# AWARD/CONTRACT

1. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 350)

Rating

Page 1 of Pages 23

2. CONTRACT (Proc. Inst. Ident.) NO. D10PC20024

3. EFFECTIVE DATE 09/09/2010

4. REQUISITION/PURCHASE REQUEST PROJECT NO. SZ100658

5. ISSUED BY CODE 00053

DOI - NBC 17 Huachuca AZ
NBC - Acquisition Services Directorate
Sierra Vista Branch
P.O. Box 12924
Fort Huachuca, AZ 85670-2924

6. ADMINISTERED BY (If other than Item 5) CODE

7. NAME AND ADDRESS OF CONTRACTOR (No., street, city, county, State and ZIP Code)

SRI INTERNATIONAL
333 Ravenswood Avenue
Menlo Park, CA 94025-3492

CODE

FACILITY CODE

8. DELIVERY FOB Origin ✓ Other (See below)

9. DISCOUNT FOR PROMPT PAYMENT
10 days %
20 days %
30 days %
0 days %

10. SUBMIT INVOICES (4 Copies unless otherwise specified) TO THE ADDRESS SHOWN IN ITEM 12

11. SHIP TO/MARK FOR CODE DARPA

Joseph Olive
DARPA
3701 N. Fairfax Drive
Arlington, VA 22203-1714

12. PAYMENT WILL BE MADE BY CODE D2730

Dept of the Interior - National Business Center
National Business Center - Denver
Fiscal Support Section - D2730-FH
7301 W. Mansfield
Denver, CO 80235-2230

13. AUTHORITY FOR USING OTHER THAN FULL AND OPEN COMPETITION:
☐ 10 U.S.C. 2304(c) ( ) ☐ 41 U.S.C. 253(c) ( )

14. ACCOUNTING AND APPROPRIATION DATA
2010 - - WH - 6041 - - 255D - - WHDRP - - - Z99500 - - 1A - - - -

| 15A. ITEM NO. | 15B. SUPPLIES/SERVICES | 15C. QUANTITY | 15D. UNIT | 15E. UNIT PRICE | 15F. AMOUNT |
|---|---|---|---|---|---|
| | SEE LINE ITEM DETAIL | | | | |

15G. TOTAL AMOUNT OF CONTRACT 1,000,000.00

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**CONTRACTING OFFICER WILL COMPLETE ITEM 17 OR 18 AS APPLICABLE**

17. ✓ CONTRACTOR'S NEGOTIATED AGREEMENT (Contractor is required to sign this document and return 1 copies to issuing office) Contractor agrees to furnish and deliver all items or perform all the services set forth or otherwise identified above and on any continuation sheets for the consideration stated herein. The rights and obligations of the parties to this contract shall be subject to and governed by the following documents: (a) this award/contract, (b) the solicitation, if any, and (c) such provisions, representations, certifications, and specifications, as attached or incorporated by reference herein.

(Attachments are listed herein.)

18. AWARD (Contractor is not required to sign this document.) Your offer on Solicitation Number _____ including the additions or changes made by you which additions or changes are set forth in full above, is hereby accepted as to the items listed above and on any continuation sheets. This award consummates the contract which consists of the following documents: (a) the Government's solicitation and your offer, and (b) this award/contract. No further contractual document is necessary.

19A. NAME AND TITLE OF SIGNER (Type) Colleen Ferguson
Senior Contracts Administrator

19B. NAME OF CONTRACTOR
By Colleen R. Ferguson
(Signature of person authorized to sign)

19C. DATE SIGNED 09/10/10

20A. NAME OF CONTRACTING OFFICER
Lisa A. Mattocks

20B. UNITED STATES OF AMERICA
By Lisa A Mattocks
(Signature of Contracting Officer)

20C. DATE SIGNED 9/10/10

NSN 7540-01-152-8067
PREVIOUS EDITION UNUSABLE

STANDARD FORM 26 (REV 4 - 85)
Prescribed by GSA
FAR (48 CFR) 53.214(a)

Total Funding: $1,000,000.00

| FYs | Fund | Budget Org | Sub | Object Class | Sub | Program | Cost Org | Sub | Proj/Job No. | Sub | Reporting Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2010 | WH | 6941 | | 255D | | WHDRP | | | Z99500 | | 1A |

Division | Closed FYs | Cancelled Fund

| Line Item Number | Description | CLIN Ref | Delivery Date (Start Date to End Date) | Quantity | Unit of Issue | Unit Price | Total Cost (Includes Discounts) |
|---|---|---|---|---|---|---|---|
| 0001 | RESEARCH AND DEVELOPMENT SERVICES - | 0001 | | 1.00 | LO | $1,000,000.000 | $ 1,000,000.00 |

(09/09/2010 to 03/08/2014)

The contractor shall furnish the necessary personnel, materials, facilities, and nonpersonal services to perform the research and development in accordance with the contractor's technical and management proposal entitled, "SCENIC: Speech Content Extraction from Noisy Information Channels", undated and revised cost proposal dated 17 August 2010 submitted in response to the Defense Advanced Research Project Agency/Information/Innovation Office (DARPA/I2O) Broad Agency Announcement (BAA) 10-34, and reports as identified in Section J.

The contractor's revised cost proposal dated 17 August 2010 is hereby redacted and incorporated by reference.

The Contract Data Requirements List (CDRLS) are not separately priced.

Estimated Cost: $12,083,268.00
Fixed Fee: $964,210.00
Cost-Plus-Fixed-Fee (CPFF): $13,047,478.00

Ref Req No: SZ100658

Funding Information:

2010 - - WH - 6941 - - 255D - - WHDRP - - - Z99500 - - 1A - -
- -
$1,000,000.00

**Total Cost:** $1,000,000.00

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# SECTION C -- DESCRIPTIONS AND SPECIFICATIONS

## C.1 DESCRIPTIONS AND SPECIFICATIONS

SECTION C -- DESCRIPTIONS AND SPECIFICATIONS

The contractor shall furnish the necessary personnel, materials, facilities and non-personal services to perform the research and development effort in accordance with the contractor's technical proposal entitled "SCENIC: Speech Content Extraction from Noisy Information Channels" dated 26 March 2010 and revised cost proposal entitled, "SCENIC: Speech Content Extraction from Noisy Information Channels"dated 17 August 2010 submitted in response to DARPA/I2O (Information/Innovation) BAA 10-34 and incorporated to this contract by reference.

## C.2 DELIVERABLES

The deliverables for this effort are as follows:

Contractor are expected to submit to the Program Manager the following deliverables:

-All software and supporting documentation developed in the program
-An integrated system to be evaluated at the site of the Evaluation team.
-For Phase 2 and Phase 3, a fully functioning, military user-friendly software suite including an intuitive, easy to use graphic user interface. systems must be field trainable for new languages, speakers and key words.
-A written final report of their activities and accomplishments.

(END OF SECTION C)

# SECTION D -- PACKAGING AND MARKING

## D.1 MARKING

Shipping documents, containers, correspondence and packages shall be marked with the following information:

| | |
| --- | --- |
| Contract Number: | D10PC20024 |
| ARPA Order Number: | Z995/00 |
| Proposal Title: | "SCENIC: Speech Content Extraction from Noisy Information Channels" |

## D.2 PACKAGING

All deliverables called for shall be packed and shipped in accordance with the Contractor's standard commercial practices in a manner that shall afford adequate protection against physical and environmental deterioration and damage during shipment.

**(END OF SECTION D)**

# SECTION E -- INSPECTION AND ACCEPTANCE

## E.1 52.252-02 CLAUSES INCORPORATED BY REFERENCE

This contract incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. Also, the full text of a clause may be accessed electronically at this/these addresses):

http://farsite.hill.af.mil/

| Clause | Title | Date |
| --- | --- | --- |
| 52.246-09 | Inspection of Research and Development (Short Form) | April 1984 |

## E.2 REVIEW AND OVERSIGHT

Review and oversight of research and development services will be made by the DARPA Program Manager (PM) identified in Section G. DARPA PM will inform Government Contracting Officer's Representative identified in Section G, if research and development services do not conform to contract requirements.

**(END OF SECTION E)**

# SECTION F -- DELIVERIES OR PERFORMANCE

## F.1 52.252-02 CLAUSES INCORPORATED BY REFERENCE

This contract incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. Also, the full text of a clause may be accessed electronically at this/these address(es):

http://farsite.hill.af.mil/

| Clause | Title | Date |
|---|---|---|
| 52.242-15 Alt I | Stop-Work Order (Aug 1989) Alternate I | April 1984 |
| 52.247-34 | F.O.B. Destination | November 1991 |

## F.2 DELIVERY OF DATA

The data to be delivered with the reports shall be delivered in accordance with the instructions provided as identified in Section J.

## F.3 PERIOD OF PERFORMANCE

The contract period of performance will be a 42-month period.

Period of Performance
September 09, 2010 through March 08, 2014

**(END OF SECTION F)**

# SECTION G -- CONTRACT ADMINISTRATION DATA

## G.1 INCREMENTAL FUNDING

Of the total price of CLIN 0001 the sum of $1,000,000.00 is presently available for payment and allotted to this contract. It is anticipated from time to time additional funds will be allotted to this contract until the total price of these items is allotted. It is contemplated that funds presently allotted to this contract will cover the work to be performed, as limited by the provision of (b) below, until 31 January 2011.

b. For purposes of the Limitation of Funds Clause, Section I, 52.232-22, this provision will be the "Schedule". Accordingly, the contractor is working at his own risk if funds are expended beyond those currently allotted to this contract at any given time.

## G.2 CONTRACTING OFFICER'S TECHNICAL REPRESENTATIVE

Contracting Officer's Technical Representative (COTR) responsibilities will be performed by:

Department of Interior/National Business Center
Acquisition Services Directorate
Sierra Vista Division 3
Post Office Box 12924
Fort Huachuca, Arizona 85670-2924

POC: Lawrence Carter
Phone: (520) 533-1213
Fax: (520) 538-3761
E-Mail: Lawrence_H_Carter@nbc.gov

Building Location and Zip Code for Overnight Deliveries:
Augur and Adair Streets, Bldg #22208 (2nd Floor)
Zip Code: 85613-6000

## G.3 DARPA PROGRAM MANAGER

The DARPA Program Manager (PM) for this contract is:

Joseph Olive
DARPA/IPTO
3701 North Fairfax Drive
Arlington, VA 22203-1714

Phone: (571) 218-4920
Fax: (571) 218-4369
E-Mail: Joseph.Olive@darpa.mil

## G.4 CONTRACT ADMINISTRATION DATA

Contractor's office, which will supervise and administer the resulting contract, is as follows:

SRI International .
333 Ravenswood Avenue
Meno Park, CA 94025

POC: Ms. Colleen Ferguson
Senior Contracts Administrator
Phone: (650)859-4199
Fax: (650)859-6171
E-Mail: colleen.ferguson@sri.com

## G.5 GOVERNMENT CONTRACT ADMINISTRATOR

Administration of the contract, except for COR responsibilities, shall be performed by:

POC: Yvonne Edwards
Phone: (520) 533-0055
Fax: (520) 538-3761
E-Mail: Yvonne_M_Edwards@nbc.gov

Mailing Address:

U.S. Department of the Interior
National Business Center
Acquisition Services Directorate
Sierra Vista Division
Post Office Box 12924
Fort Huachuca, AZ 85670-2924

Commercial Address:

U.S. Department of the Interior
National Business Center
Acquisition Services Directorate
Sierra Vista Division
Augur and Adair Streets, Bldg #22208 (2nd Floor)
Fort Huachuca, AZ 85613-6000

## G.6 DEFENSE CONTRACT AUDIT AGENCY (DCAA) OFFICE

The DCAA for this contract is:

Defense Contract Audit Agency (DCAA)
Peninsula Branch Office
480 San Antonio Road
Suite 150
Mountain View, CA 94040-1218

Phone: (650) 917-5000

## G.7 PAYMENT OFFICE

Payment will be made by the following office:

US Dept of the Interior
Office of the Secretary
National Business Center - Denver
Fiscal Support Section - D2730-FH
7301 W. Mansfield Avenue
Denver, Co 80235-2230

E-Mail: Ft_Huachuca_Pay_NBCDENVER@NBC.GOV

## G.8 CONTRACT PAYMENTS

VOUCHER SUBMISSION FOR COST:

A. The contractor shall submit an original and one copy of interim invoices, excluding the final invoice, to the Contracting Officer's Representative (COR) and one copy to the Government Contract Administrator identified in Section G. The Contracting Officer's Representative (COR) shall certify the accepted proper invoice and submit to the payment office indentified in Section G within 5 days of receipt.

B. Final Invoice. The original of the final invoice must be forwarded to the Cognizant DCAA Office. The Cognizant DCAA Office will submit the reviewed final invoice to the Government Contract Administrator no later than twenty (20) working days from receipt. The Government Contract Administrator will approve and submit the approved final invoice to the payment office identified in Section G.

C. Proper invoices for this contract will be submitted on at least a monthly basis in accordance with FAR Clause 52.216-7, Allowable Cost and Payment (Dec 2002), not more often than once every two (2) weeks.

D. For payment of fee, the contractor will invoice for 8% fee incurred, cost amount, not to exceed $964,210.00 for this contract. In accordance with FAR 52.216-8, Fixed Fee, the 15% fee withhold amount for this contract is $144,632.00.

E. All requests for payment shall be submitted in accordance with FAR Clause 52.232-25, Alt 1, Prompt Payment (Feb 2002).

# SECTION H -- SPECIAL CONTRACT REQUIREMENTS

## H.1 SF294 AND SF395 SUBCONTRACTING REPORTING REQUIREMENTS

Standard Form (SF) 294, Subcontracting Report for Individual Contracts, and SF 295, Summary Subcontract Report, required in accordance with FAR 19.704(a), shall be submitted via the new electronic Subcontracting Reporting System (eSRS), which is located at the following website: https://www.esrs.gov.

## H.2 NOTIFICATION UNDER A COST REIMBURSEMENT CONTRACT

a. To facilitate administration of the contract and the several provisions and clauses associated with cost/performance administration, including "Limitation of Funds," etc., the Contractor agrees to give timely notification to the Contracting Officer at any time he has reason to believe the total cost to the Government for the performance of this contract will be greater or less than the estimated cost set forth in the contract.

b. As part of such notification, the Contractor shall provide a revised cost estimate for accomplishing the specified work including a detailed statement of costs incurred, a detailed estimate of cost to complete, and an analysis, accompanied with an explanation, for the projected variance from estimated cost at completion. In the case of a projected increase, such analysis and explanation must include a description of action(s) taken or projected by the contractor in attempting to eliminate or mitigate the increase while discharging the management role of assuring performance within cost.

c. It is agreed by the parties that the notification contemplated above is to be accomplished only by separate written correspondence directed to the Contracting Officer and that no other form or "notification" (e.g. mention in any type of monthly progress or status report) will effect compliance. Further, notification to any individual other than the Administrative Contracting Officer shall not constitute compliance with this requirement.

