Statement Of Purpose

Applicant's Name - Ravi Tandon
Applying For - M.S. in Computer Science

Research Interests: One of the primary aims of scientific research is to fabricate technologies that weave themselves into the realm of human understanding in a seamless manner. *My motivation behind pursuing graduate studies is to be able to identify and subsequently understand inherent problems in computer systems that impede the augmentation of pervasive technologies.* Through my research I have primarily focused on resolving issues of energy deficiency in Wireless Sensor Networks and developing transactional support in file systems. I intend to pursue Masters of Science (MS) in computer science at *University of Illinois at Urbana-Champaign.*

Wireless Sensor Networks:I undertook my first project in sensor networks during the fifth semester of my undergraduate studies. It involved designing an energy efficient clustering scheme using residual energy of sensor nodes. We proposed a protocol called *Adaptive Lagrangean Clustering Protocol (ALCP)*[1]. The research work has been accepted in *The Second IEEE International Conference on Parallel, Distributed and Grid Computing (PDGC-2012).* During the two years I worked on this project, I proposed the idea, carried out experiments and finally analyzed the outcomes to publish a paper. Working on an open-ended problem for such a long period of time made me realize the importance of diligence and patience in research. During further examination ALCP protocol, we designed *Distributed Lagrangean Clustering Protocol (DLCP)* for heterogeneous sensor networks. *DLCP*[2] was accepted in *The 14th International Conference on Distributed Computing and Networking (ICDCN 2013)* as a poster paper. To further understand sensor network protocols, I worked on variants of the research problem. It helped me broaden the scope of enquiry. The efforts resulted in two different clustering strategies viz. *Weight Based Clustering in Heterogeneous Networks (WBCHN)* and *Cluster Head Reelection Protocol (CRP).* We compared CRP with a popular sensor network protocol and observed it to perform better. The intellectual challenge involved in innovating on an existing technology was an exhilarating experience. CRP [3] was accepted in *The Fifth International Conference On Communication Systems And Networks (Cosmnets 2013).*

My research efforts had been focused on experimental evaluation of different clustering schemes and comparison with existing protocols up to now. Theoretical analysis of sensor networks was an intriguing domain of research that I had never ventured into. I came up with a stochastic model called *Unequal Probability Election Model (UEPEM)* for predicting optimal number of cluster heads in a circularly shaped sensor network. My research work on *Determination of Optimal Number of Clusters in Wireless Sensor Networks* was been published in the *International Journal of Computer Networks and Communications*[4].

File Systems: I am also interested in the development of file systems. My bachelor's thesis, *Recovery Protocols For Flash File Systems*[5], was on the implementation of a transactions on a flash file system. This dissertation presents a transaction support and management system for log-structured file systems. It was accepted as a paper in *The 9th International Conference on Distributed Computing and Internet Technologies (ICDCIT 2013).* My thesis gave me insight into supporting concurrent backup and transaction operations on a log-structured file system. Based upon this idea I have designed a consistent online backup scheme for log-structured file systems (*Online backup and versioning in log-structured file systems (OBVLFS)*)[6]. *OBVLFS*

was accepted in the *IEEE International Conference on High Performance Computing (HiPC-2012)* in a student symposium.

Ubiquitous Computing: Human Computer Interaction is another facet of research that has intrigued me immensely. During the summer project of 2011, I worked on Ubiquitous Computing, where I developed *novel interface designs* which could facilitate humans to interact with digital information in an effortless manner. I validated my hypothesis by conducting a user study and analyzing the feedback received from the human subjects. It made me realize that the integration of digital and physical world could enrich human experience and make us efficient.

My Vision: Ubiquitous computing presents its own set of challenges. Predominantly, human understanding of the interdependence between the cyber space and material realm needs to be reframed. Wireless Sensor Networks will lay the corner stone of a future that would embed digital information into the physical domain. Providing a comprehensive support to a pervasive computing environment could lead to significant advancements.

I believe that University of Illinois at Urbana-Champaign will provide me with a healthy environment for research. I wish to join the *Cyber Physical Computing Group* under *Tarek F. Abdelzaher*. I am highly motivated to work under the guidance of eminent researchers viz. *Robin Kravets, Indranil Gupta, Marco Caccamo, Pramod Viswanath*. Their work in the field of systems has been fascinating and challenging. My aim is to remain in the field of academia and pursue further research work. In the end, I would like to thank the advisory committee for patiently reviewing my graduate application.

Comprehensive information about my projects can be found http://ravi-tandon.com/.

References

[1] R. Tandon, B. Dey, and S. Nandi, "Adaptive lagrangean clustering protocol," in *The Second IEEE International Conference on Parallel, Distributed And Grid Computing.* IEEE Xplore, 2012.

[2] ——, "Distributed lagrangean clustering protocol," in *The 14th International Conference on Distributed Computing and Networking (ICDCN 2013).* Lecture Notes in Computer Science (LNCS), 7730,, 2012, pp. p–450.

[3] R. Tandon and S. Nandi, "CRP: Cluster Head Reelection Protocol for heterogeneous Wireless Sensor Networks," in *The Fifth International Conference On Communication Systems And Networks: Cosmnets 2013.* IEEE, 2013.

[4] R. Tandon, "Determination of optimal number of clusters in wireless sensor networks," *Arxiv preprint arXiv:1208.1982*, 2012.

[5] R. Tandon and G. Barua, "Recovery protocols for flash file systems," in *The 9th International Conference on Distributed Computing and Internet Technologies (ICDCIT 2013).* Springer, Lecture Notes In Computer Science, 2013.

[6] R. Tandon, "Online backup and versioning in log-structured file systems," in *High Performance Computing 2012.* IEEE, 2012.