BROAD AGENCY ANNOUNCEMENT W911NF-12-R-0011-03
SOURCES SOUGHT NOTICE

REQUEST FOR WHITE PAPERS
BAA TOPIC 4.2.1: ADAPTIVE INTELLIGENT TRAINING TECHNOLOGIES
"Research and Development for Multi-Agent Tutoring Approaches"

Introduction

Applications to the Fiscal Year 2016 [FY16] "Research and Development for Multi-Agent Tutoring Approaches" are being solicited by the U.S. Army Research Laboratory (ARL), Human Research and Engineering Directorate (HRED), Simulation and Training Technology (STTC) division. The Execution Management Agent for this Broad Agency Announcement (BAA) / Funding Opportunity is the Army Research Laboratory – Simulation Technology and Training Center (ARL-STTC).

Broad Agency Announcement (BAA) W911NF-12-R-0011-03 was publicized on FedBizOpps and Grants.gov on 15 May 2012. This Sources Sought Notice calls for White Paper submissions in reference to the research within the BAA is topic 4.2.1: 'Adaptive Intelligent Training Technologies'. This BAA is issued under the provisions of paragraph 6.102(d)(2) of the Federal Acquisition Regulation, provides for the competitive selection of proposals. Proposals submitted in response to this BAA and selected for award are considered to be the result of full and open competition and in full compliance with the provisions of Public Law 98-369, "The Competition in Contracting Act of 1984," and subsequent amendments. Funding of research and development (R&D) within ARL areas of interest will be determined by funding constraints and priorities set during each budget cycle. Awards related to the submission of White Papers requested by this Notice are subject to funds availability and priorities. ARL may choose not to select any new awards due to unavailability of funds or other factors.

The sequence of steps leading to award is:

(1) Request for White Paper initiated by ARL

(2) Submission of a timely White Paper no more than ten pages in length to the POC for the U.S. Army Contracting Command via usarmy.rtp.aro.mbx.baa@mail.mil and cc: the ARL Point of Contact (POC) identified below in this section

(3) Written or telephonic feedback provided to the Offeror regarding the White Paper's scientific merit and potential contributions to the Army mission as per established criteria presented in Section II

(4) Request of a formal proposal submission initiated by ARL, if the White Paper merits a proposal request

(5) Submission of a timely, formal proposal

(6) Evaluation of the formal proposal as per established criteria presented in Section II

(7) Contract or grant award for selected proposals based on availability of funds or other factors

This sequence allows earliest determination of the potential for funding and minimizes the labor and cost associated with submission of full proposals that have minimal probability of being selected for funding.

Note that interested Offerors **must** submit a White Paper electronically in order to be eligible to submit a formal proposal under this Notice. This Notice requires that White Papers be submitted electronically no later than 11 DEC 2015, 5:00 P.M. Eastern Daylight Time (EDT). See Part IV, Deadlines, for additional details. BAA W911NF-12-R-0011-03 allows several potential instrument types (e.g., contract, grant, cooperative agreement) to result from a successful proposal. For this Notice, the intention of the Government is to award a contract.

THOSE SUBMITTING WHITE PAPERS/PROPOSALS ARE CAUTIONED THAT ONLY A GOVERNMENT CONTRACTING OR GRANTS OFFICER CAN OBLIGATE THE GOVERNMENT TO ANY AGREEMENT INVOLVING EXPENDITURE OF GOVERNMENT FUNDS.

This Sources Sought Notice for White Papers consists of six parts as follows:

- Background and Introduction
- Part I: Research Objectives
- Part II: Preparation, Submission, and Evaluation Criteria
- Part III: Feedback
- Part IV: Deadlines
- Part V: Inquiries
- Part VI: References

Technical Points of Contact:
Dr. Robert Sottilare, Senior Scientist
12423 Research Parkway, Orlando, FL 32826
407-208-3007
robert.a.sottilare.civ@mail.mil (email contact preferred)

Contractual Point of Contact:
Jessica McTaggart, Contract Specialist US Army Contracting Command
12423 Research Parkway, Orlando, FL 32826.
407-208-3372
jessica.h.mctaggart.civ@mail.mil.

PART I: BACKGROUND, INTRODUCTION RESEARCH OBJECTIVES, RESEARCH QUESTIONS

In 2011, the US Army placed significant emphasis on the development of self-regulated learning (SRL) skills with the expectation that new methods of instruction such as Intelligent Tutoring Systems (ITSs) would augment institutional training (i.e., classroom and small group instruction). One-to-one human tutoring has been shown to be significantly more effective than one-to-many instructional methods (e.g., traditional classroom instruction [Bloom 1984; VanLehn 2011]). However, it is not practical nor is it affordable to have one expert human tutor to mentor each Soldier in the US Army for every required operational task. This alone signals the need for capabilities to support one-to-one, tailored training, and educational experiences.