## H.3 AWARD MADE ON BEHALF OF A DOD AGENCY

This contract is issued by the Department of Interior/National Business Center (DOI/NBC) on behalf of a Department of Defense (DoD) Agency-Defense Advanced Research Projects Agency (DARPA).

## H.4 KEY PERSONNEL REQUIREMENTS

Certain skilled/experienced professional and/or technical personnel are essential for successful contractor accomplishment of the work to be performed under this contract. These are defined as "key personnel" and listed:

| | |
| --- | --- |
| SRI International : | Andreas Stolcke |
| | Horacio Franco |
| | Martin Graciarena |
| | Dimitra Vergyri |
| | Lynn Voss |
| | Nicolas Scheffer |

The contractor agrees key personnel shall not be removed from the contract work or be replaced without compliance with the following:

a. If one or more of the key personnel for whatever reason becomes, or is expected to become, unavailable for work under this contract for a continuous period exceeding 30-calendar days, or is expected to devote substantially less effort to the work than indicated in the proposal as initially anticipated, the contractor shall promptly notify the Government Contract Administrator identified in Section G. Upon concurrence of the Contracting Officer or authorized representative, the contractor shall promptly replace such personnel with personnel of at least equal ability and qualifications.

b. All requests for approval of substitutions hereunder must be in writing and provide a detailed explanation of the circumstances necessitating the proposed substitution(s). They must contain a complete resume for the proposed substitute, and any other information requested by the Contracting Officer to approve or disapprove the proposed substitution. The Contracting Officer or duly authorized representative will evaluate such requests and promptly notify the contractor of the approval or disapproval thereof, in writing.

## H.5 NOTICE OF INCORPORATION OF SECTION K

The following section of the solicitation will not be distributed with the contract; however, this section is incorporated by reference and forms a part of the resultant contract as though furnished in full text therewith:

Section K - Representations, Certifications and Other Statements of Offerors dated 08 June 2010.
Online Representations and Certifications Application (ORCA).

## H.6 EQUIPMENT CLAUSE

The Contractor shall report any purchase of property, plant or equipment whose unit cost exceeds $100,000 to the DARPA Comptroller and the Contracting Officer. DoD FMR 7000.14R, Vol. 4, Chapter 6 and Federal Financial Accounting Standards No. 6 Accounting for Property, Plant and Equipment, applies.

## H.7 NO-COST SETTLEMENT

When in the best interest of the Government and Contractor, a no-cost settlement may upon mutual agreement of the parties be executed in lieu of a termination due to the immature stage and uncertainties involved in contract performance in research and development efforts. In a no-cost settlement, all costs reimbursable, not previously paid, for the performance of the contract to the date of the termination are allowable; however, the costs for anticipatory profits or consequential damages resulting from the termination of this contract (or any subcontract) to include: accounting, legal, clerical and other expenses necessary for the preparation of settlement proposals and supporting data shall be excluded from the settlement proposal submitted by the contractor. The rights and remedies of the Government in this clause are in addition to any other rights and remedies provided by law under this contract.

## H.8 PERMITS, TAXES, LICENSES, ORDINANCES AND REGULATIONS

The Contractor shall, at its own expense, obtain all necessary permits, give all notices, pay all license fees and taxes, comply with all Federal, State, Municipal, County and local Board of Health ordinances, rules and regulations applicable to the business carried on under this contract, and be responsible for all applicable State Sales and Use Taxes.

## H.9 PUBLICATION

PUBLIC RELEASE OR DISSEMINATION OF INFORMATION

(a) There shall be no dissemination or publication, except within and between the Contractor and any subcontractors, of information developed under this contract or contained in the reports to be furnished pursuant to this contract without prior written concurrence of the COR. All scientific and technical reports will be issued with a classification of Distribution Statement C. In consideration of the nonprofit institutions of higher education who will be subcontractors under this contract, papers resulting from unclassified contracted fundamental research (as defined by DoD Instruction Number 5230.27) are exempt from prepublication controls and the requirement for prior written concurrence of the COR.

(b) When submitting material for written approval for open publication, the Contractor/Awardee must submit a request for public release to the DARPA Technical Information Office (TIO) and include the following information: 1) Document Information: document title, document author, short plain-language description of technology discussed in the material (approx. 30 words), number of pages (or minutes of video) and document type (briefing, report, abstract, article, or paper); 2) Event Information: event type (conference, principle investigator meeting, article or paper), event date, desired date for DARPA's approval; 3) DARPA Sponsor: DARPA Program Manager, DARPA office, and contract number; and 4) Contractor/Awardee's Information: POC name, e-mail and phone. Allow four weeks for processing; due dates under four weeks require a justification. Unusual electronic file formats may require additional processing time. Requests can be sent either via e-mail to tio@darpa.mil or via 3701 North Fairfax Drive, Arlington VA 22203-1714, telephone (571) 218-4235. Refer to www.darpa.mil/tio for information about DARPA's public release process.

## H.10 TRAVEL AND PER DIEM

Travel and per diem costs claimed shall be in accordance with those rates/amounts allowed by the Joint Travel Regulation (JTR) in effect at the time travel is actually performed. There may be occasions where the contractor travels to high cost areas and is unable to remain in accordance with the Joint Travel Regulation. If required, the contractor will justify those costs to the Contracting Officer prior to performing the travel. The contractor agrees to use the most economical method of travel available. All travel other than what was proposed will have prior approval of the Contracting Officer's Representative as identified in Section G. This provision also applies to all subcontractors other than educational institutions performing travel in support of this contract. Universities will be reimbursed IAW their internal travel policies pursuant to OMB Circular A-21. Foreign travel requires 90 days approval by the Contracting Officer Representative.

## H.11 ASSERTION OF DATA RIGHTS

The Contractor has asserted restrictions on the Government's use, release and disclosure of technical data and computer software. The technical data and computer software assertions are attached at Section J.

## H.12 ACQUISITION OF COMPUTER EQUIPMENT AND RELATED ITEMS

The contractor and subcontractors are authorized to purchase information technology (IT) equipment and services for direct support of this contract not to exceed the value indicated in this contract clause. Any claimed costs in excess of this amount shall be unallowable in accordance with FAR 52.216-7, Allowable Cost and Payment.

Contract No. D10PC20024
NTE: $697,646.00 per AO

## H.13 SUBCONTRACTING PLAN

SRI International Master Subcontracting Plan, dated 15 May 2009 and Individual Subcontracting Plan dated 25 August 2010, as submitted to and approved by the Contracting Officer in accordance with FAR 52.219-09 is herein attached at Section J and applicable to this contract.

## H.14 REPORTING REQUIREMENTS

### a. QUARTERLY RESEARCH AND DEVELOPMENT (R&D) TECHNICAL STATUS REPORT

Description: The Quarterly R&D Technical Status Report provides a means to capture a comprehensive assessment of project goals, progress, and status. The report provides a section for programmatic data, technical progress, project plans, and issues and concerns. The report shall be formatted in accordance with the report template provided at Attachment 2.

Submission Requirements:

--Frequency: Quarterly.
--Reporting Period: Report on performance during previous quarterly.
--Due Date: Submit within fifteen (15) calendar days after the end of the previous quarter. Post-award initial submission will be submitted within 30 calendar days of award.

### b. QUARTERLY FINANCIAL STATUS REPORT

Description: The Quarterly Financial Status Report provides a means to capture a comprehensive assessment of expenditures. The report provides a section for incurred expenses and invoices submitted, both for the period and for the total cumulative effort which maintains a running balance of the funds remaining. Burn rates are easy to identify as all the pertinent information is side-by-side and easy to compare. The report shall be formatted in accordance with the report template provided at Attachment 2.

Submission Requirements:

--Frequency: Quarterly
--Reporting Period: Report on performance during previous quarterly.
--Due Date: Submit within fifteen (15) calendar days after the end of the previous quarter. Post-award initial submission will be submitted within 30 calendar days of award.

### c. FINAL TECHNICAL REPORT

Description: The Final Technical Report describes and disseminates to the analytical, scientific and technical community the precise nature and results of analytical studies, research development, test and evaluation (RDT&E) on an assigned task(s). The Scientific and Technical Report may be definitive for the subject presented, exploratory in nature, or an evaluation of critical subsystem or of technical problems. The document content shall be clearly written, describe accomplishments and other facts adequately with no technical errors and be acceptable for release. There is no prescribed format. If the Final Technical Report is marked unclassified, unlimited distribution, it should be accompanied by a letter certifying that it has been cleared for public release and/or sale; to include release and/or sale to foreign nationals.

### d. DISTRIBUTION OF REPORTS

All reports listed above shall be submitted according to Section J, Exhibit 1 of the contract.

The Final Report must be electronically submitted to the Program Manager (PM) as identified in Section G. The PM is responsible for reviewing and redacting any information prior to submitting Final Report to the Defense Technical Information Center (DTIC), DTIC-BCS, 8725 John J. Kingman Road, Suite 0944, Fort Belvoir, VA 22060-6218. The PM shall send an electronic copy to the Government Contract Administrator as identified in Section G, when the final report is sent to the DTIC.

(END OF SECTION H)

SECTION I -- CONTRACT CLAUSES

## I.1 52.252-02 CLAUSES INCORPORATED BY REFERENCE

This contract incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. Also, the full text of a clause may be accessed electronically at this/these address(es):

http://farsite.hill.af.mil/

| Clause | Title | Date |
|---|---|---|
| 52.202-01 | Definitions | July 2004 |
| 52.203-03 | Gratuities | April 1984 |
| 52.203-05 | Covenant Against Contingent Fees | April 1984 |
| 52.203-06 | Restrictions On Subcontractor Sales To The Government | September 2006 |
| 52.203-07 | Anti-Kickback Procedures | July 1995 |
| 52.203-08 | Cancellation, Rescission, and Recovery of Funds for Illegal or Improper Activity | January 1997 |
| 52.203-10 | Price Or Fee Adjustment For Illegal Or Improper Activity | January 1997 |
| 52.203-12 | Limitation on Payments to Influence Certain Federal Transactions | September 2007 |
| 52.203-13 | Contractor Code of Business Ethics and Conduct | April 2010 |
| 52.204-04 | Printed or Copied Double-Sided on Recycled Paper. | August 2000 |
| 52.204-07 | Central Contractor Registration | April 2008 |
| 52.209-06 | Protecting the Government's Interest When Subcontracting with Contractors Debarred, Suspended, or Proposed for Debarment | September 2006 |
| 52.215-02 | Audit and Records--Negotiation | March 2009 |
| 52.215-08 | Order of Precedence--Uniform Contract Format | October 1997 |
| 52.215-10 | Price Reduction for Defective Cost or Pricing Data | October 1997 |
| 52.215-11 | Price Reduction for Defective Cost or Pricing Data--Modifications | October 1997 |
| 52.215-12 | Subcontractor Cost or Pricing Data | October 1997 |
| 52.215-13 | Subcontractor Cost or Pricing Data--Modifications | October 1997 |
| 52.215-15 | Pension Adjustments and Asset Reversions | October 2004 |
| 52.215-16 | Facilities Capital Cost of Money | June 2003 |
| 52.215-18 | Reversion or Adjustment of Plans for Postretirement Benefits (PRB) Other than Pensions | July 2005 |
| 52.215-21 | Requirements for Cost or Pricing Data or Information Other Than Cost or Pricing Data--Modifications | October 1997 |
| 52.215-23 | Limitations on Pass-Through Charges. | October 2009 |
| 52.216-07 | Allowable Cost and Payment | December 2002 |
| 52.216-08 | Fixed Fee | March 1997 |
| 52.219-08 | Utilization of Small Business Concerns | May 2004 |
| 52.219-09 | Small Business Subcontracting Plan | April 2008 |
| 52.219-16 | Liquidated Damages-Subcontracting Plan | January 1999 |
| 52.219-28 | Post-Award Small Business Program Representation | April 2009 |
| 52.222-03 | Convict Labor | June 2003 |
| 52.222-21 | Prohibition of Segregated Facilities | February 1999 |
| 52.222-26 | Equal Opportunity | March 2007 |
| 52.222-35 | Equal Opportunity for Special Disabled Veterans, Veterans of the Vietnam Era, and Other Eligible Veterans | September 2006 |
| 52.222-36 | Affirmative Action For Workers with Disabilities | June 1998 |

| | | |
|---|---|---|
| 52.222-37 | Employment Reports on Special Disabled Veterans, Veterans of the Vietnam Era, and Other Eligible Veterans | September 2006 |
| 52.222-50 | Combating Trafficking in Persons | February 2009 |
| 52.222-54 | Employment Eligibility Verification | January 2009 |
| 52.223-06 | Drug Free Workplace | May 2001 |
| 52.223-14 | Toxic Chemical Release Reporting | August 2003 |
| 52.225-13 | Restrictions on Certain Foreign Purchases | June 2008 |
| 52.227-01 Alt I | Authorization And Consent (Jul 1995) - Alternate I | April 1984 |
| 52.227-02 | Notice And Assistance Regarding Patent And Copy Infringement | December 2007 |
| 52.227-11 | Patent Rights--Ownership by the Contractor | December 2007 |
| 52.228-07 | Insurance--Liability To Third Persons | March 1996 |
| 52.230-02 | Cost Accounting Standards | October 2008 |
| 52.230-06 | Administration of Cost Accounting Standards | March 2008 |
| 52.232-09 | Limitation on Withholding of Payments. | April 1984 |
| 52.232-17 | Interest | October 2008 |
| 52.232-22 | Limitation of Funds | April 1984 |
| 52.232-23 | Assignment Of Claims | January 1986 |
| 52.232-25 Alt I | Prompt Payment (Oct 2003) Alternate I | February 2002 |
| 52.232-33 | Payment by Electronic Funds Transfer-Central Contractor Registration | October 2003 |
| 52.233-01 Alt I | Disputes (Jul 2002) - Alternate I | December 1991 |
| 52.233-03 Alt I | Protest After Award (Aug 1996) - Alternate I | June 1985 |
| 52.233-04 | Applicable Law for Breach of Contract Claim | October 2004 |
| 52.242-01 | Notice of Intent to Disallow Costs | April 1984 |
| 52.242-03 | Penalties for Unallowable Costs | May 2001 |
| 52.242-04 | Certification of Final Indirect Costs | January 1997 |
| 52.242-13 | Bankruptcy | July 1995 |
| 52.243-02 Alt V | Changes--Cost-Reimbursement (Aug 1987) -Alternate V | April 1984 |
| 52.243-07 | Notification Of Changes | April 1984 |
| 52.244-05 | Competition in Subcontracting | December 1996 |
| 52.244-06 | Subcontracts for Commercial Items | April 2010 |
| 52.245-01 Alt. II | Government Property | June 2007 |
| 52.245-09 | Use And Charges | June 2007 |
| 52.246-23 | Limitation Of Liability | February 1997 |
| 52.246-25 | Limitation of Liability--Services | February 1997 |
| 52.249-06 | Termination (Cost-Reimbursement) | May 2004 |
| 52.249-14 | Excusable Delays | April 1984 |
| 52.253-01 | Computer Generated Forms | January 1991 |

I.2 52.215-19 NOTIFICATION OF OWNERSHIP CHANGES OCTOBER 1997

(a) The Contractor shall make the following notifications in writing:

(1) When the Contractor becomes aware that a change in its ownership has occurred, or is certain to occur, that could result in changes in the valuation of its capitalized assets in the accounting records, the Contractor shall notify the Administrative Contracting Officer (ACO) within 30 days.

