

NEW CONTROL SOFTWARE FOR CERBERUS 3D NANOINDENTATION SYSTEM

by

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INTRODUCTION:-

Evaluation of mechanical properties of thin films has become important with the extending application of functional thin films, such as the protection film in the magnetic recording media and heads, the interconnects in the integrated circuit, the surface modified layer in the ion implanted materials, etc. **Nanoindentation** is a powerful and simple means for evaluating the mechanical properties of thin films. The data of nanoindentation measurement is usually expressed by a curve of applied load f_a versus displacement (penetration depth) h .

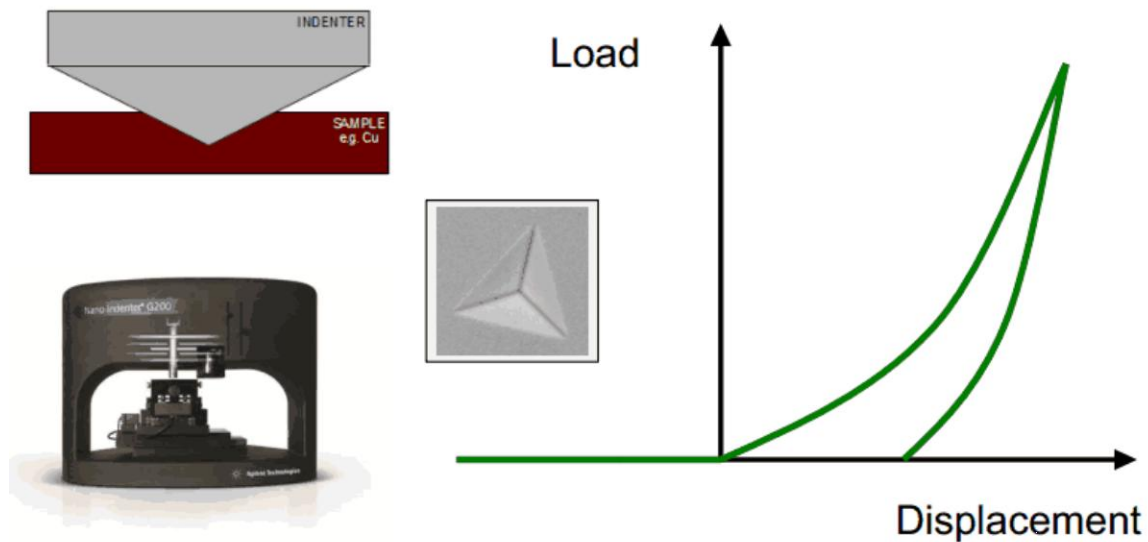


Figure 1: Indentation Technique and plot for result

Recently, several nanoindentation instruments were commercialized. **Cerberus** is one such instrument. Cerberus is controlled by an electronic hardware system that consists of an ISA-bus backplane which holds a number of ISA daughter-boards that control various functions of the indenter. These include interface cards to three external lock-in amplifier (LIA) boxes that are used to run the dynamic mode of the instrument in each of the x, y, and z axes. The entire system is managed by a Single Board Computer (SCB) ISA board, which is currently an old **Intel 80286** based PC running **Microsoft Windows 3.1** (i.e. DOS).

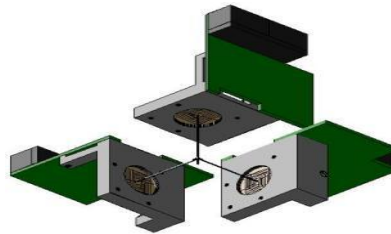


Figure 2: 3D Laser Indentation

The Cerberus controller software is a large program written in the HT Basic interpreted language. It consists of low-level subroutines that communicate with the ISA boards and LIAs, intermediate level algorithms that make Cerberus perform nanoindentation tests by making calls to the low-level subroutines, and high level GUI elements that interact with the user.

