A REQUEST for COLLABORATIVE RESEARCH PROPOSALS (RCRP)

GTU BOARD for MOBILE COMPUTING and WIRELESS TECHNOLOGIES

(a part of the NETWORKED RESEARCH SYSTEM at GTU)

TO ALL FACULTY MEMBER: Research is an important part of the Learning System in any institution of Higher Learning. Since last year, the University has been working with the faculty to upgrade our Learning systems in many ways. Similarly the University wants to assist the faculty in every possible way in their research.

Since the University has started in August 2011, three excellent Master's programs in the areas of Mobile Computing & Wireless Technologies, Cyber Security and VLSI Design & Embedded Technologies, the first RCRP is being issued in this area. Your suggestions for RCRPs in other areas are welcome.

Research

in the area of

Mobile Computing, Networking and Applications (MNA).

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The Concept of Networked Research System at GTU

BACKGROUND of NETWORKED RESEARCH: Even after 64 years of independence, in 2011, no Indian University could be ranked among the top 200 Universities of the world. (by QS Ranking system – Reference:http://www.business-standard.com/india/news/indian-varsities-fare-badly-in-2011-qs-rankings/146111/on).

Why is it so?

- We are not able to have adequate number of well-qualified faculty, working together in a collegial environment for research.
- Faculty members all over the world work for management of their department, faculty and the University. But we provide very little of secretarial support and use up a great deal of the time of our faculty members for doing clerical jobs.[1]
- Our faculty members are required to take more of teaching load than the faculty members at any of the top 200 Universities.[2]

As an example let us compare Computer Science and Engineering at IIT Delhi (which in 2011 was India's highest ranked University at rank 218) with the Cheriton School of Computer Science at University of Waterloo (ranked 160 in 2011). CSCS at Waterloo has 84 regular faculty members. (Reference: As of 11th December 2011, http://www.cs.uwaterloo.ca/about/people/faculty). On the other hand CS at IITD has 26 faculty members. (Reference: http://www.cse.iitd.ernet.in/people/faculty.shtml)

Now let us look at GTU. By AICTE regulations, we should have 3,650 faculty members in the area of Computers and It and we should have 2,308 in the area of Electronics and Communication. (We have a good number of vacancies and most of our faculty members are young, but enthusiastic. As a whole we may have more PhDs in our system than may be the case in any top-rated institution. However while PhDs in engineering may be smaller in number, we have a good number in Pharmacy and Businesss Studies.) However they are not able to work together since they are all spread out over hundreds of departments all over the state.

With today's means of communication, it is quite possible for these faculty members to begin working together.

The process has already been started. On 22nd December 2010, GTU set up the Board for Environment and Green Technologies and on 6th February 2011, we set up the Board for Mobile Computing and Wireless Technologies. Faculty members from all over the state are working in the two Boards for organizing presentations of their work and for organizing seminars and workshops.

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In January 2012, we shall be establishing GTU Sectoral Innovation Councils (SICs). Each SIC will be a virtual group in a specific area of technology. The SIC are being set up since during the summer of 2011, we have succeeded in locating 16,000 problems, relating to the shop-floor issues in thousands of industries. Our Final Year students are working on solving these problems as their Final Year projects. We have to marshal all the knowledge resources within GTU, in the industries and in fact from any where else in the world to provide mentoring to these students so that by May they are able to solve these problems. In each SIC faculty members in a discipline, from all over the state, will work jointly to mentor our Final Year students, to complete their Final Year projects by April 2012.

Many of the Professors at GTU Colleges have done creditable work during their doctoral studies. Some others are supervising excellent work by their research students. (We have about 950 Master's students at Master's in Computers and IT and we have about 780 Master's students in the area of Electronics and Communication. --We have about 250 students in our doctoral program, which started on 30th Of September 2011.) Some of us have been able to successfully compete for research grants from governmental organizations, which support research at Universities. But very few of us have been able to get research grants from user industries, businesses or other user entities. The fact is that while none of our Colleges has been able to establish a dynamic research group, which is recognized for its excellence by its peers everywhere, jointly we may have the capability to generate path-breaking ideas, new products and better processes, for use by the world.