The Army Research Laboratory has been pursuing efforts in intelligent tutoring, utilizing the Generalized Intelligent Framework for Tutoring (GIFT). GIFT effectively operates as a series of modules, such as the Sensor, Domain, Learner, Pedagogical, and Gateway Modules, each of which performs actions dictated by it's *a priori* policies. An advantage of this approach is that the flow of messages between modules is specified and guaranteed, while a disadvantage is that the addition of software services which perform actions such as "data-mine best approaches used" or "watch and copy all messages to a recommendation agent" are somewhat difficult to add to the tool chain, especially where it concerns items such as the on-the-fly adjustment of instructional strategy [1]. Criticism of these weaknesses can be found in the GIFTSym paper discussions [2]. ARL seeks research into the design and implementation of an agent framework, experimentation with the system, impacts on system development time, and impacts on student learning.

Specifically sought in this BAA call are potential solutions to leverage towards some of the following problems:
- Conflict detection and resolution between instructional management recommendations
- Incorporation of existing, hand-craft and research-based, if/then decision tree logic into a probabilistic framework.
- Novice user authoring of agent policy
- Dynamic tradeoffs between competing goals, such as switching between an agent following a "maximize for retention" policy and a "minimize time" policy where they come in conflict.

Specific questions sought in this BAA call include:
- Where is the agent software/policy stored in a cloud-based tutoring environment?
- How are agent policies updated?
- How are agent policies created?
- How does the framework operate in various domains (cognitive, affective, psychomotor, social) and various host environments (desktop, tablet, mobile)?
- How effective is such a solution, when put into practice, on learning outcomes?
- How does such a design affect the other problems of intelligent tutoring such as authoring time and integration of new domains of instruction?

PART II: PREPARATION, SUBMISSION, AND EVALUATION CRITERIA

Preparation & Submission:

The process of execution begins with white paper evaluation and a down-selection process. The government will notify the offeror if their white paper is selected, and formally request a full proposal. The full proposals undergo a full scientific review and programmatic view prior to being funded.

The planned method for accomplishing the research in this area is to utilize a phased approach. Therefore, white papers submitted should be structured with a technical approach / solution for a Basic Award (Phase 1 / Year 1) and two option years. Executions of additional options are at the discretion of the Government. The white paper shall include the anticipated period of performance, a technical description of the proposed concepts, the technical objectives and a planned approach to accomplish the stated objectives as well as a rough order of magnitude (ROM) cost. The ROM cost consists of the total cost plus profit / fee / overhead.

Phase I contract will be awarded as a 12-month effort and funding of approximately $100,000.

At this time, it is anticipated that Phases II and III will be 12-month efforts with funding of approximately $200,000 each, subject to budgeting constraints.

White Papers shall not exceed 10 pages of computerized text at 12 pitch (excluding resumes). Contractor format is acceptable. The white papers should be provided in hardcopy and CD electronic form no later than 11 DEC 2015, 5:00 P.M. Eastern Daylight Time (EDT).. NOTE: Both the hardcopy as well as the electronic (CD) copy MUST BE received together, by the due date and time. **MAIL WHITE PAPERS TO**: US Army RDECOM Acquisition Center, Attn: Jessica McTaggart, 12423 Research Parkway, Orlando, FL 32826.

THIS ANNOUNCEMENT CONSTITUTES THE ENTIRE SOLICITATION FOR THIS EFFORT. DO NOT SUBMIT A FORMAL PROPOSAL AT THIS TIME.

Evaluation Criteria

White papers will be evaluated by a technical review board using the following criteria listed in descending order of importance:

1. Overall scientific and/or technical merits of the proposed research: the Offeror must demonstrate a thorough understanding of the research problem and articulate a clear approach to addressing the research objectives. The proposed approach must be based on feasible and realistic scientific methods and provide the Government with a high level of confidence of successful completion within proposed timeline.

2. Potential contributions of the effort to the U.S. Army Research Institute's mission: In addition, to showing how the proposed research aligns with the solicited topic, the Offeror must also specify how the proposed research will contribute to or advance the current U.S. Army Research Institute's social/ behavioral research mission.

