



RA 06-46

Applicant Information Package

Computer Science Study Group (CS Study Group)

FY 2007

September 15, 2006

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A OVERVIEW

The Defense Advanced Research Projects Agency (DARPA), with support from the Institute for Defense Analyses (IDA), is soliciting applications from U.S. institutions of higher learning (institution) nominating junior institution faculty to participate in the “Computer Science Study Group”, or CS Study Group. The CS Study Group consists of two principal functional areas: participation in the FY07 Computer Science Study Panel (CS Study Panel) and application for, and conduct of, Computer Science Research Projects (CS Research Projects) in support of DoD objectives. Participation in the CS Research Projects is limited to those individuals who were selected to participate in the CS Study Panel. The CS Study Panel will meet at least four times throughout 2007, for a total of approximately twenty days. Two of the meetings will occur during the academic year and will take place in the Washington D.C. metropolitan area. Two extended meetings, lasting approximately a week each, will take place during the summer and will involve travel throughout the United States. Applicants selected to participate in the CS Study Panel may conduct CS Research Projects in the second year and, optionally, in the third year of the CS Study Group program.

For successful applicants, host institutions will receive grants or cooperative agreements, as applicable, for up to \$100,000 to support the applicant’s participation in the Computer Science Study Panel. IDA will have administrative responsibility for the Panel, which will include organizing and leading trips to government and industry sites, some of which will require a Secret security clearance. In addition, participation in this program may expose participants to proprietary and other non-public data and as a result participants will be required to sign Non-Disclosure Agreements (NDA)/Conflict of Interest (COI) forms or other related forms as required by IDA. In performing its administrative functions under this program, IDA will hold all participants’ clearances and NDA/COIs. Due to this, all participants on the panel must be U.S. citizens and must either already have a minimum of a Secret security clearance or apply for and receive a U.S. Department of Defense SECRET security clearance through IDA. Funding to the host institution, which will not exceed \$100,000 per applicant, will support participant salary, to include time spent while on the panel as well as additional time (e.g., summer research support) while at the host institution, and travel expenses for participation in year 1 of the CS Study Panel.

Near the end of the first year, each selected participant will be eligible to submit a research proposal for which they would become the principal investigator. The goal of these CS Research Projects will be to identify and develop innovative ideas with high payoff in cognitive systems, computer graphics, computational physics, information technology, machine learning, control and networking of unmanned vehicles, secure communications, software engineering, terrain mapping and visualization, and other advanced disciplines in computer science of potential interest to the military. Research will focus on ideas that can lead to revolutionary technology to permit significant advances in computational modeling, simulation, control, and analysis and DoD functional capabilities. Technologies should be derived from the broad area of computer science, although respondents do not necessarily need to be members of traditional computer science departments. A participant is not required to submit a proposal for a CS Research Project. However, any participant who does not submit a proposal for a Yr. 2 CS Research Project will not be eligible for future funding under this program. Participants whose Yr. 2 CS Research Projects are not selected for award will not be eligible to submit proposals for Yr. 3 CS Research Projects.

Details of the requirements for the research proposal will be provided to the selected applicants as part of the CS Study Panel. Proposal submissions may be made through the Grants.gov

website, found at <http://www.grants.gov/> , or directly to DARPA's Defense Sciences Office (DSO) at www.sainc.com/dso0646.

Each selected CS Research Project will be funded in an amount not to exceed \$500,000, expected to commence some time near the spring of 2008. Research activities will take place at the institution, and will be confined to unclassified, fundamental research, that supports the objectives of the program. The principal investigators may continue their participation on the CS Study Panel for a second year, funded from the research project grant or cooperative agreement.

Starting in late 2008, principal investigators will be eligible to submit proposals for matching funds for the continuation of their institution research project, in an amount not to exceed \$250,000. The designated funds to be matched (up to an additional \$250,000) may come from any government or industrial source, but must support the ongoing research project in a manner consistent with the development and transition of computational technology as developed in the research project. A principal investigator is not required to continue participation for ongoing research through either an extension or follow-on effort. However, any principal investigator who does not desire to participate in follow-on effort for a second year will not be eligible for future funding under this program.

Although no classified work will be conducted at the institution, panel participants will take part in classified meetings and onsite visits. Further, as noted above, the participant should be a "junior faculty member" at a U.S. "Institution of Higher Learning (Institution)," and a U.S. citizen. Generally speaking, this means that the participant is a full-time employee of an institution engaged in teaching courses and managing research, primarily a domestic college or university, and that the participant is either pre-tenure or no more than seven years beyond receiving a doctorate degree.