(2) The Contractor shall also notify the ACO within 30 days whenever changes to asset valuations or any other cost changes have occurred or are certain to occur as a result of a change in ownership.

(b) The Contractor shall--

(1) Maintain current, accurate, and complete inventory records of assets and their costs;

(2) Provide the ACO or designated representative ready access to the records upon request;

(3) Ensure that all individual and grouped assets, their capitalized values, accumulated depreciation or amortization, and remaining useful lives are identified accurately before and after each of the Contractor's ownership changes; and

(4) Retain and continue to maintain depreciation and amortization schedules based on the asset records maintained before each Contractor ownership change.

(c) The Contractor shall include the substance of this clause in all subcontracts under this contract that meet the applicability requirement of FAR 15.408(k).

## I.3 52.222-02 PAYMENT FOR OVERTIME PREMIUMS JULY 1990

(a) The use of overtime is authorized under this contract if the overtime premium does not exceed * 0 or the overtime premium is paid for work --

(1) Necessary to cope with emergencies such as those resulting from accidents, natural disasters, breakdowns of production equipment, or occasional production bottlenecks of a sporadic nature;

(2) By indirect-labor employees such as those performing duties in connection with administration, protection, transportation, maintenance, standby plant protection, operation of utilities, or accounting;

(3) To perform tests, industrial processes, laboratory procedures, loading or unloading of transportation conveyances, and operations in flight or afloat that are continuous in nature and cannot reasonably be interrupted or completed otherwise; or

(4) That will result in lower overall costs to the Government.

(b) Any request for estimated overtime premiums that exceeds the amount specified above shall include all estimated overtime for contract completion and shall--

(1) Identify the work unit; e.g., department or section in which the requested overtime will be used, together with present workload, staffing, and other data of the affected unit sufficient to permit the Contracting Officer to evaluate the necessity for the overtime;

(2) Demonstrate the effect that denial of the request will have on the contract delivery or performance schedule;

(3) Identify the extent to which approval of overtime would affect the performance or payments in connection with other Government contracts, together with identification of each affected contract; and

(4) Provide reasons why the required work cannot be performed by using multishift operations or by employing additional personnel.

* Insert either "zero" or the dollar amount agreed to during negotiations. The inserted figure does not apply to the exceptions in subparagraph (a)(1) through (a)(4) of the clause.

## I.4 52.252-06 AUTHORIZED DEVIATIONS IN CLAUSES APRIL 1984

(a) The use in this solicitation or contract of any Federal Acquisition Regulation (48 CFR Chapter 1) clause with an authorized deviation is indicated by the addition of "(DEVIATION)" after the date of the clause.

(b) The use in this solicitation or contract of any U.S. Department of the Interior Acquisition Regulation Supplement (DIARS) clause with an authorized deviation is indicated by the addition of "(DEVIATION)" after the name of the regulation.

## I.5 DEFENSE FEDERAL ACQUISITION REGULATION SUPPLEMENT

**DEFENSE FEDERAL ACQUISITION REGULATION SUPPLEMENT (DFARS)**

Incorporate By Reference: The below referenced DFARS clauses are applicable, will be incorporated in, and will form a part of the resultant contract as though furnished in full text herewith:

| | |
|---|---|
| 252.201-7000 | Contracting Officer's Representative (Dec 1991) |
| 252.203-7000 | Requirements Relating to Compensation of former DoD Officials (Jan 2009) |
| 252.203-7001 | Prohibition on Persons Convicted of Fraud or Other Defense-Contract-Related Felonies (Dec 2008) |
| 252.203-7002 | Requirement to Inform Employees of Whistleblower Rights (Jan 2009) |
| 252.204-7003 | Control of Government Personnel Work Product (Apr 1992) |
| 252.204-7004 | Alternate A, Central Contractor Registration (Sep 2007) |
| 252.204-7008 | Requirements for contracts involving export-controlled item (Jul 2008) |
| 252.205-7000 | Provision of Information to Cooperative Agreement Holders (Dec 1991) |
| 252.209-7004 | Subcontracting with Firms That Are Owned or Controlled by the Government of a Terrorist Country (Dec 2006) |
| 252.215-7000 | Pricing Adjustments (Dec 1991) |
| 252.215-7002 | Cost Estimating System Requirements (Dec 2006) |
| 252.219-7003 | Small business subcontracting plan (DoD contracts) (Apr 2007) |
| 252.225-7001 | Buy American Act and Balance of Payments Program (Jan 2009) |
| 252.225-7002 | Qualifying Country Sources as Subcontractors (Apr 2003) |
| 252.225-7006 | Quarterly Reporting of Actual Contract Performance Outside the United States (May 2007) |
| 252.225-7012 | Preference for Certain Domestic Commodities (Dec 2008) |
| 252.227-7013 | Rights in Technical Data--Noncommercial Items (Nov 1995) |
| 252.227-7014 | Rights in Noncommercial Computer Software and Noncommercial Computer Software Documentation. (June 1995) |
| 252.227-7016 | Rights in Bid or Proposal Information (June 1995) |
| 252.227-7017 | Identification and assertion of use, release, or disclosure restrictions (Jun 1995) |
| 252.227-7019 | Validation of asserted restrictions - Computer software (June 1995) |
| 252.227-7025 | Limitations on the Use or Disclosure of Government Furnished Information Marked with Restrictive Legends (June 1995) |
| 252.227-7027 | Deferred Ordering of Technical Data or Computer Software (Apr 1988) |
| 252.227-7030 | Technical Data - Withholding of Payments (Mar 2000) |
| 252.227-7037 | Validation of Restrictive Markings on Technical Data (Sep 1999) |
| 252.227-7039 | Patents - Reporting of Subject Inventions (Apr 1990) |
| 252.231-7000 | Supplemental Cost Principles (Dec 1991) |
| 252.232-7010 | Levies on Contract Payments (Dec 2006) |
| 252.235-7011 | Final Scientific or Technical Report (Nov 2004) |
| 252.243-7002 | Requests for Equitable Adjustment (Mar 1998) |

NOTE: Full text versions may be accessed electronically at this/these address(es):

http://farsite.hill.af.mil/

Incorporate in Full Text: The below DFARS clause is applicable, will be incorporated in, and will form a part of the resultant contract:

252.235-7010 Acknowledgement of Support and Disclaimer (May 1995)

(a) The Contractor shall include an acknowledgment of the Government's support in the publication of any material based on or developed under this contract, stated in the following terms: This material is based upon work supported by the Defense Advanced Research Projects Agency (DARPA) under Contract No. D10PC20024.

(b) All material, except scientific articles or papers published in scientific journals, must, in addition to any notices or disclaimers by the Contractor, also contain the following disclaimer: Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the Defense Advanced Research Projects Agency (DARPA); or its Contracting Agent, the U.S. Department of the Interior, National Business Center, Acquisition & Property Management Division, Southwest Branch.

## I.6 1452.203-70 RESTRICTION ON ENDORSEMENTS JULY 1996

1452.203-70 RESTRICTION ON ENDORSEMENTS -
DEPARTMENT OF THE INTERIOR (JUL 1996)

The Contractor shall not refer to contracts awarded by the Department of the Interior in commercial advertising, as defined in FAR 31.205-1, in a manner which states or implies that the product or service provided is approved or endorsed by the Government, or is considered by the Government to be superior to other products or services. This restriction is intended to avoid the appearance of preference by the Government toward any product or service. The Contractor may request the Contracting Officer to make a determination as to the propriety of promotional material.

(End of clause)

## I.7 1452.204-70 RELEASE OF CLAIMS JULY 1996

1452.204-70 RELEASE OF CLAIMS -- DEPARTMENT OF THE INTERIOR (JUL 1996)

After completion of work and prior to final payment, the Contractor shall furnish the Contracting Officer with a release of claims against the United States relating to this contract. The Release of Claims form (DI-137) shall be used for this purpose. The form provides for exception of specified claims from operation of the release.

(End of clause)

## I.8 1452.215-70 EXAMINATION OF RECORDS BY DOI APRIL 1984

1452.215-70 EXAMINATION OF RECORDS BY THE DEPARTMENT OF THE INTERIOR (APR 1984)

For purposes of the Examination of Records by the Comptroller General clause of this contract (FAR 52.215-1), the Secretary of the Interior, the Inspector General, and their duly authorized representative(s) from the Department of the Interior shall have the same access and examination rights as the Comptroller General of the United States.

(End of clause)

## I.9 1452.228-7 INSURANCE - LIABILITY TO THIRD PERSON APRIL 1984

1452.228-7 Insurance - Liability to Third Persons

(a) As prescribed in 1428.311-2, the clause at FAR 52.228-7, Insurance - Liability to Third Persons, shall be modified before insertion into solicitations and contracts by (1) changing the title of the clause to read:
"INSURANCE - LIABILITY TO THIRD PERSONS (APR 1984) (DEVIATIONS)";

and (2) changing the first sentence in subparagraph (c)(2) of the clause to read:

"For certain liabilities (and expenses incidental to such liabilities) to third persons not compensated by insurance or otherwise but subject to the 'Limitation of Cost' or 'Limitation of Funds' clause of this contract."
(b) As prescribed in FAR 52.103(a) and 52.107(f), the clause at FAR 52.252-6, Authorized Deviations in Clauses, shall be inserted into solicitations and contracts containing the clause in paragraph (a) of this section.

(End of clause)

## I.10 1452.237-70 INFORMATION COLLECTION - DOI JULY 1996

1452.237-70 INFORMATION COLLECTION -- DEPARTMENT OF THE INTERIOR (JUL 1996)

If performance of this contract requires the contractor to collect information on identical items from ten or more public respondents, no action shall be taken or funds expended in the solicitation or collection of such information until the contractor has received from the Contracting Officer written notification that approval has been obtained from the Office of Management and Budget (OMB) pursuant to the Paperwork Reduction Act of 1980. The Contractor agrees to provide all information requested by the Contracting Officer which is necessary to obtain approval from OMB.

(End of clause)

## I.11 52.244-02 SUBCONTRACTS JUNE 2007

(a) Definitions. As used in this clause--

"Approved purchasing system" means a Contractor's purchasing system that has been reviewed and approved in accordance with Part 44 of the Federal Acquisition Regulation (FAR).

"Consent to subcontract" means the Contracting Officer's written consent for the Contractor to enter into a particular subcontract.

"Subcontract" means any contract, as defined in FAR Subpart 2.1, entered into by a subcontractor to furnish supplies or services for performance of the prime contract or a subcontract. It includes, but is not limited to, purchase orders, and changes and modifications to purchase orders.

(b) When this clause is included in a fixed-price type contract, consent to subcontract is required only on unpriced contract actions (including unpriced modifications or unpriced delivery orders), and only if required in accordance with paragraph (c) or (d) of this clause.

(c) If the Contractor does not have an approved purchasing system, consent to subcontract is required for any subcontract that--

(1) Is of the cost-reimbursement, time-and-materials, or labor-hour type; or

(2) Is fixed-price and exceeds--

(i) For a contract awarded by the Department of Defense, the Coast Guard, or the National Aeronautics and Space Administration, the greater of the simplified acquisition threshold or 5 percent of the total estimated cost of the contract; or

(ii) For a contract awarded by a civilian agency other than the Coast Guard and the National Aeronautics and Space Administration, either the simplified acquisition threshold or 5 percent of the total estimated cost of the contract.

(d) If the Contractor has an approved purchasing system, the Contractor nevertheless shall obtain the Contracting Officer's written consent before placing the following subcontracts:

NONE

(e)(1) The Contractor shall notify the Contracting Officer reasonably in advance of placing any subcontract or modification thereof for which consent is required under paragraph (b), (c), or (d) of this clause, including the following information:

(i) A description of the supplies or services to be subcontracted.

(ii) Identification of the type of subcontract to be used.

(iii) Identification of the proposed subcontractor.

(iv) The proposed subcontract price.

(v) The subcontractor's current, complete, and accurate cost or pricing data and Certificate of Current Cost or Pricing Data, if required by other contract provisions.

(vi) The subcontractor's Disclosure Statement or Certificate relating to Cost Accounting Standards when such data are required by other provisions of this contract.

(vii) A negotiation memorandum reflecting--

(A) The principal elements of the subcontract price negotiations;

(B) The most significant considerations controlling establishment of initial or revised prices;

(C) The reason cost or pricing data were or were not required;

(D) The extent, if any, to which the Contractor did not rely on the subcontractor's cost or pricing data in determining the price objective and in negotiating the final price;

(E) The extent to which it was recognized in the negotiation that the subcontractor's cost or pricing data were not accurate, complete, or current; the action taken by the Contractor and the subcontractor; and the effect of any such defective data on the total price negotiated;

(F) The reasons for any significant difference between the Contractor's price objective and the price negotiated; and

(G) A complete explanation of the incentive fee or profit plan when incentives are used. The explanation shall identify each critical performance element, management decisions used to quantify each incentive element, reasons for the incentives, and a summary of all trade-off possibilities considered.

(2) The Contractor is not required to notify the Contracting Officer in advance of entering into any subcontract for which consent is not required under paragraph (b), (c), or (d) of this clause.

(f) Unless the consent or approval specifically provides otherwise, neither consent by the Contracting Officer to any subcontract nor approval of the Contractor's purchasing system shall constitute a determination--

(1) Of the acceptability of any subcontract terms or conditions;

(2) Of the allowability of any cost under this contract; or

(3) To relieve the Contractor of any responsibility for performing this contract.

(g) No subcontract or modification thereof placed under this contract shall provide for payment on a cost-plus-a-percentage-of-cost basis, and any fee payable under cost-reimbursement type subcontracts shall not exceed the fee limitations in FAR 15.404-4(c)(4)(i).

(h) The Contractor shall give the Contracting Officer immediate written notice of any action or suit filed and prompt notice of any claim made against the Contractor by any subcontractor or vendor that, in the opinion of the Contractor, may result in litigation related in any way to this contract, with respect to which the Contractor may be entitled to reimbursement from the Government.

(i) The Government reserves the right to review the Contractor's purchasing system as set forth in FAR Subpart 44.3.