3. The Offeror's capabilities, related experience, facilities, techniques or unique combination of these which are integral factors for achieving the proposed research objectives: the Offeror must demonstrate relevant organizational capabilities [e.g., experience, facilities, techniques] beyond individual capability to ensure the proposed research objectives can be achieved by the organization as a whole.

4. The qualifications, capabilities, and experience of the proposed Principal Investigator, team leader, and other key personnel who are critical to the achievement of the proposed research objectives: the Offeror must demonstrate that the key personnel have the education and experience necessary to successfully complete the research objectives. Personnel capabilities need to be aligned with the expertise needed to achieve the required tasks.

5. The Offeror's record of past performance: Past performance information obtained from the Offeror's proposal, centralized past performance databases, and other sources will be used to evaluate past performance on projects of similar size, scope, and complexity to determine timely compliance with Government specifications. For Offerors with no relevant past performance, the Government may take into account information regarding the past performance of predecessor companies, subcontractors, or proposed personnel that will perform key aspects of the proposed research.

6. Realism, affordability, and appropriateness of proposed costs: the Offeror must demonstrate that the proposed costs are appropriate given the suggested research approach. The Government will also evaluate the proposed costs in relation to the scope of the research objectives and the U.S. Army Research Institute's budget.

7. Current and/or future relationship or interface with ongoing activities in academia and/or industry: the Offeror must demonstrate how the research findings and/or products could inform current or future scientific research, impact industry, and/or meet Army needs and goals.
White Papers found to be consistent with the requirements of this announcement and deemed to best meet the program objectives may be invited to submit a technical and cost proposal. To be eligible for award a white paper must be submitted.

Upon completion of white paper evaluations, Offerors will be notified whether or not their white paper was favorably received. Favorable review of a white paper does not constitute selection of the proposed effort for contract award and will not establish a binding commitment for the Government to fund the effort in whole or in part. Upon notification, the Government will issue a request for proposal letter to the qualified offeror(s), who best meet the program objectives. If proposals are solicited, proposals are due 11 DEC 2015, 5:00 P.M. Eastern Daylight Time (EDT).   The requirements for proposal preparation and submission can be found at http://www.arl.army.mil/www/pages/8/Mod2_ARL_BAA_revsept13.pdf

This announcement is an expression of interest only and does not commit the government to reimburse any proposal preparation cost for responding. The cost of proposal preparation in response to this announcement is not considered an allowable expense to the normal bid and proposal indirect costs as specified in FAR 31.205-18. Any request for white paper or submission of a full proposal does not guarantee award. The Government reserves the right to cancel this requirement at any time and shall not be liable for any cost of proposal preparation or submission. Within the meaning of the Federal Acquisition Regulation (FAR) at 6.102 and

35.016, this announcement constitutes the Government's solicitation for this effort. There will be no other solicitation issued in regard to this requirement. Offerors should be alert for any BAA amendments that may be published.

PART III: FEEDBACK

Written or telephonic feedback will be provided to the Offeror regarding the White Paper's scientific merit and potential contributions to the Army mission. If the Government decides to request a full proposal, a written request will be sent to the Offeror. The written request will, at a minimum, invite a full proposal. The request may also include feedback intended to improve the proposal's potential for award.

PART IV: DEADLINES

Any responsible offeror capable of satisfying the objectives identified in this announcement may submit a white paper. White Paper submissions are encouraged as early as possible but must be received at ARL/HRED/STTC no later than 11 DEC 2015, 5:00 P.M. Eastern Daylight Time (EDT). No extensions will be granted. Only unclassified white papers will be accepted. All white papers must include Phase II as a priced option. The white papers will be reviewed to determine that the proposed effort is within the scope and interest of this solicitation. A proposal will only be solicited from white papers deemed to best meet the program objectives.

PART V: INQUIRIES

Inquiries for additional information should be made with the ARL POC, Dr. Robert Sottilare, who may be reached at:

E-Mail: robert.a.sottilare.civ@mail.mil (email contact preferred).
Telephone: 407-208-3007

PART VI: REFERENCES

[1]   Y.-E. Liu, T. Mandel, E. Brunskill, and Z. Popovic, "Trading Off Scientific Knowledge and User Learning with Multi-Armed Bandits."

[2]   B. D. Nye and D. M. Morrison, "Toward a Generalized Framework for Intelligent Teaching and Learning Systems: The Argument for a Lightweight Multiagent Architecture," in *Artificial Intelligence in Education (AIED) 2013 Workshop on the Generalized Intelligent Framework for Tutoring (GIFT)*, 2013, pp. 105-115.