A web site for general information about this solicitation is maintained at <http://www.darpa.mil/baa/#dso>. The information provided in this Applicant Information Package, in addition to the solicitation provided in Grants.gov, constitutes a DARPA Research Announcement (RA), which is a Broad Agency Announcement as contemplated in the FAR 6.102 (d)(2).

The Grants.gov announcement and this document are available online at <http://www.darpa.mil/baa/#dso>. Administrative or technical questions should be sent via e-mail to RA06-46@darpa.mil. All questions and answers of relevance to the community will be posted to a "Frequently Asked Questions (FAQ)" accessible at the URL <http://www.darpa.mil/dso/solicitations/FY2007CS2PFAQ.htm> . Questions for the grants officer, including budget questions, should be directed to RA06-46@darpa.mil. Note that the process of awarding the initial grant or cooperative agreement only begins after the proposer's initial eligibility for a clearance has been determined, the proposal has been determined to meet the evaluation criteria specified herein, and the proposer is notified of his or her selection to be a participant on the CS Study Panel. The DARPA contracting officer serving as the grant officer for the CS Study Group will be Wade Wargo, RA06-46@darpa.mil. Questions regarding the clearance process should be e-mailed to CS2P.ClearanceQuestions@ida.org.

B OBJECTIVE

DoD conducts research to develop computational capabilities by developing a broad range of technologies in areas of computer science of interest for military applications. These areas

include, but are not limited to, a number of broad categories of particular interest, including operation, control, and optimum exploitation of unmanned vehicles; optimum deployment and networking of sensors and other information sources, and efficient and economic means of presenting and exploiting the data they generate; modeling and simulation of the modern air, sea and land battlefield, including terrain, weather and environmental conditions, enhanced methods for secure sharing, collaboration, transmission, archiving and retrieval of information, and improved planning methodologies for deployment of military resources. The purpose of this project is to rapidly identify ideas in the field of computer science that can be used to provide revolutionary advances in the broad areas outlined above, as well as other areas that are deemed relevant to military applications, and to rapidly investigate the application of those ideas in problems of significance to DoD. Research should demonstrate innovation and creative thought to move beyond current practices and applications to achieve fundamental advances in the field.

This applicant information package covers applications to be submitted by 31 October 2006 for FY2007 Year 1. Details regarding follow-on application submissions will be communicated to the selected CS Study Panel participants during Year 1.

C PROJECT COMPONENTS

C.1 COMPUTER SCIENCE STUDY PANEL (CS STUDY PANEL)

Faculty members are invited to apply as candidate participants for the CS Study Panel. Participants should be no more than seven years beyond receiving a doctorate degree, with demonstrated exceptional potential for world-class contributions to the field of computer science. Each participant shall have intense research interest in a computer science topic of relevance to DoD and demonstrate novel ideas that lead to fundamental advances rather than incremental work in the field. Section D contains a description of example topics, but is not intended to be a complete list. Other topics will be considered, and will be judged according to their innovativeness and potential relevance to applications of interest to DoD.

Candidates will be selected based on a review of the applications by DARPA reviewers. Each selected participant will either provide IDA with its clearance or immediately submit a full application for a SECRET level security clearance through IDA if they do not already have an appropriate security clearance. Applications involve completion of Standard Form SF-86 (see <http://www.dss.mil/epsq/>), which can be completed through an online process. A general determination for each candidate as to whether their clearance nomination is likely to be successful will be made as soon as possible. Once the eligibility of selected CS Study Panel applicants is confirmed, awards to the associated institutions will then take place.

Multiple candidates may apply from any institution. DARPA estimates that there will be at most a dozen participants on the panel during 2007.

The CS Study Panel will also include a number of “mentors” and “adjuncts,” as selected by DARPA and IDA. The meetings of the study panel will consist largely of briefings and visits, and will provide to the combined members of the Study Panel information about the challenges and successes of the DoD in the field of computer science.

The first formal meeting of the 2007 Computer Science Study Panel will occur approximately in March 2007. This session will last three days, and will take place at IDA in Alexandria Virginia. The session will consist primarily of briefings and discussions at the IDA facility.

There will be two summer sessions in 2007, each meeting lasting roughly a week. Participants will receive, well in advance, instructions as to a date, time, and location where the meeting will commence, and a date, time, and location where the meeting will end. Both locations will be

somewhere in the Continental United States. Travel to and from the participant's host institution to the starting point and from the finish point will be arranged individually by the participant's host institution. For the time in between the start and finish points, transportation, transfers, hotel bookings, and some meals will be arranged by a travel agency designated by IDA, which will assess an applicable cost for the session. Participants will visit industrial and government laboratories, factories, assembly plants, and military ranges and facilities where important applications of computer science technology are currently operational. Participants will meet with operational workers, project managers, commanding officers, government researchers, and many others. To receive the full benefit of all the visits, there will be occasions where moderate physical activity or ability will be required.