(j) Paragraphs (c) and (e) of this clause do not apply to the following subcontracts, which were evaluated during negotiations:

NONE

(End of clause)

## I.12 1452.233-2 SERVICE OF PROTEST JULY 1996

1452.233-2 Service of Protest

"SERVICE OF PROTEST DEPARTMENT OF THE INTERIOR (JUL 1996) (DEVIATION)";

and adding the following sentence to the end of the provision:

(c) A copy of the protest served on the Contracting Officer shall be simultaneously furnished by the protester to the Department of the Interior Assistant Solicitor for Procurement and Patents, 1849 C Street, NW, Room 6511, Washington, D.C. 20240."

# SECTION J -- LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACHMENTS

## J.1 ATTACHMENTS

Attachment 1 - Assertion of Data Rights
Attachment 2 - Master Subcontracting Plan
Attachment 3 - Individual Subcontracting Plan
Attachment 4- DD Form 1423-1 Contract Data Requirements List

## J.2 EXHIBITS

Exhibit A - Progress, Status and Management Report/Monthly Progress Report, 3 pages.

**(END OF SECTION J)**

copyright.

(c) Offers submitted in response to this solicitation shall identify, to the extent known at the time an offer is submitted to the Government, the technical data or computer software that the Offeror, its subcontractors or suppliers, or potential subcontractors or suppliers, assert should be furnished to the Government with restrictions on use, release, or disclosure.

(d) The Offeror's assertions, including the assertions of its subcontractors or suppliers or potential subcontractors or suppliers, shall be submitted as an attachment to its offer in the following format, dated and signed by an official authorized to contractually obligate the Offeror:

Identification and Assertion of Restrictions on the Government's Use, Release, or Disclosure of Technical Data or Computer Software.

The Offeror asserts for itself, or the persons identified below, that the Government's rights to use, release, or disclose the following technical data or computer software should be restricted:

| FAR/DFARS IP Restrictions (Technical Data and Computer Software) | | | |
|---|---|---|---|
| Computer Software | | | Name of Person |
| to be Furnished | Basis for | Asserted Rights | Asserting |
| With Restrictions* | Assertion** | Category*** | Restrictions**** |
| (LIST)***** | (LIST) | (LIST) | (LIST) |
| NONE | | | |
| | | | |

**FAR/DFARS Commercial Items IP Restrictions (Technical Data and Computer Software)**

| COMMERCIAL | | | |
|---|---|---|---|
| **Technical Data / Computer Software To be Furnished With Restrictions** | **Basis for Assertion** | **Asserted Rights Category** | **Name of Person Asserting Restrictions** |
| Decipher® Speech Recognition System | Commercial Computer Software | Commercial Rights (Vendor standard no cost agreement) | SRI International |
| SRILM – SRI Language Modeling Toolkit | Commercial Computer Software | Commercial Rights (www.speech.sri.com/projects/srilm/docs/ License) | SRI International |
| Algemy | Commercial Computer Software | Commercial Rights (Equivalent of Unlimited Rights, with waiver of warranty and liability) | Bosch & Volkswagen of America |
| Matlab | Commercial Computer Software | Commercial Rights (Vendor standard agreement) | Mathworks |

REPRESENTATIONS AND CERTIFICATIONS OF OFFERORS

| COMMERCIAL | | | |
|---|---|---|---|
| **Technical Data / Computer Software To be Furnished With Restrictions** | **Basis for Assertion** | **Asserted Rights Category** | **Name of Person Asserting Restrictions** |
| SVMLight implementation of Support Vector Machines in C | Commercial Computer Software | Commercial Rights (Free for non-commercial use, no redistribution allowed) | Thorsten Joachims, Cornell University |
| HTK Hidden Markov Model Tool-kit | Commercial Computer Software | Commercial Rights (htk.eng.cam.ac.uk/docs/license.shtml) | University of Cambridge |
| Speech data | Commercial Data | Commercial Rights (www.ldc.upenn.edu/Catalog/) | Linguistic Data Consortium |
| R Statistics Packs | Commercial Computer Software | Commercial Rights (GNU General Public License) | Free Software Foundation (FSF) |
| Octave | Commercial Computer Software | Commercial Rights (GNU General Public License) | Free Software Foundation |
| Python | Commercial Computer Software | Commercial Rights (Python 2.4.2 license: www.python.org/download/releases/2.4.2/license/) | Python Software Foundation (PSF) |
| Perl | Commercial Computer Software | Commercial Rights (GNU General Public License) | Free Software Foundation |
| DynaSpeak® Speech Recognition System | Commercial Computer Software | Commercial Rights | SRI International |
| QT User Interface Libraries | Commercial Computer Software | Commercial Rights (http://www.qtsoftware.com/products/licensing) | Nokia, Inc. |
| XMLRPC-c | Commercial Computer Software | Commercial Rights (http://xmlrpc-c.sourceforge.net/) | Sourceforge.net |
| Apache XML RPC | Commercial Computer Software | Commercial Rights (http://ws.apache.org/xmlrpc/) | Apache open source project |
| Microsoft C++ 2008 Redistributable Package | Commercial Computer Software | Commercial Rights | Microsoft |
| Java Standard Edition Runtime Environment Version 6 (or later) | Commercial Computer Software | Commercial Rights (http://java.sun.com/javase/downloads/index.jsp) | Sun microsystems |
| Postgresql | Commercial Computer Software | Commercial Rights | Postgresql |
| Postgresql jdbc | Commercial Computer Software | Commercial Rights | Postgresql |

REPRESENTATIONS AND CERTIFICATIONS OF OFFERORS

| COMMERCIAL | | | |
|---|---|---|---|
| **Technical Data / Computer Software To be Furnished With Restrictions** | **Basis for Assertion** | **Asserted Rights Category** | **Name of Person Asserting Restrictions** |
| SPHINX | Commercial Computer Software | Commercial Rights | Carnegie Mellon University |

*For technical data (other than computer software documentation) pertaining to items, components, or processes developed at private expense, identify both the deliverable technical data and each such item, component, or process. For computer software or computer software documentation identify the software or documentation.

**Generally, development at private expense, either exclusively or partially, is the only basis for asserting restrictions. For technical data, other than computer software documentation, development refers to development of the item, component, or process to which the data pertain. The Government's rights in computer software documentation generally may not be restricted. For computer software, development refers to the software. Indicate whether development was accomplished exclusively or partially at private expense. If development was not accomplished at private expense, or for computer software documentation, enter the specific basis for asserting restrictions.

***Enter asserted rights category (e.g., government purpose license rights from a prior contract, rights in SBIR data generated under another contract, limited, restricted, or government purpose rights under this or a prior contract, or specially negotiated licenses).

****Corporation, individual, or other person, as appropriate.

*****Enter "none" when all data or software will be submitted without restrictions.

Date 8 June 2010

Printed Name and Title Colleen R. Ferguson, Sr. Contracts Administrator

Signature

Colleen R. Ferguson

Digitally signed by Colleen R. Ferguson
Date: 2010.06.08
11:47:03 -07'00'

(End of identification and assertion)

(e) An offeror's failure to submit, complete, or sign the notification and identification required by paragraph (d) of this provision with its offer may render the offer ineligible for award.

(f) If the Offeror is awarded a contract, the assertions identified in paragraph (d) of this provision shall be listed in an attachment to that contract. Upon request by the Contracting Officer, the Offeror shall provide sufficient information to enable the Contracting Officer to evaluate any listed assertion.

(End of provision)

| K.12 | TECHNICAL DATA OR COMPUTER SOFTWARE PREVIOUSLY DELIVERED TO THE GOVERNMENT (DFARS 252.227-7028) JUNE 1995 |
|---|---|

The Offeror shall attach to its offer an identification of all documents or other media incorporating technical data or computer software it intends to deliver under this contract with other than unlimited rights that are identical or substantially similar to documents or other media that the Offeror has produced for, delivered to, or is obligated to deliver to the Government under any contract or subcontract. The attachment shall identify-

(a) The contract number under which the data or software were produced;
(b) The contract number under which, and the name and address of the organization to whom, the data or software were most recently delivered or will be delivered; and
(c) Any limitations on the Government's rights to use or disclose the data or software, including, when applicable, identification of the earliest date the limitations expire.

(End of provision)

Colleen R. Ferguson Digitally signed by Colleen R. Ferguson Date: 2010.06.08 11:47:19 -07'00'

Signature

8 June 2010

Date

Colleen R. Ferguson

Printed Name

Sr. Contracts Administrator

Title

SRI International

## VOLUME 1: TECHNICAL PROPOSAL

BAA Number: DARPA-BAA-10-34 "RATS"

Proposal Title: **SCENIC: Speech Content Extraction from Noisy Information Channels**

Technical Area 1: "Algorithmic Development and Signal Processing"

Technical Point of Contact: Dr. Andreas Stolcke
Senior Research Engineer
SRI International
333 Ravenswood Avenue
Menlo Park, CA 94025;
stolcke@speech.sri.com
Ph: (650) 859-2544; Fax: (650) 859-5984

Administrative Point of Contact: Mrs. Colleen Ferguson
Senior Contracts Administrator
SRI International
333 Ravenswood Avenue
Menlo Park, CA 94025;
colleen.ferguson@sri.com
Ph: (650) 859-4199; Fax: (650) 859-6171

Summary of Costs:

| | |
|---|---|
| Phase 1 (Base): | $ 5,192,620 |
| Phase 2 (Option): | $ 4,125,016 |
| Phase 3 (ROM): | $ 3,729,881 |
| Total: | $13,047,517 |

Contractor's Reference Number: SRI Proposal ECU 10-006

Type of Business: Large, Other Nonprofit

Date Proposal Prepared: 26 March 2010

Approved by: Kristin Precoda, Director
Speech Technology & Research Laboratory

William S. Mark, Vice President
Information and Computing Sciences Division

This proposal or quotation includes data that shall not be disclosed outside of the government and shall not be duplicated, used, or disclosed—in whole or in part—for any purpose other than to evaluate this proposal or quotation. If, however, a contract is awarded to this offeror or quoter as a result of—or in connection with—the submission of these data, the government shall have the right to duplicate, use, or disclose the data to the extent provided in the resulting contract. This restriction does not limit the government's right to use information contained in these data if it is obtained from another source without restriction. The data subject to this restriction are contained in all pages.

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USE OR DISCLOSURE OF DATA IS SUBJECT TO THE RESTRICTION ON THE COVER OF THIS PROPOSAL.

# SECTION 2. TECHNICAL DETAILS

## 2.1 INNOVATIVE CLAIMS

(b) (4)

[redacted]



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## 2.2 PROPOSAL ROADMAP

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## 2.3 TECHNICAL APPROACH

### 2.3.1 INTRODUCTION

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### 2.3.4 SYSTEM DESIGN AND IMPLEMENTATION

**Task 7: Software and Team Integration**

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## 2.4 COMPARISON WITH CURRENT TECHNOLOGY

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## 2.5 STATEMENT OF WORK

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Task 2: Advanced Modulation

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Task 3: Decision Making

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Task 4: Speech and Metadata Extraction

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Task 5: Language and Speaker Recognition

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Task 6: Keyword Spotting

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Task 7. Software and Plane Integration

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## 2.6 INTELLECTUAL PROPERTY

### 1. FAR/DFARS Noncommercial Items IP Restrictions (Technical Data and Computer Software)

NONE.

### 2. FAR/DFARS Commercial Items IP Restrictions (Technical Data and Computer Software)

| COMMERCIAL | | | |
|---|---|---|---|
| **Technical Data / Computer Software To be Furnished With Restrictions** | **Basis for Assertion** | **Asserted Rights Category** | **Name of Person Asserting Restrictions** |
| Decipher® Speech Recognition System | Commercial Computer Software | Commercial Rights (Vendor standard no cost agreement) | SRI International |
| SRILM – SRI Language Modeling Toolkit | Commercial Computer Software | Commercial Rights (www.speech.sri.com/projects/srilm/docs/ License) | SRI International |
| Algemy | Commercial Computer Software | Commercial Rights (Equivalent of Unlimited Rights, with waiver of warranty and liability) | Bosch & Volkswagen of America |
| Matlab | Commercial Computer Software | Commercial Rights (Vendor standard agreement) | Mathworks |
| SVMLight implementation of Support Vector Machines in C | Commercial Computer Software | Commercial Rights (Free for non-commercial use, no redistribution allowed) | Thorsten Joachims, Cornell University |
| HTK Hidden Markov Model Tool-kit | Commercial Computer Software | Commercial Rights (htk.eng.cam.ac.uk/docs/ license.shtml) | University of Cambridge |
| Speech data | Commercial Data | Commercial Rights (www.ldc.upenn.edu/ Catalog/) | Linguistic Data Consortium |
| R Statistics Packs | Commercial Computer Software | Commercial Rights (GNU General Public License) | Free Software Foundation (FSF) |
| Octave | Commercial Computer Software | Commercial Rights (GNU General Public License) | Free Software Foundation |
| Python | Commercial Computer Software | Commercial Rights (Python 2.4.2 license: www.python.org/download/releases/2.4.2/license/) | Python Software Foundation (PSF) |
| Perl | Commercial Computer Software | Commercial Rights (GNU General Public License) | Free Software Foundation |
| DynaSpeak® Speech Recognition System | Commercial Computer Software | Commercial Rights | SRI International |
| QT User Interface Libraries | Commercial Computer Software | Commercial Rights (http://www.qtsoftware.com/products/licensing) | Nokia, Inc. |
| XMLRPC-c | Commercial Computer Software | Commercial Rights (http://xmlrpc-c.sourceforge.net/) | Sourceforge.net |
| Apache XML RPC | Commercial Computer Software | Commercial Rights (http://ws.apache.org/xmlrpc/) | Apache open source project |
| Microsoft C++ 2008 Redistributable Package | Commercial Computer Software | Commercial Rights | Microsoft |


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| COMMERCIAL | | | |
|---|---|---|---|
| **Technical Data / Computer Software To be Furnished With Restrictions** | **Basis for Assertion** | **Asserted Rights Category** | **Name of Person Asserting Restrictions** |
| Java Standard Edition Runtime Environment Version 6 (or later) | Commercial Computer Software | Commercial Rights (http://java.sun.com/javase/downloads/index.jsp) | Sun microsystems |
| Postgresql | Commercial Computer Software | Commercial Rights | Postgresql |
| Postgresql jdbc | Commercial Computer Software | Commercial Rights | Postgresql |
| SPHINX | Commercial Computer Software | Commercial Rights | Carnegie Mellon University |

## 3. Non-FAR/DFARS IP Restrictions (Technical Data and Computer Software)

NONE.

