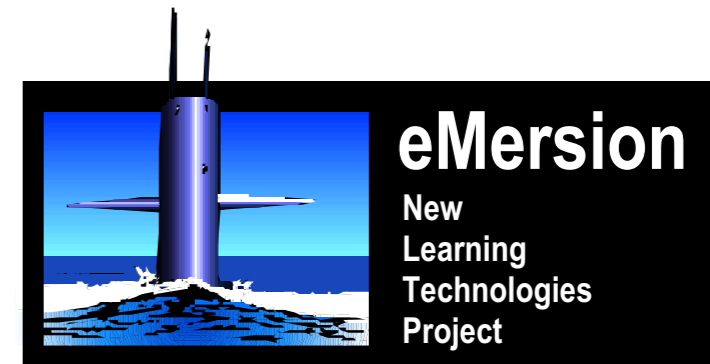
Increase in Involvement

- **Learning by doing**
- **Hands-on practice**
- **Trial and error**

Objective

Experimentation-Based Education

◆ **Learning by doing**

◆ **Hands-on practice**

◆ **Trial and error**

WBT Systems

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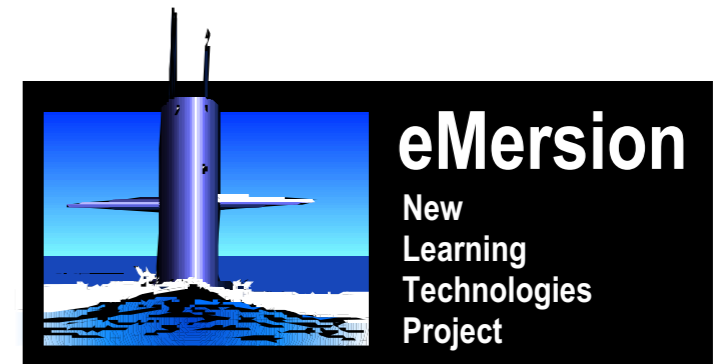Project
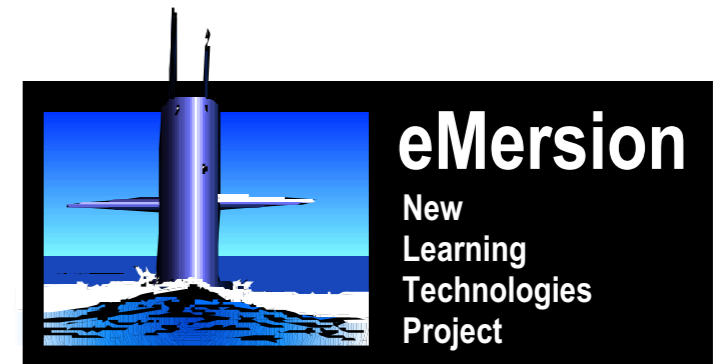
Evolution

◆ **Publishing • Interaction • Collaboration**

The challenge is about

◆ **new learning technologies ?**

◆ **new learning methods ?**

... how to integrate the technologies into new learning paradigms !