A final session in 2007 will be held in the fall, again at IDA. This session will likely include visits in the Washington, D.C., region and transportation will be provided from IDA.

C.2 COMPUTER SCIENCE RESEARCH PROJECTS (CS RESEARCH PROJECTS)

Each selected participant in the CS Study Panel will be eligible to submit a proposal for a CS Research Project, with the participant as the principal investigator. Proposals will be due approximately mid-November 2007; details regarding the Year 2 CS Research Project proposals will be communicated to the selected CS Study Panel participants during Year 1. Each proposed project will support revolutionary ideas for fundamental research in the broad computer science field to provide capabilities relevant to the mission of DoD.

Proposals will be selected for funding, and DARPA or its agents will negotiate and award grants or corporate agreements, as applicable, to the selected U.S. institutions to fund the research projects. The funding will support the continued participation by the principal investigator on the CS Study Panel and CS Research Project. A participant is not required to submit a proposal for a CS Research Project. However, any participant who does not submit a proposal for a year 2 CS Research Project will not be eligible for future funding under this program. Participants whose Yr. 2 CS Research Projects are not selected for award will not be eligible to submit proposals for Yr. 3 CS Research Projects. The CS Study Panel will meet again during the calendar year 2008.

The funding will also support a program of research, as specified in the proposal, which will typically start in the summer of 2007, and continue for at least a year. The research will be conducted by the principal investigator (PI) and the PI's research team. The principal investigators will be encouraged to make use of resources and collaborations that arise as a result of their participation on the CS Study Panel, but the research will take place in the institution environment and will be unclassified fundamental research that makes use of unclassified data and general scientific objectives.

C.3 DARPA INFORMATION ANALYSIS WORKSHOP

Toward the end of the calendar year (starting in 2008), DARPA will organize a workshop of the PIs of CS Research Projects and others. At the workshop, researchers will share ideas and report on the status of the research outlined in their proposals. Each CS Research Project will present a paper. Costs for participation in the workshop by the institution representatives will be funded by the institution's CS Research Project funds provided by DARPA.

C.4 MATCHED FUNDING

Before the end of calendar year 2008, each CS Research Project will deliver a document with plans for continued research (FY2007 Year 3). DARPA will co-fund continuations of CS

Research Project's, with a start date within Fiscal Year 2008, matching other sources dollar-for-dollar, with the following limitations:

- The CS Research Project must present evidence of progress and potential utility.
- The principal investigator will remain the principal investigator.
- The institution's administrative support to the CS Research Project must be adequate.
- The funds to be matched must support the research in a manner that permits the project to continue in largely the same manner as the ongoing project. That is, the personnel will largely remain the same, the research topic or focus idea is consistent with the original focus (albeit, the work might move toward greater applicability, or be modified on the basis of results and experiments conducted during the previous phases of the research), and the scope of the effort, in terms of personnel and expenditures, will remain approximately the same, relative to the total amount of funding available.

The funds to be matched might come from industry, a DoD service lab, or another government research funding agency. It is explicitly allowed that the matching funds might come from a DARPA seedling or research project, but the matching support will be subject to the restrictions above.

DARPA support for the continued research project is intended to last approximately an additional year. The funding may be structured as a new or follow-on modification to the grant or cooperative agreement depending on the nature of the proposed work and the nature of the support to be matched.

C.5 SUMMARY

A diagram of the components of the CS Study Group project is shown here:

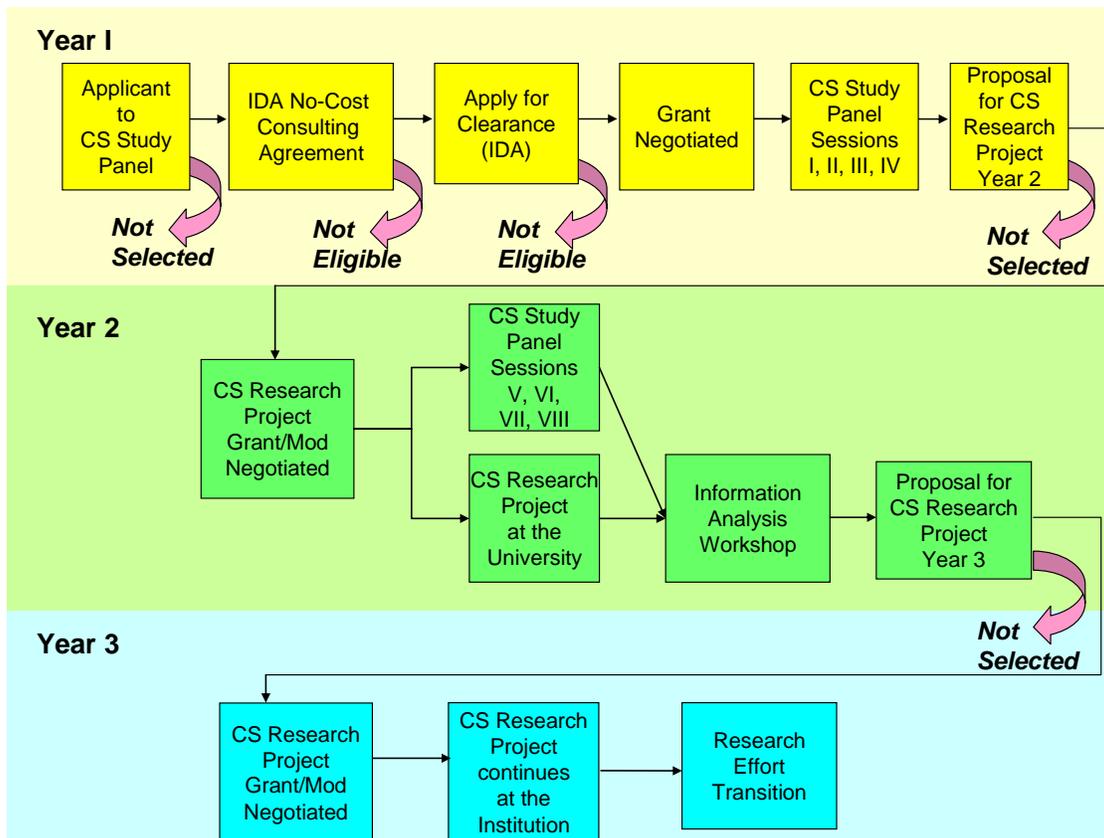


Figure 1 - Flow of components of CS Study Group.

D SAMPLE RESEARCH AREAS OF INTEREST

D.1 POTENTIAL CS STUDY GROUP RESEARCH AREAS

A number of areas have been suggested below that might become the basis of a CS Research Project. The list is not exhaustive: a successful applicant may well have research interests in other areas. Further, a CS Research Project proposed later by a CS Study Panel participant may be different than the research areas that were described in the original candidate's application. The CS Research Project should demonstrate novel approaches and innovation that lead to fundamental advances rather than incremental work in the field. These example areas of interest are provided simply to indicate the large breadth of interest that DoD has for the application of computer science research to topics of relevance to its needs.

D.1.1 Bio-inspired Exploitation Systems

Bat sonar, ant colonies, and immune systems are examples of biological systems that have inspired the development of algorithms applicable to hard and large problems in a variety of areas. Examples include genetic and evolutionary algorithms, neural networks, new ideas for developing routing algorithms in wireless networks inspired by biology, including software and

algorithms endowed with capabilities such as adaptation, evolution, growth, healing, replication and learning. Potential applications of interest to the military include autonomous intelligent vehicles, adaptive video processing algorithms, flight and other control systems, and analysis of medical data.

D.1.2 Biometrics

Biometrics is the science and technology of measuring and analyzing biological data. We are interested in the development of novel and improved technologies for measuring and analyzing human body characteristics, such as fingerprints, eye retinas and irises, voice patterns, facial patterns and hand measurements, for authentication purposes. Desirable characteristics of proposed techniques include minimizing key metrics such as the percent of invalid users who are incorrectly accepted as genuine users, the percent of valid users who are rejected as imposters, and the percent of valid users who are not recognized by the system.

D.1.3 Cognitive Unifying Exploitation Theory

Exploitation systems that provide tools for the analysis of large bodies of information have historically been developed as standalone systems pursuant to specific military problems (e.g., target recognition) and specific objectives (e.g., battlespace domination). The integration of disparate analysis systems provides the opportunity to fully utilize existing and evolving information technology as synergistic components in an encompassing cognitive exploitation structure. We will consider research on such general models of cognition that have the potential to facilitate information analysis for defense applications

D.1.4 Complexity Theory

Complexity theory deals with classifying computational problems by the amount of computational resources they require, or, more specifically, the number of processing steps and the memory required for their solution. An example of a problem of current interest in this area is the question of whether efficient approximation algorithms exist for problems that are inherently complex. We are particularly interested in means of determining what techniques exist for speeding up the solution of problems in high performance computing, and what the bounds on speed of computation are for various types of computer architectures, including scalar, parallel, distributed network, etc.