## 4. Patent Dependencies

| US Patent or Application # | Inventor(s) | Title | Issue Date | Owner |
|---|---|---|---|---|
| 7,254,538 | Hynek Hermansky, Sangita Sharma, and Daniel Ellis | Nonlinear mapping for feature extraction in automatic speech recognition | August 7, 2007 | ICSI |
| 11/758,650 | Bratt et al. | Method and Apparatus for Speaker Recognition | | SRI International and Stanford University |
| US 7,177,810 | Bratt et al. | Method and Apparatus for Performing Prosody-based Endpointing of a Speech Signal | 13-Feb-2007 | SRI International |

## 5. IP Representation

SRI International represents in good faith that to the best of its knowledge as of the date of this proposal, that SRI owns or possesses appropriate licensing rights to all other intellectual property proposed for use herein. However, SRI has not conducted any patent search or engaged counsel to provide any legal opinion regarding freedom to operate and provides no warranty of non-infringement of any third party rights.



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## 2.7 SCHEDULE AND MILESTONES

The following table presents the schedule and milestones for the SCENIC program.

| TASKS | Phase 1 | | | | | | Phase 2 | | | | Phase 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 |
| **Task 1: Robust Features** | | | | | | | | | | | | | | |
| Auditory Model Inspired Temporal Representations | | | | | | | | | | | | | | |
| Multistream Features Based on Gabor Filtering | | | | | | | | | | | | | | |
| Pitch Sync. Feats & Robust Pitch Estimation | | | | | | | | | | | | | | |
| Improved Feature Mapping | | | | | | | | | | | | | | |
| Task Specific Feature Design | | | | | | | | | | | | | | |
| Feature Combination | | | | | | | | | | | | | | |
| **Task 2: Advanced Modeling** | | | | | | | | | | | | | | |
| Structured JFA | | | | | | | | | | | | | | |
| Selective Weighting and Missing Feature Modeling | | | | | | | | | | | | | | |
| Large-Margin Training | | | | | | | | | | | | | | |
| **Task 3: Decision Making** | | | | | | | | | | | | | | |
| Module-Specific Adaptive Calibration | | | | | | | | | | | | | | |
| Cross-Module Joint Calibration | | | | | | | | | | | | | | |
| On The Fly Calibration for New Targets | | | | | | | | | | | | | | |
| **Task 4: Speech and Metadata Extraction** | | | | | | | | | | | | | | |
| System Development | | | | | | | | | | | | | | |
| SAD Specific Feature Development | | | | | | | | | | | | | | |
| SAD Combination by Scene Analysis | | | | | | | | | | | | | | |
| Metadata Generation | | | | | | | | | | | | | | |
| **Task 5: Language and Speaker Recognition** | | | | | | | | | | | | | | |
| System Development and Experimental Setup | | | | | | | | | | | | | | |
| Integration of Modeling Technologies | | | | | | | | | | | | | | |
| Selection of Feature Types and Modeling | | | | | | | | | | | | | | |
| **Task 6: Keyword Spotting** | | | | | | | | | | | | | | |
| Language Dependent Recognition Sys Development | | | | | | | | | | | | | | |
| FST-Based Hybrid KWS System | | | | | | | | | | | | | | |
| Re-Scoring KWS | | | | | | | | | | | | | | |
| **Task 7: Software and Team Integration** | | | | | | | | | | | | | | |
| Evaluation System | | | | | | | | | | | | | | |
| Graphical User Interface | | | | | | | | | | | | | | |
| Data Processing | | | | | | | | | | | | | | |
| **Reporting** | | | | | | | | | | | | | | |

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◆ = internal milestone; √ = evaluation system delivery; ▣ = quarterly technical reports

The following table presents the performance targets by phase and task for the SCENIC program.

| | SAD | Language ID | Speaker ID | Keyword Spotting |
|---|---|---|---|---|
| Phase 1 | 5% Miss<br>3% FA<br>Error – 3.75% | 7% Miss<br>10% FA<br>Error – 8.2% | 10% Miss<br>4% FA<br>Error – 5.5% | 30% Miss<br>4% FA<br>Error – 7% |
| Phase 2 | 4% Miss<br>1.5% FA<br>Error – 2.2% | 5% Miss<br>5% FA<br>Error – 5% | 10% Miss<br>2.5% FA<br>Error – 4% | 20% Miss<br>3% FA<br>Error – 5.2% |
| Phase 3 | 3% Miss<br>1% FA<br>Error – 1.6% | 5% Miss<br>1% FA<br>Error – 1.7% | 10% Miss<br>1.5% FA<br>Error – 2.6% | 15% Miss<br>2% FA<br>Error – 3.5% |



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## 2.8 PERSONNEL, QUALIFICATIONS, AND COMMITMENTS

The following biographies for all key members of the SCENIC team summarize qualifications and unique capabilities. Key personnel from SRI are Andreas Stolcke, Horacio Franco, Martin Graciarena, Dimitra Vergyri, Lynn Voss, and Nicolas Scheffer. Key personnel from ICSI are Nelson Morgan and Daniel Ellis. Other key personnel are Abeer Alwan from UCLA and John Hansen from UTD.

**Key Individual Time Commitments**

| Key Individual | Project | Current / Pending | 2010 (hr) | 2011 (hr) | 2012 (hr) | 2013 (hr) | 2014 (hr) |
|---|---|---|---|---|---|---|---|
| [redacted] | | | | | | | |

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## Andreas Stolcke, Ph.D.

**Summary of Qualifications and Unique Capabilities:**

Dr. Andreas Stolcke holds a Ph.D. in computer science from UC Berkeley, and has been with SRI International since 1994, currently as a Senior Research Engineer. Dr. Stolcke has published more than 200 journal articles and other peer-reviewed papers, with contributions to machine learning of languages, parsing, acoustic and language modeling for speech recognition, computational modeling of speech prosody, information extraction from speech, and ASR-based techniques for speaker recognition. He has served on the editorial boards or as co-editor for the journals *Computational Linguistics*, *IEEE Transactions on Audio Speech and Language Processing*, and *Computer Speech and Language*, and is a Senior Member of the IEEE Signal Processing Society. He wrote the widely used, open-source SRI Language Modeling (SRILM) toolkit.

**Previous Accomplishments:**

Dr. Stolcke was the PI for SRI's team on DARPA's EARS program, where he directed research in large-vocabulary speech recognition and recognition of structural metadata, heading a team of size similar to the proposed RATS effort. Subsequently, he was a Task Leader for SRI's team on the DARPA GALE program, responsible for coordinating speech recognition research and development among six partner sites, as well as with other team members working on machine translation and information distillation. Dr. Stolcke was part of the SRI team that fielded the winning system in the 2001 DARPA-sponsored evaluation of recognition of Speech in Noisy Environments (SPINE), and he was a key contributor to the SGI/OGI system for the NIST 2006 Spoken Term Detection evaluation. Dr. Stolcke has directed work at SRI and ICSI in meeting recognition, contributing to DARPA's PAL/CALO program, and consistently obtaining leading performance in NIST Rich Transcription evaluations. For the past six years, Dr. Stolcke has been co-leading SRI's speaker recognition program (funding from DoD, Sandia Labs, and IARPA), which resulted in numerous contributions to the state of the art in that field, and outstanding results in NIST evaluations.

**Selected Publications:**

A. Stolcke, B. Chen, H. Franco, V. R. R. Gadde, M. Graciarena, M.-Y. Hwang, K. Kirchhoff, A. Mandal, N. Morgan, X. Lin, T. Ng, M. Ostendorf, K. Sonmez, A. Venkataraman, D. Vergyri, W. Wang, J. Zheng, Q. Zhu (2006), Recent Innovations in Speech-to-Text Transcription at SRI-ICSI-UW. *IEEE Trans. Audio, Speech and Language Processing* 14(5), 1729–1744.

A. Stolcke, X. Anguera, K. Boakye, O. Cetin, A. Janin, M. Magimai-Doss, C. Wooters, J. Zheng (2008), The SRI-ICSI Spring 2007 Meeting and Lecture Recognition System, R. Stiefelhagen, R. Bowers, and J. Fiscus (eds.), Multimodal Technologies for Perception of Humans. International Evaluation Workshops CLEAR 2007 and RT 2007, Springer *Lecture Notes in Computer Science* 4625, pp. 450–463.

A. Stolcke, S. Kajarekar, L. Ferrer, E. Shriberg (2007), Speaker Recognition with Session Variability Normalization Based on MLLR Adaptation Transforms, *IEEE Transactions on Audio, Speech and Language Processing*, 15(7), 1987–1998. Special issue on speaker and language recognition.

S. S. Kajarekar, L. Ferrer, A. Stolcke, and E. Shriberg (2008), Voice-based speaker recognition combining acoustic and stylistic features, in *Advances in Biometrics: Sensors, Algorithms and Systems* (N. K. Ratha and V. Govindaraju, eds.), pp. 183--201, London: Springer.

A. Stolcke and S. Kajarekar (2008), Recognizing Arabic speakers with English phones, in *Proc. Odyssey Speaker and Language Recognition Workshop*, Stellenbosch, South Africa.

V. R. Rao Gadde, A. Stolcke, D. Vergyri, J. Zheng, K. Sonmez, A. Venkataraman (2002), Building an ASR System for Noisy Environments: SRI's 2001 SPINE Evaluation System, *Proc. Intl. Conf. on Spoken Language Processing*, vol. 3, pp. 1577–1580, Denver.



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M. Akbacak, D. Vergyri, A. Stolcke (2008), Open-Vocabulary Spoken Term Detection Using Graphone-Based Hybrid Recognition Systems, *Proc. IEEE ICASSP*, pp. 5240–5243, Las Vegas.

E. Shriberg, A. Stolcke (2004), Direct Modeling of Prosody: An Overview of Applications to Automatic Speech Processing. *Proc. Intl. Conf. on Speech Prosody*, pp. 575--582, Nara, Japan.



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## Horacio Franco, Dr. Eng.

**Summary of Qualifications and Unique Capabilities:**

Horacio Franco is Chief Scientist in the Speech Technology and Research Laboratory (STAR) at SRI. He received his Engineer Degree in Electronics in 1978, and his Doctor in Engineering degree in 1996, both from the University of Buenos Aires. Since joining SRI in 1990, he has contributed to the areas of acoustic modeling, hybrid HMM-neural net speech recognition approaches, speech recognizer architectures, speech technology for language learning, noise-robust speech recognition, and speech-to-speech translation systems. He has co-authored more than 70 papers, and several communications and book chapters. Dr. Franco is co-author of several U.S. patents in aspects of speech recognition, speech technology for language learning, and noise-robust speech recognition. He has also been active in leading development and deployment of SRI's speech technology in different areas of government and commercial use.

**Previous Accomplishments:**

Dr. Franco has been a principal investigator for several DARPA-funded projects at SRI: Speech Modeling with Neural Networks, the TRP Affordable Language Education Consortium, and the speech recognition component of OneWay and SRI's Babylon speech translation projects, as well as leader of the Acoustic Modeling task in SRI's EARS project. Dr. Franco also led an effort, funded by the Collaborative Technology Alliance, to develop noise-robust command and control speech recognition for military vehicles. He led several projects to develop noise-robust speech recognition systems for military air vehicles such as the Joint Strike Fighter and the Apache helicopter. He led a Raytheon subcontract from the DARPA BOSS program to develop embedded wordspotting, speaker ID, language ID, and topic detection capabilities.

**Selected Publications:**

M. Akbacak, H. Franco, M. Frandsen, S. Hasan, H. Jameel, A. Kathol, S. Khadivi, X. Lei, A Mandal, S. Mansour, K. Precoda, C. Richey, D. Vergyri, W. Wang, M., Yang, J. Zheng, Recent Advances in SRI's IraqComm ™ Iraqi Arabic-English Speech-to-Speech Translation System, Proc. IEEE ICASSP (Taipei), Apr. 2009.

A. Stolcke, B. Chen, H. Franco, R. Gadde, M Graciarena, M.H. Hwang, K. Kirchhoff, A. Mandal, N. Morgan, T. Ng, M. Ostendorf, K. Sönmez, A. Venkataraman, D. Vergyri, W. Wang, J. Zheng, Q. Zhu, Recent Innovations in Speech-to-Text Transcription at SRI-ICSI-UW, IEEE Trans. Speech, Acoustics and Audio Processing 14(5), 1729–1744, 2006.

Jing Zheng, Horacio Franco, Andreas Stolcke (2004), Effective Acoustic Modeling for Rate-of-Speech Variation in Large Vocabulary Conversational Speech Recognition, Proc. ICSLP, pp. 401-404, Jeju, Korea.

H. Franco, J. Zheng, K. Precoda, F. Cesari, V. Abrash, D. Vergyri, A. Venkataraman, H. Bratt, C. Richey, A. Sarich (2003), Development of Phrase Translation Systems for Handheld Computers: From Concept to Field, Proc. Eurospeech, Geneve, Switzerland.

M. Graciarena, H. Franco, Greg Myers, Victor Abrash, Robust Feature Compensation in Nonstationary and Multiple Noise Environments, Proc. Eurospeech, Lisbon, Portugal, 2005.

M. Graciarena, H. Franco, Unsupervised Noise Model Estimation for Model-Based Robust Speech Recognition, Proc. IEEE Automatic Speech Recognition and Understanding Workshop, 2003

H. Franco, J. Zheng, K. Precoda, F. Cesari, V. Abrash, D. Vergyri, A. Venkataraman, H. Bratt, C. Richey, A. Sarich (2003), Development of Phrase Translation Systems for Handheld Computers: From Concept to Field, Proc. Eurospeech, Geneve, Switzerland.

J. Zheng, H. Franco, A. Stolcke (2003), Modeling Word-Level Rate-of-Speech Variation in Large Vocabulary Conversational Speech Recognition, Speech Communication, 41, pp. 273–285.

H. Franco, J. Zheng, J. Butzberger, F. Cesari, M. Frandsen, J. Arnold, V. R. Rao Gadde, A. Stolcke, V. Abrash (2002), DynaSpeak: SRI's Scalable Speech Recognizer for Embedded and Mobile Systems, Proc. Second Intl. Conf. on Human Language Technology Research, pp. 25–30, Mar. 24–27, San Diego, California.



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## Martin Graciarena, Ph.D.

**Summary of Qualifications and Unique Capabilities:**

Martin Graciarena is a Research Engineer in the STAR Laboratory at SRI. He is a reviewer of noise-robust speech and speaker recognition papers on the most relevant publications and conferences in the area such as the *IEEE Transactions on Speech and Language* and the *IEEE International Conference on Acoustics, Speech and Signal Processing*. He has published more than 25 papers on noise-robust speech and speaker recognition, and he has done pioneering work on combination of standard and throat microphones for robust speech recognition. His paper about this research is one of the most cited papers in this area. He has improved feature mapping techniques and model-based noise-robust speech recognition, has improved state-of-the-art speech recognition systems by incorporating prosodic-based features, done research on noise-robust speaker identification in Arabic language as well as improving channel robustness of high-level prosodic-based speaker identification systems. He holds one patent on a noise-robust speech recognition technique and is an IEEE member.

His current research interests are improving the feature extraction processing based on human auditory modeling, improving feature mapping techniques by combining heterogeneous transformations, and improving speech activity detection in combination with speech and background improved feature extraction.