WBT Systems

A survey

◆ **http://edutech.ch (111 evaluation criterions)**

Student

**Access to courses
Private space and customization
(A)synchronous communications
Pedagogical tools**

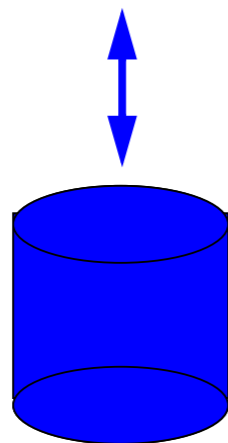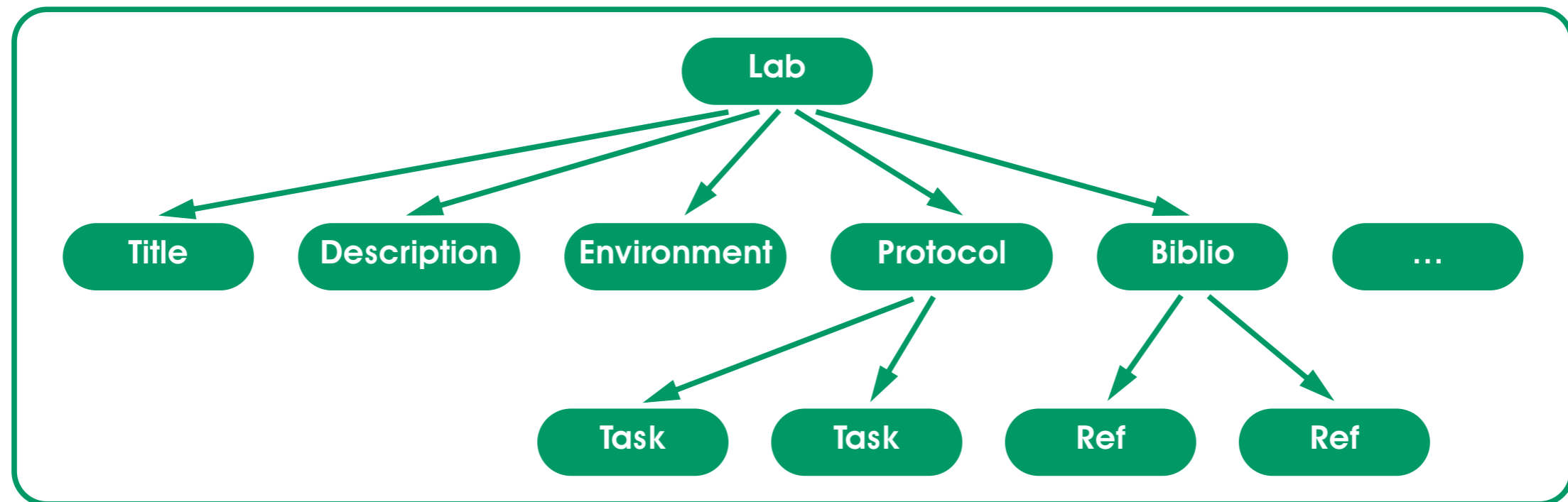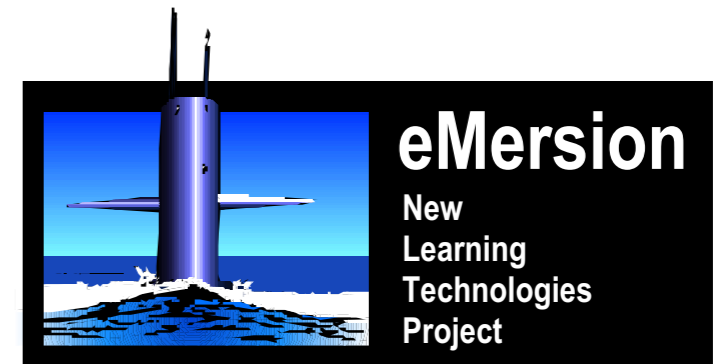**Teacher**

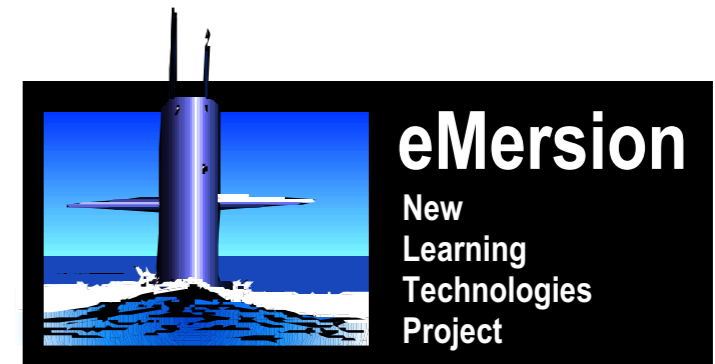**Teamwork
Tutoring
Course evaluation**

Author

**Production
Management
Quizzing**

Document Technology

Lab

Title Description Environment Protocol Biblio …

Task Task Ref Ref

Authoring facilities
Reusability
Collaboration
Telemanipulation

The eMersion Project

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New
Learning
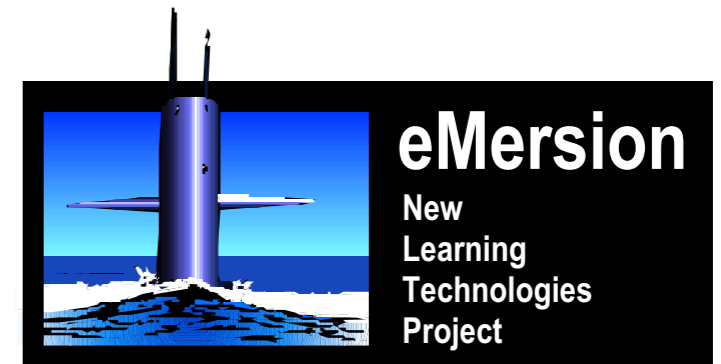Technologies
Project

What ?