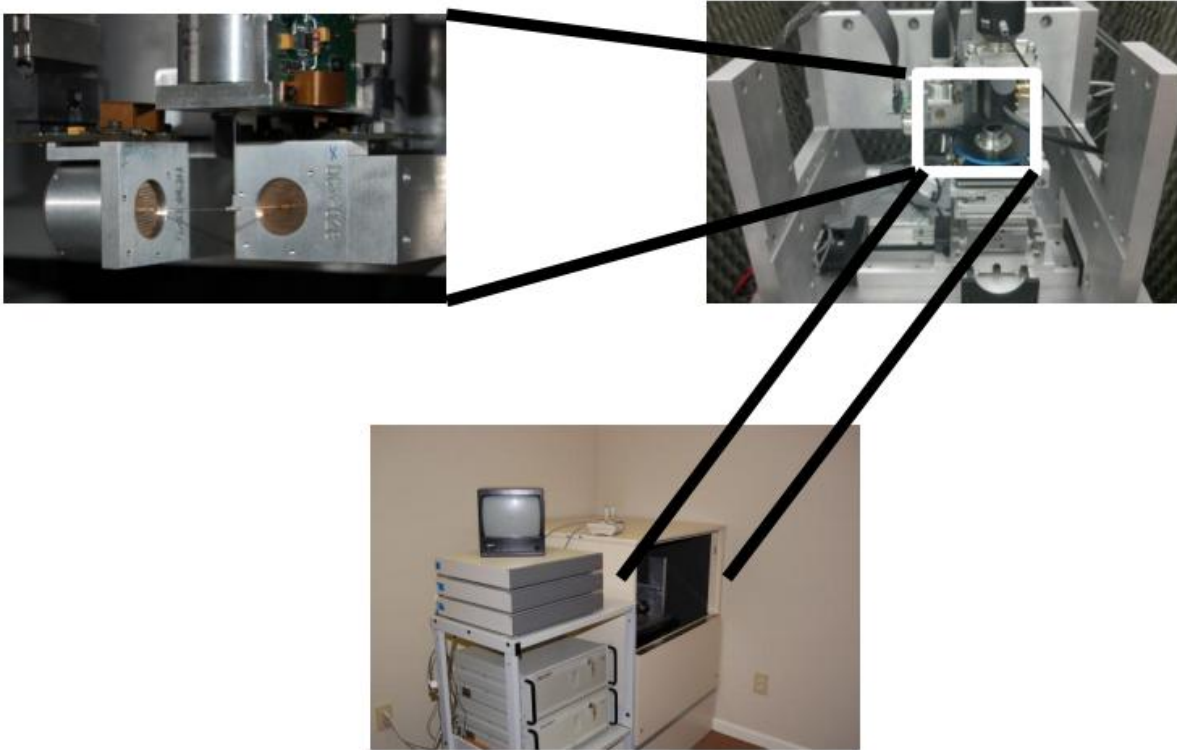


Figure 3: Cerberus nanoindentation system

AIM:-

The purpose of this project is to upgrade the existing control software system that runs the “Cerberus”.

The goals of the project are as follows:

1. To replace the HT Basic GUI elements with a modern GUI environment running under Windows 7 and written in a modern (e.g. scripted, e.g. PyLab (Python), Matlab, Igor Pro, or other) language suitable for scientific programming and real-time control, data storage and data display and review.

2. To encapsulate the existing HT Basic intermediate and low level subroutines in the new scripting language to make an API for easy extension of high level GUI code in the future
3. To implement the project with minimal interruption to the use of Cerberus. This will be done by writing a **Cerberus hardware simulator** that will essentially be a separate program run on a separate PC or laptop, which will receive and return simulated electronic signals through a DAQ card.

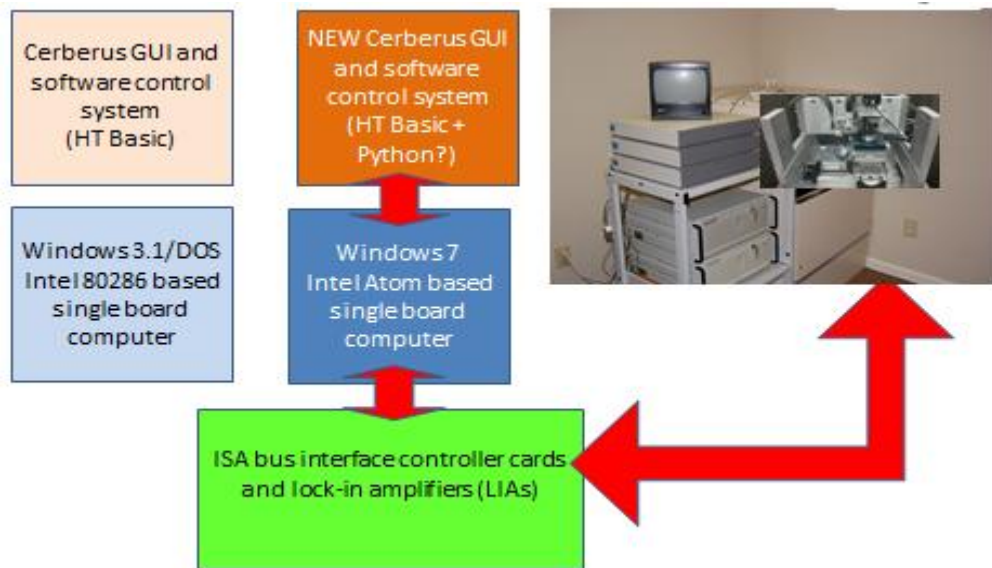


Figure 4: Front hand implementation

RESULT & DISCUSSION:-

The control system of the Cerberus nanoindentation system is outdated and needs to be updated. The old Cerberus GUI and software control system will be replaced by new software system which will be more efficient and can run smoothly on modern machines. In addition, a hardware simulator for the machine has to be designed. So that the machine may be free during the testing phase.

CONCLUSION:-

After analysis of the project and discussions with my supervisors the project workflow is envisioned as follows:

Task	June	July	Aug.	Sept.	Oct.	Nov.
Assess requirements, decide and order software and hardware, start on GUI elements for user inputs, live display of data, etc.						
Write and test the Cerberus hardware simulator						
Write and test the new Cerberus software control system using the simulator						
Test new software system for the real Cerberus						
Documentation and report write up						

The objectives of the next phase in the project are as follows-

- ✓ To explore various environments and summing up the pros and cons to finalize the environment.
- ✓ To study the existing HTBasic code of the Cerberus system and study about the subroutines.