**Previous Accomplishments:**

Dr. Graciarena did pioneering work on combining speech- and throat-based microphones for robust speech recognition under the DARPA ROAR program. He was a researcher in the DARPA EARS program where he improved the performance of state-of-the-art speech recognition systems by the incorporation of voicing features in the acoustic front end. He improved the robustness to channel degradation of state-of-the-art prosodic-based speaker identification systems for Sandia National Laboratory.

**Selected Publications:**


M. Graciarena, S. Kajarekar, A. Stolcke, E. Shriberg (2007). Noise Robust Speaker Identification for Spontaneous Arabic Speech. *Proc. IEEE ICASSP*, vol. 4, pp. 245–248, Honolulu.

L. Ferrer, M. Graciarena, A. Zymnis, E. Shriberg (2008). System Combination Using Auxiliary Information for Speaker Verification. *Proc. IEEE Intl. Conf Acoustics, Speech and Signal Processing*, 2008.

M. Graciarena, H. Franco, G. Myers, V. Abrash (2005). Robust Feature Compensation in Nonstationary and Multiple Noise Environments. *Proc. Eurospeech*, pp. 985–988, Lisbon, Portugal.

M. Graciarena, H. Franco, J. Zheng, D. Vergyri, A. Stolcke (2004). Voicing Feature Integration in SRI's Decipher LVCSR System. *Proc. IEEE Intl. Conf. on Acoustics, Speech and Signal Processing*, vol. 1, pp. 921–924, Montreal, Canada.

M. Graciarena, H. Franco, G. Myers, C. Cowan, F. Cesari, V. Abrash (2004).. Combination of Standard and Throat Microphones for Robust Speech Recognition in Highly Noisy Environments. *Proc. Intl. Conf. Spoken Language Processing*. Jeju Island, Korea.

M. Graciarena, H. Franco, K. Sonmez, H. Bratt (2003). Combining Standard and Throat Microphones for Robust Speech Recognition. *IEEE Signal Processing Letters*, vol. 10, no. 3, pp. 72–74, Mar. 2003.

M. Graciarena, H. Franco (2003). Unsupervised Noise Model Estimation for Model-Based Robust Speech Recognition. *Proc. IEEE Automatic Speech Recognition and Understanding Workshop*, pp. 351–356, Virgin Islands.

G. Myers, H. Franco, M. Graciarena, C. Cowan, F. Cesari, V. Abrash (2003). Noise-Robust Spoken Language Interface. *CTA 2003 Symposium on Robotics*, pp. 135–139, Adelphi, New York.

M. Graciarena (2000). Adaptive Model-Based Technique for Robust Speech Recognition. *Proc. 34th Asilomar Conference on Signals, Systems and Computers*, Pacific Grove, CA.

M. Graciarena (2000). Maximum Likelihood Noise HMM Estimation in Model-Based Robust Speech Recognition. *Proc. 6th International Conference on Spoken Language Processing*, vol. 3, pp. 598–601, Beijing.




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## Dimitra Vergyri, Ph.D.

**Summary of Qualifications and Unique Capabilities:**

Dimitra Vergyri is a Research Engineer at SRI. She obtained her Ph.D. degree from Johns Hopkins University in 2000 when she joined the Speech Technology and Research laboratory at SRI. She has published more than 40 papers in refereed conferences and journals. Her research interests include acoustic and language modeling for languages with sparse training data, spoken term detection, machine translation and information extraction from speech. She has served since 2009 as an Associate Editor for the *IEEE Transactions on Audio, Speech and Language Processing*.

**Previous Accomplishments:**

Dr. Vergyri has worked as one of the key personnel in four major DARPA-funded projects: EARS, CALO, GALE and TRANSTAC, where she participated in regular evaluations for speech recognition and speech translation. She led the ASR development for Arabic systems under GALE, and Pashto, Farsi and Arabic under TRANSTAC. She also participated as part of the SRI team in the Spoken Term Detection NIST evaluation in 2006, where SRI had the best submission for the Meetings condition, and in the SPeech In Noise Environments NIST evaluation in 2001, where SRI had the best performance.

**Selected Publications:**


D. Vergyri, A. Stolcke, and G. Tur, "Exploiting user feedback for language model adaptation in meeting recognition," in *Proc. IEEE ICASSP*, (Taipei), pp. 4737--4740, April 2009.

D. Vergyri, A. Mandal, W. Wang, A. Stolcke, J. Zheng, M. Graciarena, D. Rybach, C. Gollan, R. Schlüter, K. Kirchhoff, A. Faria, and N. Morgan, "Development of the SRI/Nightingale Arabic ASR system," in *Proc. Interspeech*, (Brisbane, Australia), pp. 1437--1440, September 2008.

D. Vergyri, I. Shafran, A. Stolcke, R. R. Gadde, M. Akbacak, B. Roark, and W. Wang, "The SRI/OGI 2006 Spoken Term Detection system," in *Proc. Interspeech/Eurospeech*, (Antwerp), pp. 2393--2396, August 2007.

M. Akbacak, D. Vergyri, and A. Stolcke, "Open-vocabulary spoken term detection using graphone-based hybrid recognition systems," in *Proc. IEEE ICASSP*, (Las Vegas), pp. 5240--5243, March 2008.

K. Precoda, J. Zheng, D. Vergyri, H. Franco, C. Richey, A. Kathol, and S. Kajarekar, "IraqComm: A next generation translation system," in *Proc. Interspeech*, (Antwerp, Belgium), August 2007.

H. Lin, J. Bilmes, D. Vergyri, and K. Kirchhoff, "OOV detection by joint Word/Phone lattice alignment," in *Proc. Automatic Speech Recognition and Understanding Workshop*, (Kyoto, Japan), p. 478, December 2007.

K. Kirchhoff, D. Vergyri, J. Bilmes, K. Duh, and A. Stolcke, "Morphology-based language modeling for conversational Arabic speech recognition," *Computer Speech and Language*, vol. 20, pp. 589--608, October 2006.

D. Vergyri and K. Kirchhoff, "Automatic diacritization of Arabic for acoustic modeling in speech recognition," in *COLING Workshop on Arabic-script Based Languages*, (Geneva, Switzerland), August 2004.

D. Vergyri, K. Kirchhoff, R. Gadde, A. Stolcke, and J. Zheng, "Development of a conversational telephone speech recognizer for Levantine Arabic," in *Proc. Eurospeech*, (Lisbon), pp. 1613--1616, September 2005.

V. R. R. Gadde, A. Stolcke, D. Vergyri, J. Zheng, K. Sonmez, and A. Venkataraman, "Building an ASR system for noisy environments: SRI's 2001 SPINE evaluation system," in *Proc. International Conference on Spoken Language Processing*, vol. 3, (Denver, CO), pp. 1577--1580, September 2002.




USE OR DISCLOSURE OF DATA IS SUBJECT TO THE RESTRICTION ON THE COVER OF THIS PROPOSAL.

## L. Lynn Voss

**Summary of Qualifications and Unique Capabilities:**

Mr. Voss is a Program Manager in the Software Engineering Program at SRI. He received his B.S. in Computer Science (summa cum laude) from Montana State University-Bozeman and MBA in Technology Management from the University of Phoenix. He currently manages a team of 11 software engineers in the SRI Helena, Montana office. He has extensive experience in software systems engineering: software engineering management, design and development; graphical user interface design and implementation; automated build systems; configuration management; web design; and database programming.

**Previous Accomplishments**

Mr. Voss is currently the Architecture and integration lead on FAUST – the DARPA Machine Reading project at SRI. This integrates the work of SRI with efforts from seven (mostly university) subcontractors in the areas of natural language processing, machine learning, and probabilistic reasoning to transform the knowledge contained in natural texts so that it can be utilized by artificial intelligence reasoning systems.

Previously, Mr. Voss was the Engineering Manager for the Meeting Assistance effort of the Cognitive Assistant that Learns and Organizes (CALO) project within the DARPA-sponsored Personalized Assistant that Learns (PAL) program. He was responsible for overall system design; managed design, implementation and project timeline of internal developers and university and commercial subcontractors; procured hardware; resolved licensing issues; and performed testing and integration with an independent test evaluator. The CALO Meeting Assistance project addressed multi-modal, multiparty dialogue understanding, including speech recognition, natural language and discourse and dialogue understanding; handwriting and sketch recognition; computer vision; coarse location and pointing, gaze estimation, and audio-visual speech recognition.

**Selected Publications:**

G. Tur, A. Stolcke, L. Voss, S. Peters, D. Hakkani-Tür, J. Dowding, B. Favre, R. Fernandez, M. Frampton, M. Frandsen, C. Frederickson, M. Graciarena, D. Kintzing, K. Leveque, S. Mason, J. Niekrasz, M. Purver, K. Riedhammer, E. Shriberg, J. Tien, D. Vergyri, F. Yang, "The CALO Meeting Assistant System," To appear in *IEEE Transactions on Audio, Speech, and Language Processing*, 2010.

G. Tur, A. Stolcke, L. Voss, J. Dowding, B. Favre, R. Fernandez, M. Frampton, M. Frandsen, C. Frederickson, M. Graciarena, D. Hakkani-Tür, D. Kintzing, K. Leveque, S. Mason, J. Niekrasz, S. Peters, M. Purver, K. Riedhammer, E. Shriberg, J. Tien, D. Vergyri, F. Yang, "The CALO Meeting Speech Recognition and Understanding System," in *Proc. IEEE Workshop on Spoken Language Technologies*, (Goa, India), pp. 69-72, 2008.

L. Voss, P. Ehlen, and the DARPA CALO Meeting Assistant Project Team, "The CALO Meeting Assistant (demonstration)," *Human Language Technologies: The Annual Conference of the North American Chapter of the Association for Computational Linguistics* (NAACL-HLT), (Rochester, NY), 2007.



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## Nicolas Scheffer, Ph.D.

**Summary of Qualifications and Unique Capabilities:**

Dr. Nicolas Scheffer obtained a Ph.D. in 2006 from University of Avignon, France, in Computer Science. Dr. Scheffer also holds a Master of Engineering in Control Systems Engineering as well as a Master of Science in EEE. He has been at SRI International since 2007, currently as a Research Engineer. Dr. Scheffer published numerous papers in international conferences and workshops. He received the IBM best paper award at the 2006 IEEE Odyssey Speaker and Language Recognition Workshop for his work on discriminative training in speaker recognition.

**Previous Accomplishments:**

Dr. Nicolas Scheffer has worked on speaker recognition for the past 6 years, including his Ph.D. thesis. His work has focused on acoustic modeling (SVMs and factor analysis) for speaker ID, and unsupervised feature extraction using universal background models. He has participated in all NIST speaker recognition evaluations since 2004, as well as in other evaluations for speaker diarization and tracking.

Dr. Scheffer interests also lie in technology transfer and software management best practices. As such, he is a previous member of the core team of the ALIZE project, an open-source tool to implement state-of-the-art speaker verification systems, widely used in the community. He acquired strong skills in software packaging, development, maintenance and community management.

Dr. Scheffer has also been leading the software development effort in SRI's speaker recognition program (funded by DoD, Sandia Labs, and IARPA), and has a proven track record in fast transfer of complex technologies to government clients.

**Selected Publications:**

N. Scheffer, R. Vogt "On the use of speaker superfactors for speaker recognition", in *Proc. IEEE ICASSP*, pp. 4410-4413, Dallas, March 2010.

S. S. Kajarekar, N. Scheffer, M. Graciarena, E. Shriberg, A. Stolcke, L. Ferrer, and T. Bocklet, "The SRI NIST 2008 speaker recognition evaluation system," in *Proc. IEEE ICASSP*, Taipei, pp. 4205-4209, April 2009.

Benoit G. B. Fauve, Driss Matrouf, N. Scheffer, Jean-François Bonastre, John S. D. Mason. State-of-the-Art Performance in Text-Independent Speaker Verification Through Open-Source Software, *IEEE Trans. Audio, Speech & Lang. Proc.* 15(7): 1960-1968, 2007.

Matrouf, D. and Scheffer, N. and Fauve, B. and Bonastre, J.F.: A Straightforward and Efficient Implementation of the Factor Analysis Model for Speaker Verification. In *Proc. Interspeech*, pp. 1242-1245, Antwerp, 2007.

Nicolas Scheffer, Jean-Francois Bonastre, "A multi-class framework within an Acoustic Event Sequence system for Speaker Verification", *Proc. Interspeech*, Pittsburgh, 2006.

Nicolas Scheffer, Jean-Francois Bonastre, "A UBM-GMM driven discriminative approach for Speaker Verification", *Proc. IEEE Odyssey Workshop*, San Juan, Puerto Rico, 2006 (IBM best paper student award).



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## Nelson Morgan, Ph.D.

**Summary of Qualifications and Unique Capabilities:**

Nelson Morgan is the Director of the International Computer Science Institute (ICSI) and the leader of its Speech Group. He is also a Professor-in-residence at UC Berkeley, where he has mentored many Ph.D. students and postdoctoral Fellows. He is a former Editor-in-chief of *Speech Communication*, and is an associate member of the IEEE Speech and Language Processing Technical Committee. He is a Fellow of the IEEE. In 1997 he received the *Signal Processing Magazine* best paper award. Professor Morgan has roughly 200 publications including three books; his most recent book is a text (written jointly with Ben Gold) on speech and audio signal processing, which is currently being revised with Professor Dan Ellis. He holds a number of patents in speech processing methods, including one that has been used in millions of CDMA cell phones. He was the first to use neural networks for speech classification in a commercial application (at National Semiconductor in the early 1980s). He is also the co-inventor (along with Herve Bourlard) of connectionist HMM/MLP statistical sequence recognition, particularly as applied to speech. He developed methods for the acoustical measurement of speaking rate that have been used by many researchers. His initiative to develop processing techniques for use with speech from meetings led to the development of the largest U.S. public corpus of transcribed and annotated speech from meetings, and to a series of NIST-run evaluations of the technology.

His current research interests include the redesign from first principles of the primary signal processing used in speech recognition systems, particularly for noisy and reverberant signals. This work is particularly oriented toward the incorporation of new information about the successful working of the human auditory system (especially from measurements in primary auditory cortex) for speech processing tasks. Professor Morgan has led efforts in this direction at ICSI.

**Previous Accomplishments:**

The cell phone algorithms referred to above were based on the RASTA innovations that Professor Morgan developed (with co-inventor Hynek Hermansky) in the early 1990s. He was the Principal Investigator for the multi-site coalition funded by the DARPA EARS Novel Approaches project, which was the 2002-2005 U.S. Government program focusing on long-term progress in English language speech recognition. This work led to significant reductions in word error rate based on preliminary versions of the ICSI algorithms that are proposed here. These methods were then applied to Arabic and Mandarin speech recognition in the DARPA GALE project, with similar success, first for the SRI team and more recently for the IBM team. Results reported in a recent speech conference (Interspeech 2009) further showed that a new version of the algorithms proposed by Professor Morgan were particularly effective for noisy speech; this was partly funded by the Intelligence Community postdoctoral Fellow program (for postdoctoral Fellow Sherry Zhao, who worked with Professor Morgan).