D.1.5 Computational Mapping and Terrain Visualization

Terrain information supplies an important context for ground operations. The layout of terrain is a determining factor in arraying of forces, both friendly and enemy, and the structuring of Courses of Action (COAs). Combining information about terrain features with hypotheses about enemy assets can lead to inferences about possible avenues of approach, areas that provide cover and concealment, areas that are vulnerable to enemy observation, or choke points, etc. We are interested in applications of computer science combined with multi-sensor, high resolution data to quickly create accurate maps and identify features of military significance.

D.1.6 Computer Graphics

We are interested in the development of fast, realistic computer graphics methods for applications in battlefield simulations, flight and vehicle simulators, virtual training devices, terrain mapping and shading under various lighting conditions, and scientific visualization of the results of complex 2D/3D computer codes. Of particular interest are methods which are both fast enough for real-time simulation, yet preserve complex visual cues resulting from effects such as multiple scattering from surfaces ranging from specular to diffuse, realistic shading, atmospheric scattering, absorption and dispersion, etc.

D.1.7 Computer Vision

Computer vision is devoted to the analysis of pictures and videos with the ultimate goal of achieving results comparable to those of a human viewer. Applications of interest to DARPA include medical imaging, video surveillance, detection and tracking of individuals and vehicles, and video compression. Methods that include implementation of machine learning are of particular interest, but we will also consider methods designed to solve specific tasks more effectively than previous systems.

D.1.8 Detecting Deviations from Normalcy

Pattern recognition theory tends to focus on events and patterns that are relatively constant over time. Dynamic models of activity, however, attempt to analyze trends and extrapolate patterns to expected patterns of behavior in the future. But beyond predicting trends in patterns that an analyst might wish to detect because they represent a threat, more advanced theories might attempt to model, or predict, patterns that represent normal behavior, so that threats can be detected as deviations from that normalcy pattern. Applications of interest include the detection of intrusions in computer systems and networks, and the detection of medical anomalies.

D.1.9 Information Accessibility, Integration, and Management

We are interested in next-generation methods, tools, and technologies to make it possible to access, integrate, analyze, and efficiently manage massive stores of widely distributed, heterogeneous information (e.g., science and engineering research data, Federal records). These capabilities will help human analysts make better use of all available information resources in the pursuit of knowledge relevant to military applications. Examples of possible research areas include development of human-computer interaction capabilities that enable rapid, easy access to and understanding of heterogeneous information, and of cognitive systems able to “learn,” adjust to change, and repair themselves to enhance the capabilities and deployability of robotic devices designed for the modern battlefield. This area also includes investigation of software systems for more effectively assembling raw data from sensors into meaningful data sets.

D.1.10 Machine Learning

Machine learning is the study of computer algorithms that improve automatically through experience, typically involving systems that perform tasks associated with artificial intelligence (AI). We are interested in techniques for improving the efficiency and effectiveness of systems via the autonomous acquisition and integration of knowledge, and exploitation of this knowledge to enable continuous self-improvement. Examples of applications of potential interest to the military include robot locomotion, wargaming, object recognition in computer vision, speech and handwriting recognition, bioinformatics, and medical diagnosis.

D.1.11 Network Management and Modeling

Our military services depend on a broad array of interacting physical, informational, cognitive, and social networks. Greater fundamental understanding of these networks is essential to insure they function reliably and smoothly, and are not vulnerable to attack. This gap between what is known and what is needed to ensure the reliable and secure operation of complex networks makes the transition to network-centric operations (NCO) problematic. We are interested in developing the fundamental knowledge necessary to design large, complex networks in a predictable manner. The focus should be on advancing fundamental knowledge rather than on specific applications.

D.1.12 Novel Sensing and Information Gathering

Sensing technology has rapidly moved beyond still and video cameras as other modalities have become available. Information analysis not only requires that analytic methods be developed for a variety of sensor types, but also that relevant sensor data be gathered, which may require the development of novel information gathering methods. We are interested in investigating new types of probes, devices or systems for actively probing or passively gathering information from the environment, using probes, devices, or systems that are designed and developed for the purpose, and also in collecting data from sensors and systems that already exist, and assembling that data in a way that provides greater insight or more effective use of the information.