- ◆ **Renewal in the education schemes at EPFL**
- ◆ **Interactive modules for mechanical engineering practice based on new learning technologies**

Who ?

- ◆ **Educators in mechanical engineering**
- ◆ **Specialists in new learning technologies**
- ◆ **Advisers in pedagogy and didactics**
- ◆ **IT Development Team**

Synergies and Multidisciplinarity

Methodological Focus

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Learning by Trial and Error

- **Hybrid Experimentation**

  simulation • animation • manipulation

- **Involvement • Collaboration**
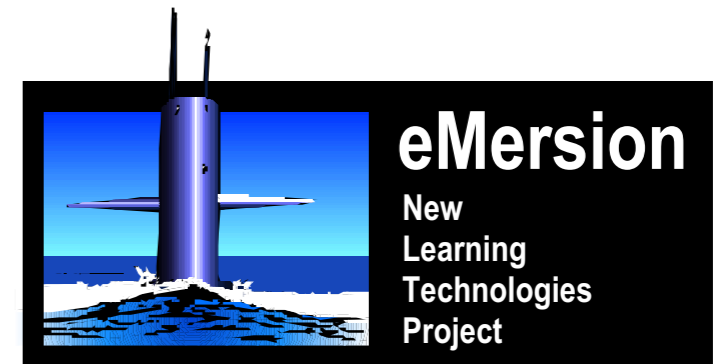
Flexibility in Experimentation