**Selected Publications:**

S. Y. Zhao, S. Ravuri, and N. Morgan, "Multi-Stream to Many-Stream: Using Spectro-Temporal Features for ASR," in *Proceedings of the 10th International Conference of the International Speech Communication Association*, pp. 2951-2954, 2009

D. Gelbart, N. Morgan, and A. Tsymbal, "Hill-Climbing Feature Selection for Multi-Stream ASR," in *Proceedings of the 10th International Conference of the International Speech Communication Association (Interspeech 2009)*, 2009, pp. 2967-2970.

J. M. Baker, L. Deng, J. Glass, S. Khudanpur, C. Lee, N. Morgan, and D. O'Shaughnessy, "Research Developments and Directions in Speech Recognition and Understanding, Part 2," *IEEE Signal Processing Magazine*, vol. 26, no. 4, pp. 78-85, July 2009.

J. M. Baker, L. Deng, J. Glass, S. Khudanpur, C. Lee, N. Morgan, and D. O'Shaughnessy, "Research Developments and Directions in Speech Recognition and Understanding, Part 1," *IEEE Signal Processing Magazine*, vol. 26, no. 3, pp. 75-80, May 2009.



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Morgan, N., Zhu, Q., Stolcke, A., Sonmez, K., Sivadas, S., Shinozaki, T., Ostendorf, M., Jain, P., Ellis, D., Doddington, G., Chen, B., Cetin, O., Bourlard, H., and Athineos, M. "Pushing the Envelope - Aside: Beyond the Spectral Envelope as the Fundamental Representation for Speech Recognition." IEEE Signal Processing Magazine, pp. 81-88, September 2005.

N. Morgan, D. Baron, S. Bhagat, H. Carvey, R. Dhillon, J. Edwards, D. Gelbart, A. Janin, A. Krupski, B. Peskin, T. Pfau, E. Shriberg, A. Stolcke, and C. Wooters, "Meetings about meetings: Research at ICSI on speech in multiparty conversations," in *Proc. 2003 IEEE Intl. Conf. on Acoustics, Speech, and Signal Processing*, Vol. 4, Piscataway, NJ: IEEE Press, 2003, pp. 740-743.

Gold, B., and Morgan, N., "Speech and Audio Signal Processing," Wiley Press, New York, 1999.

Morgan, N., and Bourlard, H., "Continuous Speech Recognition: An Introduction to the Hyorid HMM/Connectionist Approach," *IEEE Signal Processing Magazine*, pp 25-42, May 1995 (won IEEE 1997 SP Magazine Award).

Hermansky, H., and Morgan, N., "RASTA Processing of Speech", *IEEE Transactions on Speech and Audio Processing*, Special issue on Robust Speech Recognition, vol 2 no. 4, pp. 578-589, Oct., 1994.



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## Daniel P. W. Ellis, PhD

**Summary of Qualifications and Unique Capabilities:**

Daniel Ellis is an Associate Professor of Electrical Engineering at Columbia University as well as being an External Fellow of ICSI. He leads the Laboratory for Recognition and Organization of Speech and Audio, which is concerned with separating and recognizing information from all kinds of complex, real-world sounds, including speech, music, and environmental audio. He has more than 100 publications in these areas, and is currently collaborating with Prof. Nelson Morgan on a new edition of a textbook covering these topics. Dr. Ellis holds several patents on topics related to speech and audio processing, including one on Tandem Connectionist-HMM acoustic modeling (joint with Morgan), a technology that has contributed to recent improvements in the speech recognition systems developed by SRI and ICSI under DARPA projects EARS and GALE. He is well known for his work in computational auditory scene analysis, which seeks to separate out individual sounds in noisy mixtures in a manner analogous to human listeners. These techniques are currently being developed for applications in unedited video soundtracks. Dr. Ellis is also known as the author and maintainer of a range of software tools widely used by the speech and audio research community, including dpwcutils (a suite of sound file manipulation routines) and feacalc (a generalized feature extraction program).

**Previous Accomplishments:**

The Tandem technique mentioned above was developed under EU project RESPITE and achieved top performance in the 2001 Eurospeech AURORA noisy speech recognition evaluation (among 21 participants). Under DARPA EARS, he developed Frequency-Domain Linear Prediction speech features for parametric encoding of transient temporal events in speech. Recent NSF-funded research on personal audio and video soundtracks has demonstrated voice activity detection at SNRs ranges below the level of human intelligibility – much lower than the majority of work in the field. Another NSF-funded project has developed the MESSL system for separation of overlapping speech under reverberation, which shows best-in-the-world signal-to-noise ratio improvement for real-world conditions, and which can be combined with Eigenvoice models to separate speech signals to achieve state-of-the-art speech recognition without prior knowledge of speaker characteristics. Ongoing NGA- sponsored research has pioneered the detection and mining of speech and other sound categories in large archives of unedited, uncontrolled consumer video soundtracks.

**Selected Publications:**

D. Ellis and M. J. Reyes Gomez (2001). Investigations into Tandem Acoustic Modeling for the Aurora Task, *Proc. Eurospeech*, Special Event on Noise Robust Recognition, pp. 189-192. Denmark, September 2001.

M. Athineos and D. Ellis (2007). Autoregressive Modeling of Temporal Envelopes, *IEEE Trans. Signal Processing*, vol. 15 no. 11, pp. 5237-5245, Nov. 2007.

K. Lee and D. Ellis (2006). Voice Activity Detection in Personal Audio Recordings Using Autocorrelogram Compensation, *Proc. Interspeech*, pp. 1970-1973, Pittsburgh, Oct 2006.

M. Mandel, R. Weiss, and D. Ellis (2009). Model-Based Expectation-Maximization Source Separation and Localization *IEEE. Trans. Audio, Speech, and Lang. Proc.*, accepted for publication.

R. Weiss and D. Ellis (2010). Speech separation using speaker-adapted eigenvoice speech models, *Computer Speech and Language*, vol. 24 no. 1, pp. 16-29, Jan 2010.

C. Cotton and D. Ellis (2010). Audio Fingerprinting to Identify Multiple Videos of an Event, *Proc. IEEE ICASSP*, Dallas, pp. 2386-2389, March 2010.



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## Abeer Alwan, Ph.D.

**Summary of Qualifications and Unique Capabilities:**

Abeer Alwan received her Ph.D. in EECS from MIT in 1992. She has been with the Electrical Engineering Department at UCLA as an Assistant Professor (1992-1996), Associate Professor (1996-2000), Professor (2000-present), Vice Chair of the BME program (1999-2001), Vice Chair of EE Graduate Affairs (2003-2006), and Area Director of Signals and Systems (2006-present). She established and directs the Speech Processing and Auditory Perception Laboratory at UCLA. Her research interests include modeling human speech production and perception mechanisms and applying these models to improve speech-processing applications such as noise-robust ASR.

She is the recipient of the NSF Research Initiation Award (1993), the NIH FIRST Career Development Award (1994), the UCLA-TRW Excellence in Teaching Award (1994), the NSF Career Development Award (1995), and the Okawa Foundation Award in Telecommunications (1997). Dr. Alwan is an elected member of Eta Kappa Nu, Sigma Xi, Tau Beta Pi, and the New York Academy of Sciences. She served, as an elected member, on the Acoustical Society of America Technical Committee on Speech Communication (1993-1999, and 2005-present), on the IEEE Signal Processing Technical Committees on Audio and Electroacoustics (1996-2000) and on Speech Processing (1996-2001, 2005-present). She is a member of the Editorial Board of Speech Communication and was an editor-in-chief of that journal (2000-2003) and an Associate Editor of the IEEE Transactions on Audio, Speech, and Language Processing (2007-2010). Dr. Alwan is chair of the IEEE Flanagan Speech and Audio Processing Award committee. She is a Fellow of the Acoustical Society of America and of the IEEE. She was a 2006-2007 Fellow of the Radcliffe Institute for Advanced Study at Harvard University, and is a 2010-2012 Distinguished Lecturer for the International Speech Communication Association (ISCA).

**Previous Accomplishments:**

Dr. Alwan's work has been supported by DARPA (in the 1990 for work on speech coding and noise cancellation on mobile devices), NSF (since 1993 for work related to human and machine speech recognition in noise, landmark-based ASR, and voice quality), and NIH (human speech perception in noise). Dr. Alwan's group pioneered several noise-robust techniques such as peak isolation and adaptation (1997), variable frame rate analysis and amplitude demodulation of spectra (2000, 2004), weighted Viterbi recognition (2002), HMM-based signal reconstruction techniques (2008), and noise-robust voice activity detection (2010). This work led to significant reductions in word error rate in various tasks. Dr. Alwan's group is one of the few groups that have carefully studied the effects of channel packet loss and various wireless channel conditions on ASR (the other groups are in Denmark, Spain, Greece, and Germany). She continues to contribute to the above-mentioned areas, and the RATS proposed project will leverage that work.

**Selected Publications:**


L. N. Tan, B. J. Borgstrom and A. Alwan, "Voice Activity Detection using Harmonic Frequency Components in Likelihood Ratio Test," ICASSP 2010.

B. J. Borgstrom and A. Alwan, "HMM-Based Reconstruction of Unreliable Spectrographic Data for Noise Robust Speech Recognition", IEEE Trans. on Audio, Speech, and Language Processing (TASLP), Vol. 18, No. 5, July 2010.

A. Alwan, " Dealing with Limited and Noisy Data in ASR: A Hybrid Knowledge-Based and Statistical Approach," Keynote Speech at Interspeech 2008, pp. 11-15.

B. J. Borgstrom, A. Bernard, and A. Alwan, "Error Recovery - Channel Coding and Packetization," Chapter 8 in Automatic Speech Recognition on Mobile Devices and over Communication Networks, Springer-Verlag, Editors: Z.-H. Tan and B. Lindberg, pp. 163-185, 2008.

X. Cui and A. Alwan, "Robust Speaker Adaptation by Weighted Model Averaging Based on the Minimum Description Length Criterion," *Proc. IEEE Trans. Audio Speech Lang. Proc.*, vol. 15, no. 2, pp. 652-660, Feb. 2007.




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Jintao Jiang, Marcia Chen, Abeer Alwan, "On the perception of voicing in syllable-initial plosives in noise", *Journal of the Acoustical Society of America*, vol. 119, no. 2, pp. 1092-1105, February 2006.

H. You, Q. Zhu, and A. Alwan, "Entropy-base Variable Frame Rate Analysis of Speech Signals and Its Application to ASR," in *Proc. IEEE ICASSP*, pp. 549-552, Montreal, Canada, May 2004.

Q. Zhu and A. Alwan, "Non-linear feature extraction for robust recognition in stationary and non-stationary noise," *Computer Speech, and Language*, 17(4): 381-402, Oct. 2003.

X. Cui, Al. Bernard, and A. Alwan, "A Noise-Robust ASR Back-end Technique Based on Weighted Viterbi Recognition," in *Proc. EUROSPEECH*, Switzerland, pp. 2169-2172, Sept. 2003.

A. Bernard and A. Alwan, "Low-bitrate Distributed Speech Recognition for Packet-based and Wireless Communication" *IEEE Trans. Audio Speech Lang. Proc.*, vol. 10, no. 8, pp. 570-580, Nov. 2002.

Q. Zhu and A. Alwan, "On the use of variable frame rate analysis in speech recognition," Proc. IEEE ICASSP, Istanbul, Turkey, Vol. III, pp. 1783-1786, June 2000.

B. Strope and A. Alwan, "Modeling the perception of pitch-rate amplitude modulation in noise," Proc. *of the NATO ASI on Computational Hearing*, pp. 117-122, July 1998.

B. Strope and A. Alwan, "A model of dynamic auditory perception and its application to robust word recognition," *IEEE Trans. Speech Audio Lang. Proc.*, vol. 5, no. 5, pp. 451-464, September 1997.



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## John Hansen, Ph.D.

**Summary of Qualifications and Unique Capabilities:**

John Hansen is Professor and Dept. Head of Electrical Engineering at the Univ. of Texas at Dallas (the 13th largest EE Dept. in the USA), and holds the Distinguished University Chair in Telecommunications Engineering. He also holds a joint appointment as Professor in the School of Behavioral and Brain Sciences (Speech & Hearing). At UTD, he established the Center for Robust Speech Systems (CRSS) which is part of the Human Language Technology Research Institute. Previously, he served as Dept. Chair and Professor of Speech, Language and Hearing Sciences (SLHS), as well as Prof. in Electrical & Computer Engineering, at Univ. of Colorado Boulder (1998-2005), where he co-founded the Center for Spoken Language Research. In 1988, he established the Robust Speech Processing Laboratory (RSPL) – the first U.S.-based group specifically focused on robustness issues in speech systems, and continues to direct research activities in CRSS at UTD. He was named IEEE Fellow for contributions in *Robust Speech Recognition in Stress and Noise*, and is currently serving as a Member of the IEEE Signal Processing Society Speech Technical Committee (2005-08; 2010-13; elected Chair-elect in 2010), and Educational Technical Committee (2005-08; 2008-10). Previously, he served as Technical Advisor to the U.S. Delegate for NATO (IST/TG-01), as well as holding numerous positions in the IEEE Signal Processing Society, Acoustical Society of America, and Inter. Speech Communications Association. He supervised 50 (22 PhD, 28 MS/MA) thesis candidates, was recipient of The 2005 University of Colorado Teacher Recognition Award as voted on by the student body, author/co-author of 352 journal and conference papers and 8 textbooks in the field of speech processing and language technology, coauthor of the textbook *Discrete-Time Processing of Speech Signals* (IEEE Press, 2000), co-editor of *DSP for In-Vehicle and Mobile Systems* (Springer, 2004), *Advances for In-Vehicle and Mobile Systems: Challenges for International Standards* (Springer, 2006), *In-Vehicle Corpus and Signal Processing for Driver Behavior* (Springer, 2008), and lead author of the report *The Impact of Speech Under 'Stress'* on Military Speech Technology, (NATO RTO-TR-10, 2000). His research interests span the areas of digital speech processing, analysis and modeling of speech and speaker traits, speech enhancement, feature estimation in noise, robust speech recognition with emphasis on spoken document retrieval, and in-vehicle interactive systems for hands-free low-cognitive-load human-computer interaction.

