Application Pin : 82JJ8Z828
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Statement of Purpose

Background

I hail from a family of professional engineers/managers and educationists. However, it was my heart that I followed when I jumped in to the world of engineering. I chose engineering because I believe that an engineer creates. Now, as a final year student of **Civil Engineering**, the amazingly varied specializations within this seemingly unbounded field have left me agape, and this facet of engineering truly reflects what I set out to achieve in the first place i.e. visualize and create to my hearts content.

Long term goal

Three and a half years of undergraduate studies in the field of Civil Engineering at a renowned institute like IIT helped me to develop scientific temper and a keen eye for applying fundamentals to solve problems in engineering and research. Through my regular course work as well as extra workloads, I have developed a keen interest in research oriented study in the field of Water Resources Engineering especially with respect to **Mathematical Modeling of Flow in Natural Systems and Simulation-Optimization of Water Resource Systems.**

I have, therefore decided to pursue active research in Water Resources Engineering as a career. This would not only capitalize on my education but also lead me to work for the society and the problems faced with and due to water.

Short term goal

I believe that a master's degree in Environmental Fluid Dynamics and Hydrology at Stanford, will best serve my academic aspirations. I wish to explore strategic future research directions, in the academia or research laboratories, in the applications of Water Resource Engineering.

Research Background

It is my firm belief that research is a proper balance of theory and practice, to obtain theoretical results and to see, as far as possible, the immediate influence of any findings through their implementation. My experience with theory, practice and implementation began in my freshman year.

Living in a place with frequent downpours, most of us were faced with the problems caused by sudden rain. I set out to develop a gadget that monitors rain and takes action to protect drying grains or clothes. The experience with the mechanical workshop and electronics that my first year courses offered helped me set the device running. Following a submission of this idea and application I was soon the recipient of the renowned KVPY fellowship.
The "Kishore Vaigyanik Protsahan Yojana (KVPY)" is an ongoing program initiated by the Department of Science and Technology, Government of India to encourage students of Basic Sciences, Engineering and Medicine to take up research careers in these areas. The aim of the program is to identify and encourage talented students with aptitude for research.

Discovering an area of interest is always a challenge. I was faced with this challenge in my sophomore year. The KVPY Fellowship scheme let me choose a field of research to work on in many of the renowned universities across India. Mathematical modeling/Simulation-Optimization being an essential component of making predictions and interpretations of scientific phenomena, led me to request working on Civil Engineering problems with application of the same. During this period I worked on two projects under the guidance of **Dr. Pradeep Mujumdar**, Professor, Dept. of Civil Engg. IISc Bangalore. I was introduced to several optimization tools like ANN, Fuzzy logic and Genetic Algorithms. One application of these, I learnt by working on a **Fuzzy Waste Load**

Allocation Model: Simulation-Optimization Approach. The Waste load Allocated model developed in the study provides the best compromise solutions to the Pollution Control Agency (PCA), responsible for maintaining the water quality and the dischargers disposing pollutants into the river system. Working on this I acquired knowledge in the field of Hydrology and Hydraulics, and suggested to my mentor, the implementation of a Simulation-Optimization approach to an Urban Storm Water Management Model. Hence developed **A Real-Time Pumping Control Model for Storm Water Management** with a Simulation–Optimization approach.

I presented the outcome of my summer work in a technical paper titled '**A Real-Time Pumping Control Model for Storm Water Management** : **Simulation–Optimization approach**' at a **National Level Student Paper Presentation Contest, Ingenium 2004, in association with ASCE** and was placed second overall. In the course of this experience and after undertaking a Seminar and Publication Writing course I was able to understand and appreciate the art of technical writing and the need for research documentation.

