Experience as a Research Assistant.

1. Bangalore, India

Mechanical Engineering Department.
Bangalore Institute of Technology.

January 2002 - June 2002.

Kinematics and Dynamics of Robots.
CAD \ CAM and Robotics Laboratory

- *Matrix representation to describe the position and orientation of rigid bodies and to perform computations and interpret their results.*

- *Understand the concept of kinematics as a translation between the position and orientation of the robot's end effectors and the configuration of the robot.*

- *Calculate the forward kinematics of any serially connected open loop manipulator. Understand why multiple solutions and singularities arise for the inverse kinematics. Be able to use standard solutions for the inverse kinematics of manipulators.*

- *Calculate the Jacobian matrix of any serially connected open loop manipulator. Understand the use of the Jacobian especially in calculating positioning and Orientational errors.*

- *Calculate the forces and torques acting on a rigid body and decide the condition for the body to be in static equilibrium. Be able to compute how forces and torques at the joints of the robot are transmitted to the end effector.*

- *Calculate how the inertia matrix of a rigid body changes as the position and orientation of the body is moved. Understand the derivation of the equations of motion for any serially connected open loop manipulator.*

- *Understand the problem of accurately controlling a robot manipulator whose dynamics are uncertain, highly non-linear, time varying and interactive.*

- *Offline programming of a Pick and Place Robotic arm using a robotic teach pendent with the help of VICTOR`S ASSEMBLY LANGUAGE 2*

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Experience as a Research Assistant.

2. Siegen, Germany

Institut für Regelungs und Steuerungstechnik (Institute of Control Engineering)
Zentrum für Sensorsysteme (ZESS)
Universität Siegen
Paul-Bonatz-Strasse 9-11
57068 Siegen

October 2002 - January 2003.

Development of a motor-driven tripod head for an automatic repositioning of a navigation system's camera beam.

- *Was responsible for the construction of partial components for a surgical robot-led tool system with the Drafting software AutoCAD V14*

The modiCAS (modular interactive computer assisted surgery) is a medicine technical project in that a new surgical assistant system is developed. In this project a digitizing system from Northern digital Inc. (NDI) is used to track the positions and orientations from patient, robot-arm and surgical tools. The digitizing system consists of a stereoscope camera beam which measures the positions from different reference bodies via infrared light. The reference bodies are fixed to patient, robot arm and surgical tools and deliver the positioning data required. The captured data is used to position the robot arm and for navigational help to the surgeon through real time visualization.

Through permanent alteration of the reference body's position is a repositioning of the camera beam often necessary. The repositioning which was done manually is being replaced through automatic repositioning. As current reference body's position is known permanently, the needed data for repositioning is already known to the system.

The user interface of the robot system has been designed for highly interactive operation. That means that the user / surgeon keeps the system under control all the time. It is possible for him to bring in his experience and his own senses into the control process. He is informed all the time about all important system parameters and he is able to intervene when ever he thinks it is necessary.

On 29. July 2002 the surgical robot system has been tested clinically for the first time. At the orthopedic University Clinic in Frankfurt the implantation of artificial cup prosthesis, this task is part of the total hip replacement surgery, has been done with robot assistance for the first time world wide. In this surgery, performed by Prof. Dr. F. Kerschbaumer, the robot assisted in reaming the acetabulum and in positioning and fixation of the cup prosthesis.

More Details can be found on the website www.modicas.de.

Experience as a Research Assistant.

3. Siegen, Germany

Institut für Werkstofftechnik (Chair of Materials Science and Testing)
Fachbereich 11
Universität Siegen
Paul-Bonatz-Strasse 9-11
57068 Siegen

February 2003 – Currently working.

Characterization of the High-Temperature Fatigue behavior of two gamma-based titanium aluminides under isothermal and thermo-mechanical conditions having special regard to environmental effects.

Under the supervision of Dipl.Wirt.-Ing. Patric Schallow

Intermetallic compounds based on γ-TiAl are promising candidate materials for various components in advanced gas turbine engines. Gamma Titanium Aluminides offer the most attractive solution with a temperature capability up to 800 °C. Moreover they have up to half the density and specific strength and stiffness compared with currently used steel and nickel alloys. Today γ-TiAl has found first applications, and reliability under high-temperature service conditions is a key issue. Since the material is intended to be used under conditions where it undergoes not only a mechanical loading but also changing temperatures, its thermo mechanical fatigue (TMF) behavior is of particular interest. The field of research is carried out in the context of a European Research Programme (Brite Euram) with several Industrial Partners (e.g. Volvo, Rolls-Royce, BMW, Dera, Onera, Alstom, and ITP).

Life Prediction Considering the Effective Damage Mechanism

Under the supervision of Dipl.Wirt.-Ing. Valerji Bauer

Continuous efforts to increase life of mechanical components an to minimize maintenance cost require better life prediction methods. The subject of this study is to obtain more reliable predictions of damage accumulation and lifetime of materials under thermo mechanical fatigue (TMF) conditions. Experimental results on four selected high-temperature materials (near alpha titanium alloy IMI 834, stainless steel X3 CrNi 18 9,near gamma TiAl type intermetallics, and the particle reinforced aluminium alloy X8019 + 12%SiCp are used to characterize relevant damage mechanisms an to examine whether selected current models can predict the fatique life under TMF conditions. Micro structural observations will be conducted to define the boundaries within which reliable life prediction can be expected. These observations should help to obtain physically-based improvements of current life prediction models.

More Details can be found on the website Chair of Materials Science and Testing