**Previous Accomplishments:**

The noise and speaker compensation methods referred to in the proposed work were based on methods to improve word recognition in noise and stress for the U.S. Air Force and SPAWAR systems. Many of these advancements have been used by NATO RSG.10, and his enhancement algorithms based on Auto-LSP are in use by AT&T and other military groups. He served as Project Lead for the DARPA Communicator effort on In-Vehicle Speech Systems for Route Navigation (2002-2004), which included advancements in robust features and array processing for noisy speech recognition. He also served as co-PI and speech research lead for a project supported by the NSF Digital Library Initiative, entitled *National Gallery of the Spoken Word* which resulted in the first nationwide search engine for audio archives of historical content from the last 110 years (60,000 hours of historical documents). Many of the advancements to address unknown noise, channel, and speaker viabilities resulting from that 5-year study are now in use by researchers in speech recognition. More recently, he has made advancements in robustness for Speaker Recognition based on Lombard effect and small training/test data sizes, as well as accent and dialect classification of English, Arabic, and Spanish dialects, which have been supported by grants from various U.S. agencies. He has also served as a consultant, and held a U.S. clearance for more than ten years for work in speech/audio forensics.



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**Selected Publications:**

J.H.L. Hansen, R. Huang, B. Zhou, M. Seadle, J.R. Deller, Jr., A.R. Gurijala, P. Angkititrakul, "SpeechFind: Advances in Spoken Document Retrieval for a National Gallery of the Spoken Word," *IEEE Trans. Speech & Audio Proc., Special Issue on Data Mining*, vol. 13, no. 5, pp. 712-730, Sept. 2005.

U. Yapanel, J.H.L. Hansen, "A New Perceptually Motivated MVDR-Based Acoustic Front-End (PMVDR) for Robust Automatic Speech Recognition, *Speech Communication*, vol. 50, pp. 142-152, Jan. 2008.

J.H.L. Hansen, V.S.Varadarajan, "Analysis and Normalization of Lombard Speech under different types and levels of noise with application to In-Set/Out-of-Set Speaker Recognition, *IEEE Trans. Audio, Speech & Language Processing*, vol. 17, no. 2, pp. 366-378, Feb. 2009

M. Akbacak, J.H.L. Hansen, "Environmental Sniffing: Noise Knowledge Estimation for Robust Speech Systems," *IEEE Trans. Audio, Speech and Language Processing*, vol. 15, no. 2, pp. 465-477, Feb. 2007.

R. Huang, J.H.L. Hansen, "Advances in Unsupervised Audio Classification and Segmentation for the Broadcast News and NGSW Corpora," *IEEE Trans. Audio, Speech and Language Processing*, vol. 14, no. 3, pp. 907-919, May 2006.

R. Huang, J.H.L. Hansen, P. Angkititrakul, "Dialect/Accent Classification using Unrestricted Audio," *IEEE Trans. on Audio, Speech and Language Processing*, vol. 15, no. 2, pp. 453-464, Feb. 2007.

G. Zhou, J.H.L. Hansen, and J.F. Kaiser, "Nonlinear Feature Based Classification of Speech under Stress," *IEEE Transactions on Speech & Audio Processing*, vol. 9, no. 2, pp. 201-216, March 2001

W. Kim, J.H.L. Hansen, "Time-Frequency Correlation Based Missing-Feature Reconstruction for Robust Speech Recognition in Band-Restricted Conditions," *IEEE Trans. Audio, Speech and Language Processing*, vol. 17, no. 7, pp. 1292-1304, Sept. 2009

J.H.L. Hansen, "Analysis and Compensation of Speech under Stress and Noise for Environmental Robustness in Speech Recognition," *Speech Communication*, Special Issue Speech Under Stress, 20(2):151-170, Nov. 1996.

J. Deller, J.H.L. Hansen, and J. Proakis (2000), Discrete-Time Processing of Speech Signals, (2nd Edition), IEEE Press / John Wiley Publishers, New York, NY.

N. Morales, D.T. Toledano, J.H.L. Hansen, J. Garrido, "Feature Compensation Techniques for ASR on Band-limited Speech," *IEEE Trans. Audio, Speech and Language Processing*, vol. 17, no. 4, pp. 758-774, May 2009.

N. Krishnamurthy, J.H.L. Hansen, "Babble Noise: Modeling, Analysis, and Applications," *IEEE Trans. Audio, Speech and Language Processing*, vol. 17, no. 7, pp. 1394-1407, Sept. 2009.

Y. Lei, J.H.L. Hansen, "Dialect Classification via Text-independent Training and Testing for Arabic, Spanish and Chinese," *IEEE Trans. Audio, Speech and Language Processing*, to appear, 2010. [Accepted Oct. 2009].

H. Boril, J.H.L. Hansen, "Unsupervised Equalization of Lombard Effect for Speech Recognition in Noisy Adverse Environments," IEEE Trans. Audio, Speech, and Language Processing, to appear, 2010. [Accepted Sept. 2009]

M. Akbacak, J.H.L. Hansen, "Spoken Proper Name Retrieval for Limited Resource Languages Using Multilingual Hybrid Representations," *IEEE Trans. Audio, Speech and Language Processing*, to appear, 2010. [Accepted Oct. 2009].



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## 2.9 PROJECT MANAGEMENT AND INTERACTION PLAN

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Figure 12: SCENIC organizational chart



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performance. Integration, including the overall design, development, test, and evaluation of the system and the management of software deliverables from each technical task, will be the responsibility of SRI International and will be led from within the Software Engineering Program in SRI's Engineering Sciences Division.

**Interdependencies**

The seven defined project tasks are all highly interdependent. The three crosscutting tasks (Tasks 1-3), as well as the SAD/Metadata task (Task 4), benefit all others and are crucial for overall success. Tasks 5 and 6 have synergies but could be pursued independently. The software and team integration task (Task 7) is critical for all other work.

None of the subcontractors is entirely indispensable, but the loss of any one of them would seriously impact the overall outcome since they are expected to make key contributions to Task 1 (robust feature extraction) and Task 2 (advanced modeling), which are both critical to overall success, and, to a lesser extent, to Task 3 (SAD).

**Managing Software Integration**

In addition to the collaboration methods described above, we will support software collaboration and control by providing partner access to an integrated code base and repository on an SRI server. This will also support version control, code quality assurance, and a formal nightly release build. As team members will use each other's software during development, integration, test and evaluation, multiple users will have the opportunity to detect defects or integration incompatibilities as early as possible.

In addition to software components migrating from the SRI research team and partner sites to SRI's integration team, SRI will make common software components for SAD, LID, SID, and KWS available to the subcontractors to allow their research activities to be based on shared state-of-the-art software and ensure that research results can be readily integrated at SRI. We have successfully employed a similar methodology in past SRI-led multisite DARPA projects.

**Risk Mitigation**

We will continually work to identify, assess, and mitigate risks that may impact schedule, cost, and performance. Two key areas of risk are (1) failure to develop or integrate the necessary components, and (2) failure to deliver a system with real utility for users. Elements of our approach to mitigating these risks include:

- Wherever possible, using proven existing components as the starting point for SCENIC. SRI has built on, and will continue to build on, existing state-of-the-art software engines for the RATS program tasks.
- Performing diagnostic experiments with different types of degraded, as well as clean, data and/or replacing individual system modules with reference outputs, to test the utility and impact on an end-to-end system of the best achievable results. This will show us whether further development on a specific component or other improvement is worthwhile, before significant time is spent on research and implementation.
- Having more than one expert in a technical area (e.g., feature engineering) develop redundant approaches. If one approach proves systematically better, it will be adopted in the end-to-end system. If different approaches prove superior under different circumstances, we will research the best way to combine their outputs for maximum performance.
- Arranging for team members to use each other's software during development, integration, test and evaluation, so that multiple users will have the opportunity to detect defects or integration incompatibilities as early as possible.
- Engaging with DARPA and its contractor chosen for evaluation, providing feedback on software specifications prior to delivery, and obtaining and acting on the feedback after system delivery.



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**Students and Postdoctoral Reseachers**

The project will in part rely in the contributions of graduate students and postdoctoral researchers, via the three academic subcontractors: UT Dallas, UCLA, and ICSI.

UTD will employ two graduate students and two half-time postdocs. One postdoc will be responsible for development of restricted bandwidth-based feature and model compensation schemes for robust speech recognition and keyword spotting in noise and varying communications channels. This post-doc will concentrate on missing-feature-based compensation schemes. The second postdoc will focus on robust speech activity detection, and robustness with regard to speaker variability and competing background noise. One graduate student will work in collaboration with the first postdoc to develop novel automatic mask estimation schemes for missing-feature-based speech recognition in degraded channel conditions. The second graduate student will work with the second postdoc to help develop improved speaker and noise characterization schemes. These schemes will be evaluated in the context of speaker recognition, keyword/speech recognition, and language identification.

UCLA will employ one graduate student, who will be involved in the development and implementation of algorithms related to noise and channel robustness. Algorithms include variable frame rate, weighted Viterbi recognition, and error concealment techniques. The student will be conducting ASR in actual and simulated noise, and interacting with researchers at SRI, ICSI, and UTD to help deliver code and work on system integration. The student will also participate in PI meetings, if appropriate, and help write and present results at conferences and in technical reports.

ICSI will employ one graduate student, working on experiments incorporating ideas on channel and noise-robust spectral estimation and pitch detection, making use of ideas from Professors Morgan and Ellis (a senior researcher at ICSI).



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## 2.10 COST SUMMARIES

**Total Cost Summary Broken Down by Phase, by Task and Prime and Major Subcontractors [PHASE 1 (BASE)]**

| | Aug-10 $ | Sep-10 $ | Oct-10 $ | Nov-10 $ | Dec-10 $ | Jan-11 $ | Feb-11 $ | Mar-11 $ | Apr-11 $ | May-11 $ | Jun-11 $ | Jul-11 $ | Aug-11 $ | Sep-11 $ | Oct-11 $ | Nov-11 $ | Dec-11 $ | Jan-12 $ | Feb-12 $ | Total $ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Task 1 Robust Feature Extraction | | | | | | | | | | | | | | | | | | | | |
| (b) (4) | | | | | | | | | | | | | | | | | | | | |
| Task 3 - Decision Making | | | | | | | | | | | | | | | | | | | | |
| (b) (4) | | | | | | | | | | | | | | | | | | | | |
| Task 4 Speech and Metadata Extraction | | | | | | | | | | | | | | | | | | | | |
| (b) (4) | | | | | | | | | | | | | | | | | | | | |
| Task 5 - Language and Speaker Recognition | | | | | | | | | | | | | | | | | | | | |
| (b) (4) | | | | | | | | | | | | | | | | | | | | |
| Task 6 - Keyword Spotting | | | | | | | | | | | | | | | | | | | | |
| (b) (4) | | | | | | | | | | | | | | | | | | | | |
| Task 7 - Software and Team Integration | | | | | | | | | | | | | | | | | | | | |
| (b) (4) | | | | | | | | | | | | | | | | | | | | |

Note: In order to take full advantage of the available time to reach Phase 1 objectives, we plan to begin research and development with the start of Phase 1, while RATS data is still being collected. During this time, we will begin algorithm and software development, and carry out research using existing databases of degraded speech (such as the MIT-LL Tactical Speaker Identification Speech Corpus, the DARPA Spectrum Supremacy corpus, and various specialized databases at UT Dallas) and artificially degraded speech data. The level of effort during the first 6 months of Phase 1 will be limited compared to Months 7-18.



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**Total Cost Summary Broken Down by Phase, by Task and Prime and Major Subcontractors**
**[PHASE 2 (Option)]**

| | CY 12 | | | | | | | | CY 13 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Feb-12 $ | Mar-12 $ | Apr-12 $ | May-12 $ | Jun-12 $ | Jul-12 $ | Aug-12 $ | Sep-12 $ | Oct-12 $ | Nov-12 $ | Dec-12 $ | Jan-13 $ | Feb-13 $ | Total $ |
| Task 1 Robust Feature Extraction | | | | | | | | | | | | | | |
| (b) (4) | | | | | | | | | | | | | | |
| Task 2 - Advanced Modeling | | | | | | | | | | | | | | |
| (b) (4) | | | | | | | | | | | | | | |
| Task 3 - Decision Making | | | | | | | | | | | | | | |
| (b) (4) | | | | | | | | | | | | | | |
| Task 4 Speech and Metadata Extraction | | | | | | | | | | | | | | |
| (b) (4) | | | | | | | | | | | | | | |
| Task 5 - Language and Speaker Recognition | | | | | | | | | | | | | | |
| (b) (4) | | | | | | | | | | | | | | |
| Task 6 - Keyword Spotting | | | | | | | | | | | | | | |
| (b) (4) | | | | | | | | | | | | | | |
| Task 7 - [illegible] | | | | | | | | | | | | | | |
| (b) (4) | | | | | | | | | | | | | | |


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**Total Cost Summary Broken Down by Phase, by Task and Prime and Major Subcontractors**
**[PHASE 3 (ROM)]**

| | FY-12 | | | | | | | | FY-13 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Feb-12 $ | Mar-12 $ | Apr-12 $ | May-12 $ | Jun-12 $ | Jul-12 $ | Aug-12 $ | Sep-12 $ | Oct-12 $ | Nov-12 $ | Dec-12 $ | Jan-13 $ | Feb-13 $ | Total $ |
| Task 1 Robust Feature Extraction | | | | | | | | | | | | | | |
| [redacted] | | | | | | | | | | | | | | |
| Task 2 - Advanced Modeling | | | | | | | | | | | | | | |
| [redacted] | | | | | | | | | | | | | | |
| Task 3 - Decision Making | | | | | | | | | | | | | | |
| [redacted] | | | | | | | | | | | | | | |
| Task 4 Speech and Meta data Extraction | | | | | | | | | | | | | | |
| [redacted] | | | | | | | | | | | | | | |
| Task 5 - Language and Speaker Recognition | | | | | | | | | | | | | | |
| [redacted] | | | | | | | | | | | | | | |
| Task 6 - Keyword Spotting | | | | | | | | | | | | | | |
| [redacted] | | | | | | | | | | | | | | |
| Task 7 - Software and Team Integration | | | | | | | | | | | | | | |
| [redacted] | | | | | | | | | | | | | | |


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## 2.11 ORGANIZATIONAL CONFLICT OF INTEREST AFFIRMATIONS/DISCLOSURE

SRI International is not providing Scientific, Engineering, and Technical Assistance (SETA) to any DARPA technical offices.

SRI International participates in, and supports DARPA under the Intergovernmental Personnel Act (IPA) Mobility Program. SRI has IPA employees detailed or seconded as Program Managers in several offices within DARPA. We have listed those individuals below and SRI does not believe that any real or perceived conflict of interest exists, as these individuals are not directly involved with nor have access to any procurement-sensitive or budgetary information related to the effort proposed herein.

- Chris Earl, Office of the Director, DARPA
- Drew Dean, Transformational Convergence Technology Office (TCTO), DARPA

In addition, Mr. Dan Kaufman is an SRI IPA employee serving in the capacity of the Director of IPTO. It is our understanding that DARPA has policies and procedures that can be utilized to ensure that any conflict of interest, or appearance of conflict of interest, with respect to Mr. Kaufman and SRI can be addressed and avoided.



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## 2.12 HUMAN USE

None.


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## 2.13 ANIMAL USE

None.


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