D.1.13 Pattern Recognition

Pattern recognition aims to classify data (patterns) based on either *a priori* knowledge or on statistical information extracted from the patterns. The patterns to be classified are usually groups of measurements or observations, defining points in an appropriate multidimensional space. New and innovative breakthroughs in pattern recognition would be immediately applicable to information analysis. The field needs approaches that address complicated high dimensional pattern spaces with relatively small amounts of data, potentially using expert knowledge of the application domain. These techniques could help lead to the unambiguous recognition of objects and activities associated with recognition of rare objects or events.

D.1.14 Programming Languages

The goal of research in the area of programming languages should be to optimize acceptability and productivity gains, without significantly compromising correctness and ultimate program efficiency. Potential areas of research may include the debugging process and the system administration process as well as the programming process. Improvements relevant to parallel computing architectures are of particular interest. We are interested not only in new or improved versions of system programming languages such as C or Java, but also in research devoted to scripting languages such as Perl and Tcl.

D.1.15 Reasoning with Uncertainty

Probabilistic reasoning is a means of representing and reasoning with uncertain knowledge exploiting ignorance and vagueness. Many research approaches and methods have been investigated in this area, including Bayesian statistics, Bayes nets, Markov networks and decisions processes, self organizing feature maps, abductive reasoning, belief nets, dynamic and temporal probabilities models, influence diagrams, ad hoc uncertainty measures, temporal probabilistic models, decision theory, and truth maintenance systems. We are looking for methods that provide a rigorous foundation for reasoning with uncertainty in an extensible, scalable way, with demonstrated utility beyond point demonstrations.

D.1.16 Smart Surveillance Systems

The increasing need for sophisticated surveillance systems and the move to digital surveillance infrastructure has transformed surveillance into a large scale data analysis and management challenge. We are interested in smart surveillance systems that use automatic image understanding techniques to extract information from the surveillance data. In addition to proposals which consider the information extraction aspect of the challenge, we will also consider those that address the use of extracted information in the context of search, retrieval, data management and investigation.

D.1.17 Software Engineering

The process of software development and evolution is an ambitious undertaking involving complex, incomplete, sometimes inconsistent and often fuzzy factors. Variables concerning design, quality, reliability, stakeholder interests and objectives, moving targets, and constraints such as budget and timeline must all be considered throughout a dynamic life cycle. The challenge is to provide sound methodological support for enabling good decisions about processes and products, risks and bottlenecks as well as for selection of tools, methods and techniques. A need also exists to certify critical software systems to ensure their dependability, relying on evaluation of the software development process as well as the properties of the system. Research topics in the area of software engineering will identify and develop innovative means of meeting the challenge.

D.1.18 Computational Epidemiology

Epidemic models of infectious diseases date back to Daniel Bernoulli's mathematical analysis of smallpox in 1760 and have been developed extensively since the early 1900s. Mathematical modeling, with the help of modern computational tools, has provided new insights on such important issues as drug resistance, rate of spread of infection, epidemic trends, and effects of treatment and vaccination. We are interested in computational methods to model the spread of disease, to facilitate early detection of diseases resulting from acts of bioterrorism or deployment of biological weapons, and to investigate the interaction of pathogens and their hosts in epidemic situations.

D.1.19 Computational Physics

Topics of interest in computational physics include, but are not limited to, modeling of the effects of munitions designed to defeat Hard and Deeply Buried Targets (HDBT), effects of electromagnetic pulse (EMP) on sensitive electronic systems, modeling of the effects of atmospheric and other environmental conditions on the performance of smart weapons in less than ideal conditions, propagation and scatter of long wavelength electromagnetic radiation such as radar, radio, and microwaves, and modeling of shocks resulting from detonation of explosives, high velocity impact, etc.

E CS STUDY PANEL PARTICIPANT APPLICATION

E.1 CONTENT

The CS Study Group application will consist of three parts: A statement of research interests, a curriculum vitae, and a budget. The acceptable formats for submission of these documents are Word, PDF, and/or Excel. Documents submitted in other formats will not be reviewed.

The statement of research interests should include a succinct description of the active areas of research of the candidate, and a description of accomplishments to date. The statement should provide information as to where the central ideas originated, the reason the ideas being pursued are innovative and important, and why the ideas are not simply improvements and enhancements to existing methods. The statement should discuss briefly the potential impact of the ideas for defense applications, and also for non-defense applications. The statement should name collaborations and ongoing research group activities related to the research direction. Finally, while published papers are not to be included in the statement, hyperlinks to representative and relevant publications may be included.