- **Context, content, place and time**
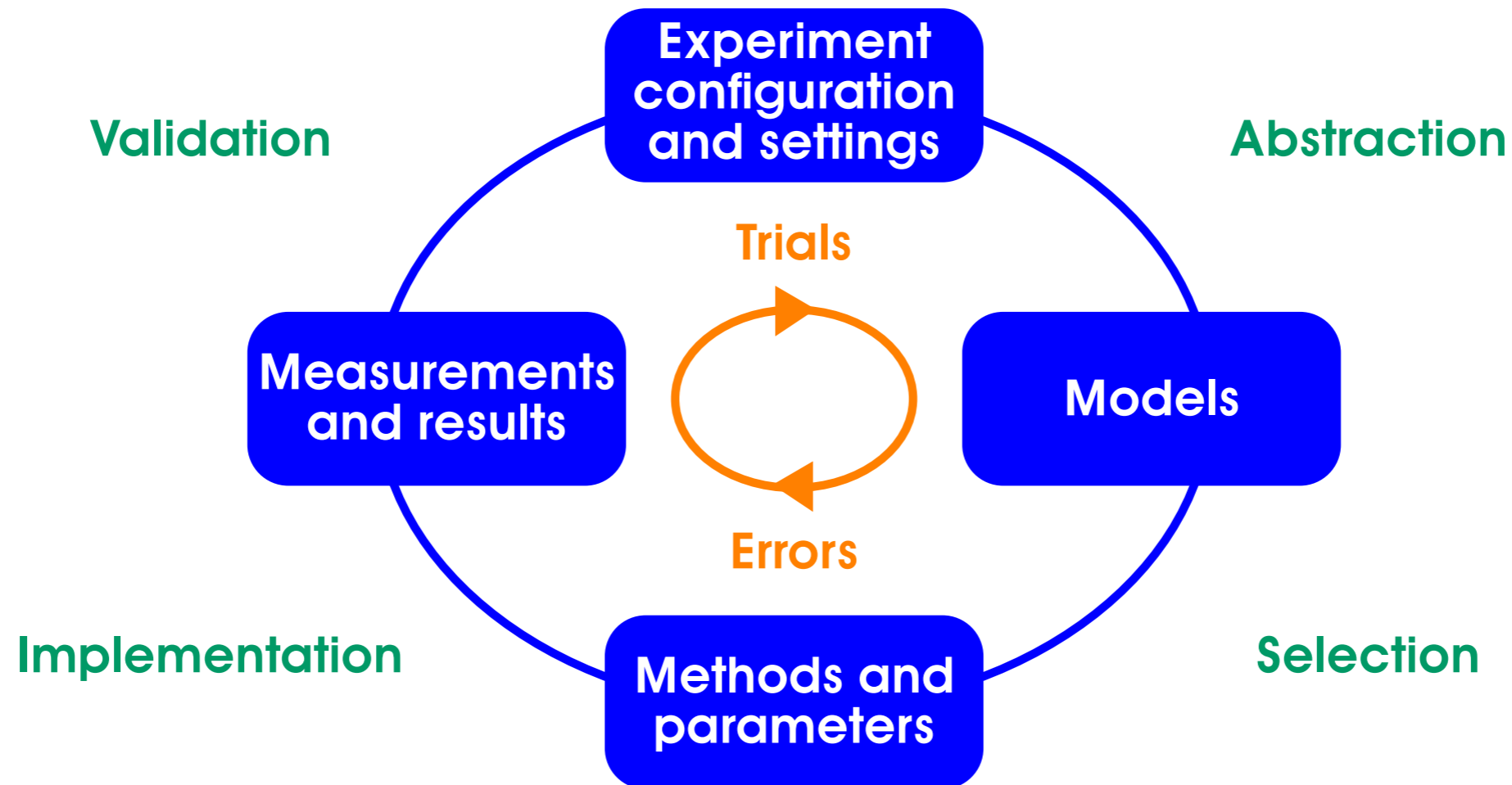
Modularity & Reusability
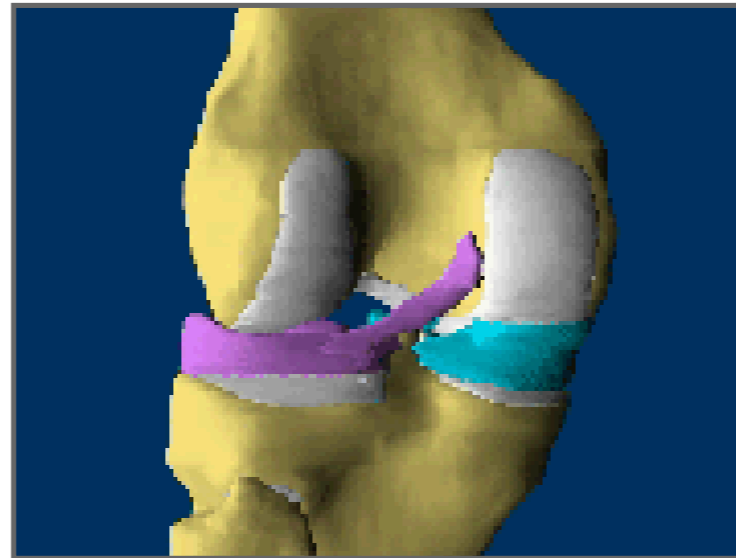
- **Content • Standard technologies: Java, XML, …**

Reinforcement

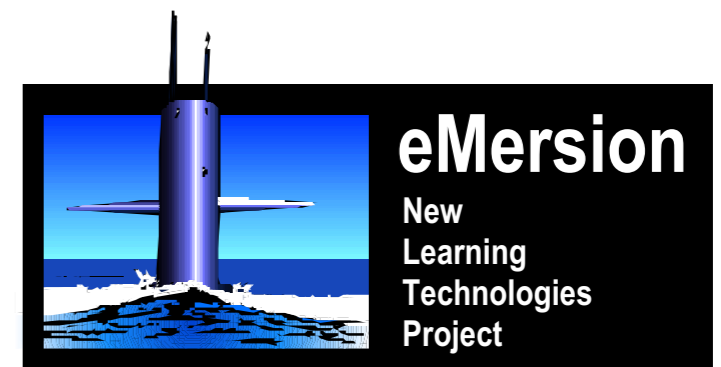## Successive stages and repetitive cycles