We feel that if our faculty members, our Master's students (about 39,000 in number) and doctoral students (250 as of now) work together, within a short time, we may be able to have active groups of researchers, who may be able to do useful and relevant research.

Note: [1] and [2]: GTU is working with college managements to progressively solve these problems also.

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A REQUEST for COLLABORATIVE RESEARCH PROPOSALS

This Request for Collaborative Research Proposals (RCRP) is aimed at seeding research activities in the area of **M**obile Computing, **N**etworking and **A**pplications (MNA) at GTU.

GTU wants to assume leadership in learning systems in this area. On 6th February 2011, we had set up the Board for Mobile Computing and Wireless Technologies. Since then, the Board has arranged some workshops and seminars. In August 2011, we have started three Master's programs, which we hope may develop into world-class programs. These are in the areas of (i) VLSI design and Embedded Technologies, (ii) Mobile Computing and Wireless Technologies and in (iii) Cyber Security.

GTU seeks proposals to initiate collaborative research in the area of MNA.

Every Proposal, submitted to GTU under this RCRP, **must be** a joint research proposal, which involves multiple Colleges and faculty members from GTU. It may also include eminent researchers from outside GTU as Co-Members of the Research Team or as Members of the Advisory Board for the Research Project..

GTU will support the research by providing the following:

- (i) Paying for Research Associates at the GTU rates
- (ii) Helping with library and literature facilities
- (iii) Permitting the use of its laboratories, once its building is ready and the laboratories have been put in place
- (iv) Providing support for participation in conferences - to one member of the team per conference
- (v) Encouraging the Team to apply to GUJCOST (Gujarat Council on Science and Technology) and to central government organizations for research grants
- (vi) Helping the team to establish contacts with industries, users and with researchers in India and abroad
- (vii) Assisting through Entrepreneurship Development Institute of India, Incubators, IPR Cell (proposed) etc, when the Team feels it was becoming ready with a marketable product,

GTU will also be prepared to consider requests for any other help required for pursuing research successfully under the proposal.

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Please apply with a Preliminary Proposal, which should give the following:

(a) A summary of the research proposal

(b) Technical Description with the expected challenges and the six-monthly milestones. Please give all the required references *(References may be of no more than 4 pages in Times New Roman 10 Pt with line spacing of 1.15).*

(c) A clear statement of what is innovative in the research proposal

(d) GTU wants to be a leader in Learning Systems. Every research project should have a positive impact on our learning systems. The Proposal should include the effects of the research project on

  (i) improvement of laboratory work

  (ii) updating the syllabi at under-graduate or post-graduate level

  (iii) doctoral work.

(e) The Collaboration Plan within the Team and the outreach plans with government laboratories or large industries, having interests in the field

(f) GTU has already established a close working relationship with Businesses and Industries (BIs) and it is working on strengthening the relationships. The Proposal should specify its plans to be relevant to BIs and other entities of the Society.

Note: The Appendix gives some examples of the research topics, on which a proposal can be submitted to GTU in response to this RCRP.

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Appendix:

Information Technology Research Academy (a central government-funded organization) has issued a Request for Proposals in the area of MNA. In the RFP, ITRA has given the following statement of why MNA is important and it has given examples of research problems. These examples can be of use to GTU faculty members, when they want to submit a proposal to GTU in response to this RCRP. The following material is drawn from the ITRA's RFP:

"With the tremendous advancement and growing coverage of cellular and wireless access networks, decreasing costs and increasing capabilities of mobile phones, it is becoming clear that mobile phones are likely 'the' interface of choice for access to many services over the Internet. MNA is expected to have an impact in numerous problem domains, ranging from the general areas of governance to agriculture, transportation, health, education, infrastructure monitoring, energy and sustainability, emergency preparedness, supply chain management and entertainment, illustrated by the following