The curriculum vitae is an account of one's career and qualifications. The budget provides a breakdown of the proposed CS Study Group costs.

Applicants are required to submit a first year budget as part of their formal application. This budget will fund the candidate's participation on the CS Study Panel including salary, travel, and related research activities. A typical cost proposal, fully-burdened (i.e., including all costs including benefits and overhead), will not exceed \$100,000. The cost proposal will fund:

- Two or three summer month's salary for the participant;
- Travel funds to attend CS Study Panel meetings, to include two meetings at IDA, one in the spring and one in the fall, and travel to the starting point and return travel from the terminal point for each of two summer trips. We estimate that travel costs for the participant in the CS Study Panel will be \$12,000 during Year 1 of the program.
- Summer trip session costs, such as per diem expenses for meals and incidentals.
- A small amount of administrative help for the participant, for example, to help prepare the research proposal to be submitted toward the end of the year.

Each selected first-year participant on the CS Study Panel may submit a research proposal for second-year funding with the participant as the principal investigator. The research proposal will be accompanied by a cost proposal. A typical research program, for one year, might support the following:

- Three summer month's salary for the principal investigator;
- Travel funds and summer trip session costs for continued participation on the CS Study Panel.
- Travel funds to the DARPA Information Analysis Workshop.
- A postdoctoral research fellow, funded as a full-time employee.
- One or two senior graduate research assistants, funded for full-time research during two summer months and part-time research during the academic year
- Part-time support for programmer and data visualization assistance to the project;
- Administrative support, such as a work study, to assist the principal investigator in administering the research program.

Fully burdened, the cost for the first increment of the research project will not exceed \$500,000.

Subsequent increments for the research project, subject to matching fund requirements, will fund proportionate shares of the substantially the same research project structure.

At all stages, DARPA funding is subject to availability of funds for the CS Study Group project within DARPA.

The following table outlines the technical application format for CS Study Group and page limitations. The vitae may be in the format of the principal investigator's choice.

| SECTION | TOPICS |
|---|--|
| <p>Statement of Research Interest</p> <p>(6 Page Limit)</p> | <ul style="list-style-type: none"> • The name of the candidate along with points of contact for the application, including telephone numbers, facsimile telephone numbers, and electronic mail addresses; • Citizenship; • Institution name and location; • Technical and administrative points of contact for the application, including telephone numbers, facsimile telephone numbers, and electronic mail addresses; • An overview of the PIs research area(s) of interest and history of the ideas; • Potential relevance of this research area to DoD computer science applications; • Potential for novel idea(s) that would lead to fundamental advances rather than incremental work; • References and pointers to relevant publications; • Collaborations and other activities. |
| <p>Curriculum Vitae</p> <p>(No Page Limit)</p> | <ul style="list-style-type: none"> • Academic/Professional Vitae; • Doctoral thesis, advisors, and thesis topic; • Post Doc activities and advisors; • List of all sponsored research as principal investigator or research participant, including agency, program manager, funding amount (in the case of DARPA funding, name the DARPA Office and program manager); • List of publications, with hyperlinks to abstracts or papers; • At least three technical references for the PI including reference name, organization, phone number, and email address. |
| <p>Budget</p> <p>(1 Page Limit)</p> | <ul style="list-style-type: none"> • Participant salary estimates; • Travel expenses (estimated as \$12K total for budget purposes); • Administration support costs; • Any other anticipated expenses. |

Table 2 - Summary of CS Study Panel Application contents.

Applications may be submitted through the www.grants.gov website using the "Apply for Grants" function. Applications received after the due date will not be considered. Applications must also reference the Research Announcement number, provide a Technical point of contact phone number and email address, provide a Contracting point of contact phone number and email address, include the institution's Data Universal Numbering System (DUNS), Tax

Identification Number (TIN) and Commercial and Government Entity (CAGE) codes and the mailing address for the above DUNS/TIN/CAGE organization as found on the Central Contractor Registration (CCR). All applications shall be submitted by the institution's Office of Sponsored Research or similar in accordance with each institution's applicable guidelines/policy.

E.2 TIMETABLE

The timetable for the receipt and evaluation of applications against this BAA is shown below.

| DATE | EVENT | URL |
|--------------------------------|---|---|
| 15 September 2006 | Grants.gov Announcement and Applicant Information Package Published | www.grants.gov |
| 31 October 2006 1600 pm EST | Applications Due Applications received after the due date <u>will not</u> be considered. | Applications must be submitted through either the www.grants.gov website or the DARPA DSO website at www.sainc.com/dso0646 . |
| 22 December 2006 | Estimated Application decision | |

Table 3 - Schedule for submission of applications.