After exposure to the field of Water Resources through these projects I decided to explore the field further. I was recommended by **Dr. Subashisa Dutta,** Assistant Professor, Dept of Civil Engg, IIT Guwahati for an internship at the Technical University of Munich (TUM). I received a full DAAD (German Education Council) scholarship to work on a project titled "**Parameter study for optimizing non-controlled retention areas along middle reaches of rivers**" under the guidance of **Dr. Theodor Strobl,** Univ. Professor, Department of Hydraulics and Water Resources Engineering, TUM. It aims at designing intake and outlet structures, adapted to the process of a flood event, i.e. to reduce the peak flow. Currently, the results of the parameter study are being integrated with real-time data from flood events along the Danube river, Germany. The results of this work have been referred by Fischer (2005) for a conference paper presented t the World Water Congress 2005.
Working in a totally new cultural milieu was an enthralling experience. Interacting with experienced researchers and contributing ideas made me realize that research discoveries often arise when one looks at old facts in a new way, and working in a team often helps one reach for ideas beyond his grasp.

Continuing on the Uncontrolled Retention Structure Design, I am at present working on a project titled "**Modeling Flood waves in a braided river with natural polders.**" under the guidance of **Dr. Subashisa Dutta** for my bachelors' dissertation. The project of modeling flood waves in rivers with natural polders is based on the satellite data obtained for the Brahmaputra river valley. The soil conditions in North-Eastern India require ground water flow also to be modeled to find out the flow contribution of the stagnant water in the flood polders during the mitigation period.

The courses I undertook on Fluid Mechanics (CE203), Hydraulics and Hydraulic Structures (CE301) and Hydrology (CE311), have captivated my interest. Drawing inspiration from my professors, peers at IIT Guwahati, and the opportunities provided by the KVPY Fellowship, I have been able to carry out various projects in the fields of Urban Storm Water Management and Flood Hazard Mitigation. These projects have shaped my research interests in **Mathematical Modeling of Flow in Natural Systems and Simulation-Optimization of Water Resource Systems.**

Professional Goals and Reasons for applying to Stanford.

I look upon graduate study as an avenue to refine my skills and give a direction to my research career. It would be my chance now to make further contribution to the field in which I undertake research. I intend to pursue my **MS** leading to **PhD** at Stanford inspired by its repute, excellent research facilities and the distinguished faculty. I am particularly interested to work with Professor **Peter K. Kitanidis**; I would also like to be part of the research groups of Professor **David Freyberg** to work on Hydrologic modeling. It would be nothing less than a privilege to be able to work under them. I believe that Stanford offers the best match and a great environment for my area of interest.

This degree would ultimately enable me to fulfill my ambitions of working as a **research professional** at an academic or a dedicated research institution.

Extra curricular

Extracurricular activities, which have served to maintain a healthy mental balance, have always been a significant part of my life. Music is my passion. I have received training in classical music for over eight years to play the Indian percussion instrument, the *Mridangam*. I have performed on stage for several Cultural Festivals. Even with the heavy workload at IIT I continue to pursue my interest in music and the fine arts. I served as the Music Society Secretary for a year and play the Drums for the college band. I have been an active debater and won several elocution competitions. Throughout my educational period I have participated in over 150 cultural events and received 112 certificates for achieving excellence.

Academic background

A few inconsistencies in my freshman year are because of the time it took me to adjust to the exceedingly competitive environment. Since IIT admits only the best students throughout the country, I believe, in view of the competitive atmosphere, that the grades secured might not reflect my aptitude for research in an absolute sense. I was quick to cope and have since seen an upward curve in my performance in the following semesters even with the added load of out of class projects.

Overall, I have displayed a good academic record before and during my undergraduate studies. Having secured a 99 percent average in the sciences and a 100 percent in Computer Science in my Secondary School Examination, I continue to maintain a good academic record with a GPA of 8.74 in the VI semester of my undergraduate studies. My proficiency in spoken and written English is well showcased in my GRE and TOEFL scores.

Substantiation and Conclusion

I am fully aware of the commitment and perseverance required for research and believe that my aptitude and motivation will see me through the challenge. I am also confident that given an opportunity, I can contribute to the ongoing work in your graduate program in a productive manner. I also intend to contribute to the cultural diversity and student activities of Stanford.

Looking forward to joining the Stanford University for pursuing higher studies leading to a Master's/Doctoral degree.

Mohan Rajasekar