Examples of MNA Domains:
- Empowering the Physically Disadvantaged
- Disaster Management
- Pervasive Security
- Mobile-Healthcare
- Educational and Learning Technologies
- Energy and Sustainability
- Mobile Commerce
- E-Governance (IT aided government functions)
- Pervasive/Ubiquitous Computing
- Smart Environments (e.g., smart hospitals or green buildings)
- Infrastructure or Environment Sensing and Monitoring
- Entertainment (e.g., gaming)
- Agriculture and Food Monitoring
- Telematics (e.g., transportation, location based services)
- Supply/Distribution Chain Management

Real world problems in these important application domains call for a variety of technical challenges to be addressed, including those related to performance, reliability, security, privacy and usability; cost effectiveness (e.g., of mobile services),and rapid design and development. Some of these problems lie within a single domain of IT expertise, and can be addressed by individual or small groups of researchers with expertise in familiar IT areas including, but not limited to, the following

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Examples of IT Research Areas
- Computer and Communication Theory
- Computer and Communication Networking
- Operating Systems
- Probability Theory and Stochastic Processes
- System Modeling and Analysis
- Privacy and Security
- Image and Video Understanding
- Speech Understanding
- Multimedia Signal Processing and Understanding
- Sensors and Actuators
- VLSI Design and Embedded Systems
- Natural Language Understanding
- Network Analysis
- Distributed Algorithms
- Human Computer Interaction
- Linguistics
- Reliability and Dependability
- Coding and Information Theory
- Geographical Information Systems
- Cloud computing in Mobile Environments

On the other hand, many other problems require synergistic integration of knowledge from multiple IT areas and are therefore best addressed by collaborative, interdisciplinary teams of experts from different IT areas. Such integrative collaboration may be illustrated by the following

Examples of Interdisciplinary IT Areas

(These should be viewed strictly as examples illustrating the intended scope of interdisciplinarity, their variety being necessarily limited by the imagination of those, who created the document, and by the space available here. Proposals involving creatively defined interdisciplinary problems, collaborations and teams are highly encouraged.)

- Operating Systems for Low Power Devices
- Networks of Sensors and Smart, MobileDevices
- Effective Low Resolution Low Bit Rate Displays
- Coding for Efficient and Secure Access
- Efficient/Distributed Solutions for Image and Video Communication
- Operation of Mobile Devices in Unreliable Networks
- Limited Vocabulary, High Speed Natural Language Interfaces
- Securing M2M Communications
- Middleware Services for Mobile and Pervasive Computing

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- Cyber-physical Systems and Smart Environments
- GIS for Low Resolution and Highly Mobile Location-based Services
- Functionality (e.g., aforementioned functions) in Constrained or Challenged Environments
  - o Low power
  - o Low cost
  - o Small form factor
  - o Limited resources (e.g., battery, storage, CPU, bandwidth)
  - o Poor/unreliable connectivity

The quality of solutions for large problems can be further enhanced by custom integrating the specific needs and characteristics of the application domains, as illustrated by the following

Examples of Interdisciplinary IT and Problem Domain Areas
(Again,it is expected that the proposals will not be constrained by the examples listed below whose purpose is strictly to illustrate the intended scope of interdisciplinarity.)

- Communication Algorithms for Facial Images
- System interfacing with
  - o Biosensors
  - o Agricultural Sensors
- Versatile Interface Design for Specific User Groups with
  - o Limited Literacy
  - o Language/Audio/Other Preferences
- Accessories for Users with Specific Physical Challenges
- Efficient Search and Retrieval of Information of Specific Types
  - o Location Specific
  - o Subject Specific

Once again, it should be noted that the examples given above, and elsewhere in this document for that matter, are intended to serve as illustrations only. They should not be treated as RCRP's expectations, or limitations on the problems or areas in which the proposals are solicited. **The proposals must have a crisp focus, on some combination of a sufficiently small number of aspects of MNA, whether listed above or not and whether suggested by the above examples or not. A diffuse and thinly spread out set of objectives is not likely to lead to the high quality of work this RCRP envisions, and therefore, will not be evaluated favorably. Quality and novelty are important, not just the breadth.** Innovative problems and application domains will themselves be considered as important features of the proposal."

*   *