F CS STUDY PANEL APPLICATION EVALUATION

F.1 GENERAL CONSIDERATIONS

It is the policy of DARPA to treat all applications as competitive information and to disclose the contents only for the purposes of evaluation. The Government may use selected support contractor personnel to assist in administrative functions only. For this solicitation, non-Government advisors who have signed appropriate non-disclosure and conflict of interest statements may assist in the application administration when their assistance is required.

F.2 EVALUATION COMMITTEE

Expert Government personnel will read, review and evaluate applications with regard to the criteria outlined in F.4 and offer recommendations for CS Study Panel participant selection.

The candidate's references may be contacted to provide additional information. They will not be given access to the content of the application, but the name and fact that an application has been submitted will be disclosed. Further, national leaders in academia and government in the broad computer science field may be solicited to provide further information about particular candidates, and once again, the name and fact of an application will be disclosed, but not the content of the application.

Applicants are advised that only contracting officers are legally authorized to contractually bind or otherwise commit the Government.

F.3 CS STUDY PANEL DIVERSITY

Although there is no set-aside for a specific numbers of panel members to represent particular groups, DARPA hopes to achieve a diverse panel, distributed geographically, distributed in terms of research topics and research ideas, and distributed in terms of minority representation. Historically Black Colleges and Universities (HBCUs)/Minority Institutions (MIs) are specifically encouraged to submit applications.

F.4 CRITERIA FOR AWARDS

Multiple candidates may apply from any institution. For eligibility to join the CS Study Panel, an application will be evaluated against the following eligibility criteria outlined below in relative order of importance:

- US citizenship of the candidate, ability to receive a U.S. SECRET security clearance, and eligibility as a junior faculty member at a U.S. institution of higher learning.

For those applicants that are judged eligible, the following evaluation criteria will be used to select candidate participants, in order of importance:

- Overall scientific and technical merit of the candidate's research interests, and the novelty of the ideas, and the likelihood that the candidate will generate new ideas. An understanding of potential beyond the state of the art must be demonstrated. ;
- Potential impact of the research interest on defense applications. Candidates must demonstrate the potential of successful research to radically change military capability or improve national security with a clear statement of the goals of their ideas and a quantitative comparison with existing technology.
- Candidate's experiences and demonstrated research accomplishments and leadership abilities. Candidates must demonstrate that they have the necessary background and experience to perform meaningful research.

At approximately 9-months of participation in the CS Study Panel, a participant may submit a proposal for a CS Research Project. The following evaluation criteria will be used to evaluate project proposals submitted by panel participants.

- Overall scientific and technical merit of the candidate's proposed research project, to include the innovativeness of the proposed approach. An understanding of potential beyond the state of the art must be demonstrated;
- Potential impact of the proposed research project on defense applications. Candidates must demonstrate the potential of successful research to radically change military capability or improve national security with a clear statement of the goals of their ideas and a quantitative comparison with existing technology.
- Cost reasonableness/realism.

If a participant is selected for a CS Study Project award, an additional proposal may be submitted at approximately 18 months of participation in the CS Study Panel. The following evaluation criteria will be used to evaluate Yr. 3 project proposals submitted by Yr. 2 project participants.

- Overall scientific and technical merit of the candidate's proposed continuation of the research project, to include the innovativeness of the proposed approach and a demonstrated progress in achieving Yr. 2 project goals;
- Potential impact of the proposed research project on defense applications. Candidates must demonstrate the potential of successful research to radically change military capability or improve national security with a clear statement of the goals of their ideas and a quantitative comparison with existing technology.
- Cost reasonableness/realism.

G SECURITY

All research work at the institution will be of a fundamental nature, and shall be unclassified. Data and technical information shall typically be publicly released and unrestricted; however, any data or technical information imported to the institution from the Government or DoD contractors shall be subject to export controls, including, but not limited to, the provisions of the International Traffic in Arms Regulation (22 CFR pt. 121 et seq.), the DoD Industrial Security Regulation (DoD 5220.22-R) and the Department of Commerce Export Regulation (15 CFR pt. 770 et seq.), and shall be handled by the principal investigator and research personnel in a manner that prevents unlicensed export..

Participants on the CS Study Panel will require a U.S. DoD SECRET security clearance. Candidates selected for participation, who do not already hold such a clearance, will apply through IDA. Potential candidates are welcome to confidentially discuss their eligibility with IDA.

The institution will not require a facility security clearance, and the participant in the CS Study Group will not deal with classified data or information at the institution.