Validation

Abstraction

Experiment configuration and settings

Trials

Measurements and results

Models

Errors

Implementation

Methods and parameters

Selection

Hybrid Experimentation
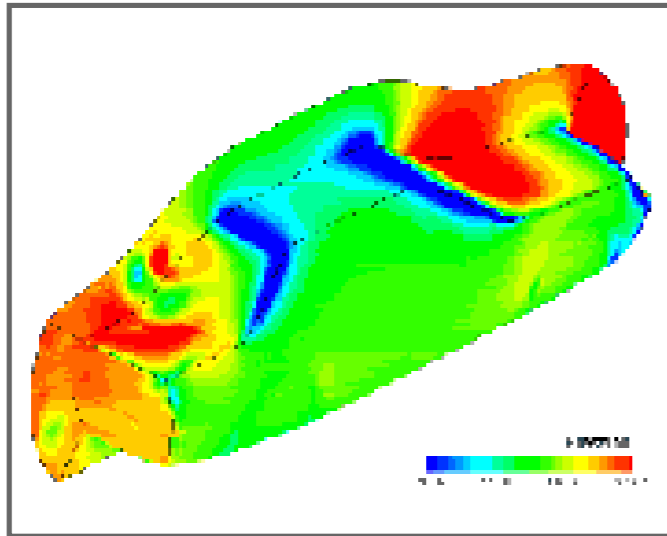
Numerical simulations   mathematical models

Animations   graphical models

Manipulations   real devices

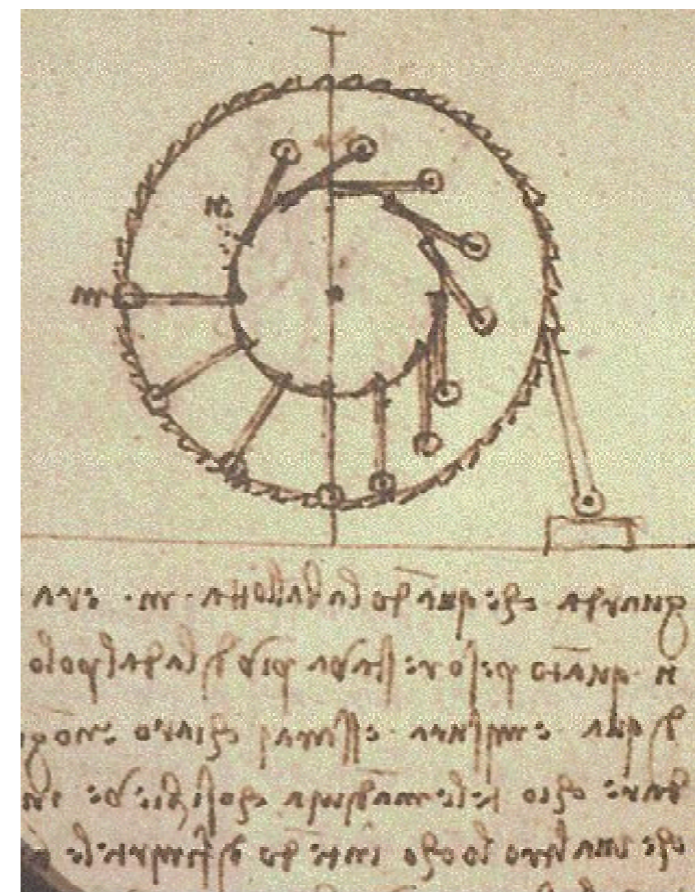**Combined experimentation modes**

Two New Metaphors
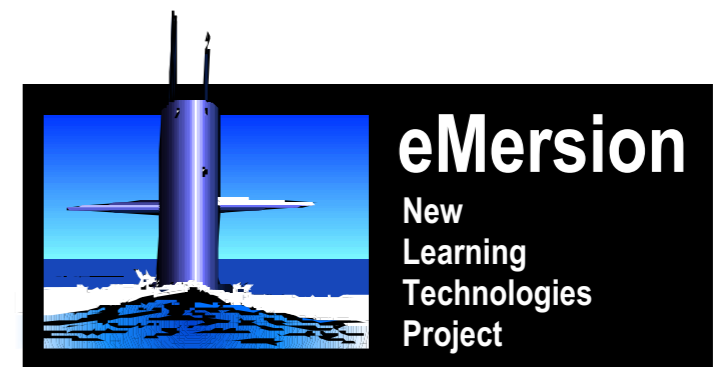
A cockpit and a laboratory journal

Sustainable Interaction with the experiments

Personalized & shared multimedia notebooks

Automatic Control

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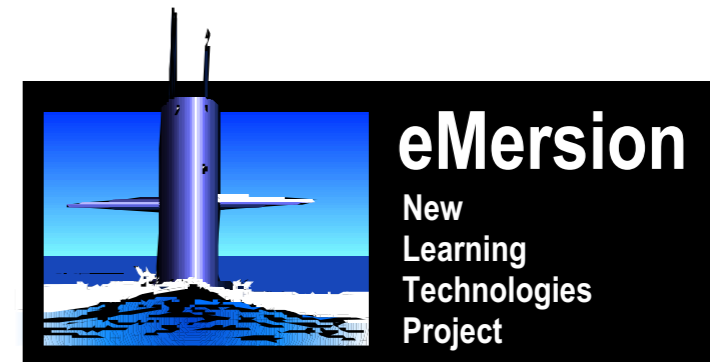
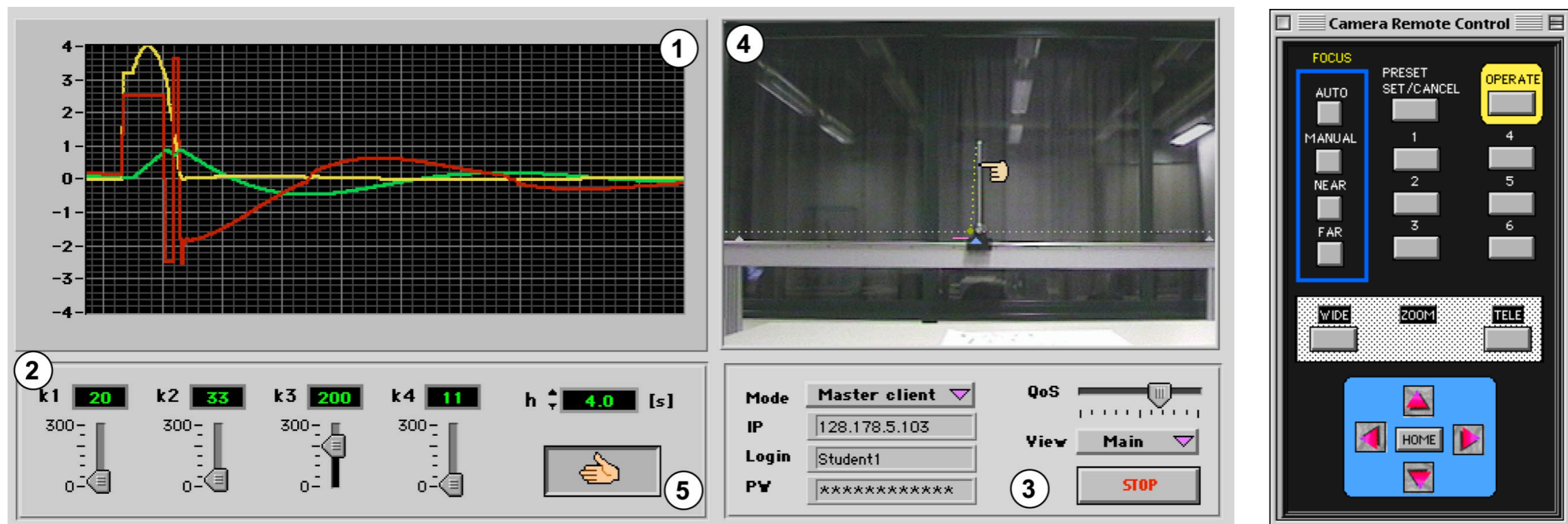# Remote Experimentation

◆ **Automatic Control Practice in 4 Engineering Majors**

Video Image
+ Virtual Representation
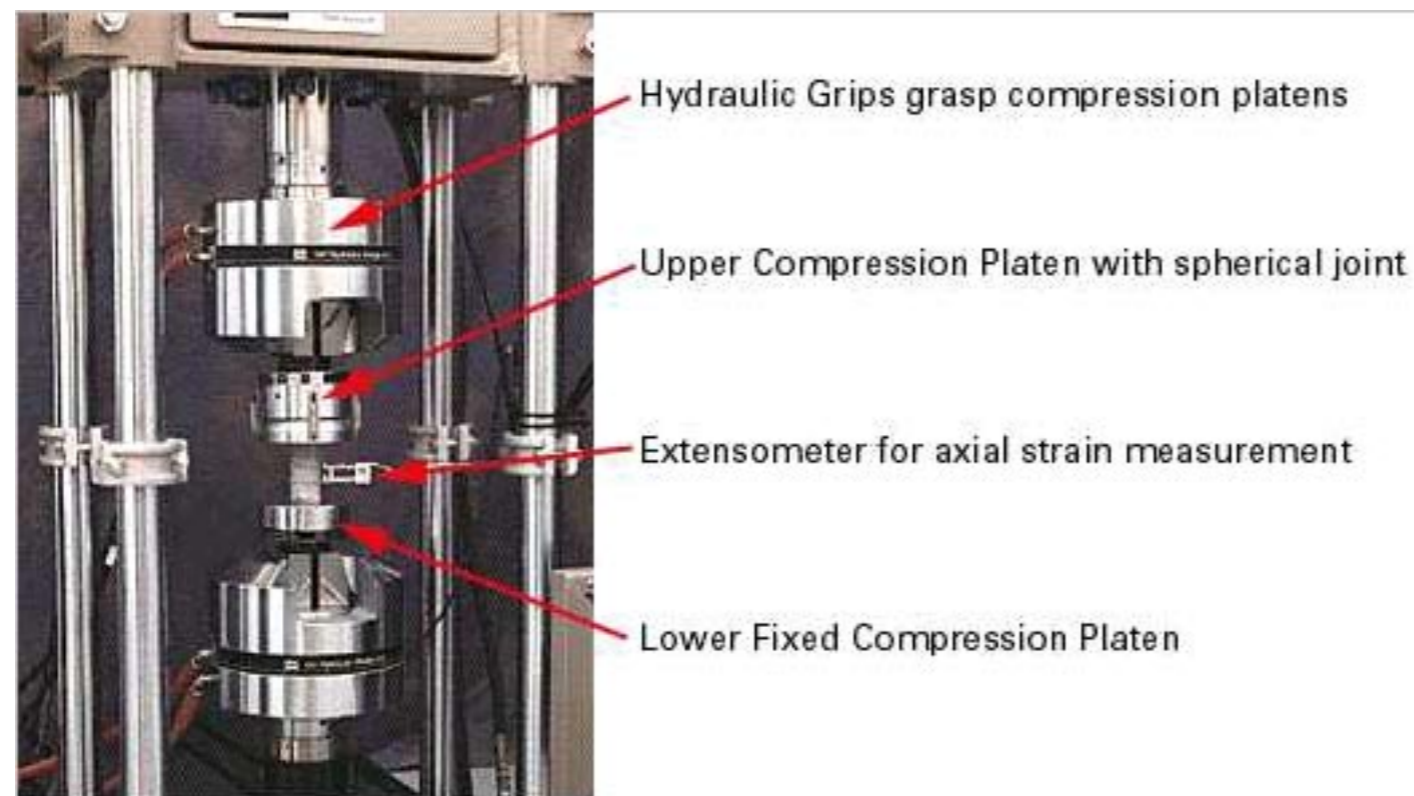Augmented Reality

Work and
collaboration
environment

States and Measurements

Interactive tuning parameters

Configuration

Biomechanics

Rheology of living tissues

◆ **Traditional curricula and continuing education**

◆ **Virtual tests on bones, ligaments, cartilages and muscles**

Hydraulic Grips grasp compression platens

Upper Compression Platen with spherical joint

Extensometer for axial strain measurement

Lower Fixed Compression Platen

Tuning inputs
- **Experimental configuration**
- **Displacement or force control**

Sensing outputs
- **Test Animations**
- **Deformations**
- **Constraints**

Fluid Mechanics

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Numerical Wind Tunnel

SHOCK DIFFRACTION BY A WEDGE

Computation
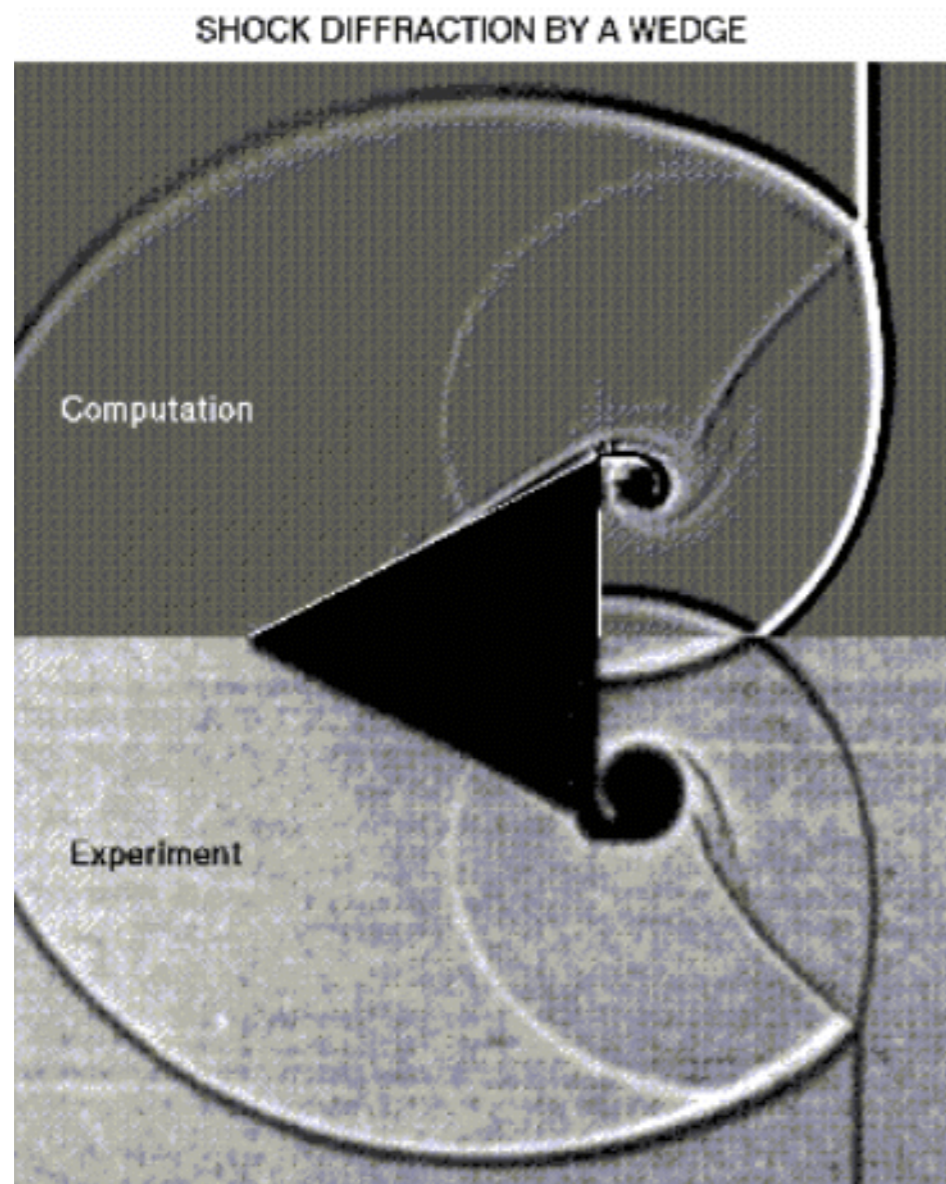
Experiment

Tuning inputs
- **Wing profiles**
- **Flow parameters**
- **Numerical methods**

Sensing outputs
- **2 or 3D visualization**
- **Animations**
- ***p* and *v* fields**

Concluding Remarks

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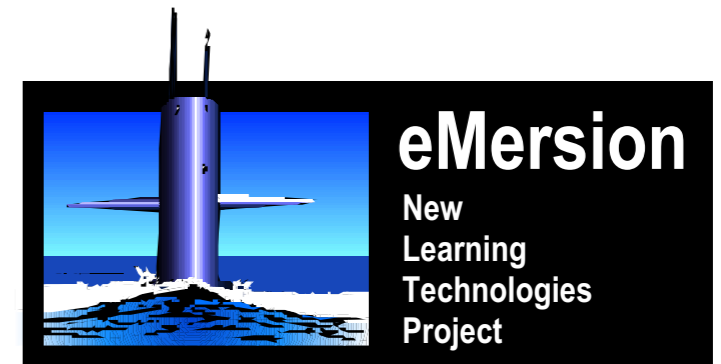
Enabling Immersion into Knowledge

- ◆ **Trial and error scheme for involvement**

- ◆ **On line experiments for flexibility**

  Simulation • Animation • Manipulation

- ◆ **Reusable components for deployment**

Knowledge fragments:	Content
Consolidation resources:	Experiments
Interaction interfaces:	Cockpits
Collaboration environments:	Lab journals