S&T Directorate SBIR Cover Sheet

Proposal Does Not Contain Proprietary Information

Proposal Information		
Proposal No.: **HSHQDC-13-R-00032-H-SB013.2-008-0024-I (Phase I)**	Topic No.: **H-SB013.2-008**	Solicitation No.: **HSHQDC-13-R-00032**
Proposal Title: **Gun Control Network--Technology for Gun Violence Prediction and Estimation**	Topic Title: **Pre-Shot Sniper Detection in Urban Environments**	
Amount: **$100,000.00**	Proposed Duration: **6 months**	Start Date: **01/01/2014**

Company Data		
Company: **AQUERRE TECHNOLOGIES LLC**		
Company URL: **http://aquerre-technologies.com**		
Address: **1445 COLBY AVE #3**		
City: **LOS ANGELES**	State: **CA**	Zip: **90025 - 7844**
Phone: **3108578049**	Fax: **4242700709**	President E-mail: **noah@aquerre-technologies.com**
POC First: **Noah**	POC Middle: **B**	POC Last: **Jacobsen**
POC Phone: **3108578049**	POC Fax: **4242700709**	POC E-mail: **noah@aquerre-technologies.com**
POC Title: **Ph.D.**	Year Founded: **2013**	Number of Employees (including all affiliates): **1**
DUNS + 4: **078829869**	TIN/EIN: **462755575**	CAGE Code:
Company Registered at SBIR.gov: **Yes**	SBC Control ID: **SBC_000001433**	
1.) Has your company received more than 20 Phase I awards across all agencies? **No**		
2.) Does your company meet the DHS Phase I to Phase II transition rate (refer to the Phase I and Phase II transition rate and relevant time periods cited in the solicitation)? **Yes**		
3.) How many Phase I awards has the small business firm received over the relevant time period (refer to the Phase I and Phase II relevant time periods cited in the solicitation)? **0**		
4.) How many Phase II awards has the small business firm received over the relevant time period (refer to the Phase I and Phase II relevant time periods cited in the solicitation)? **0**		

Principal Investigator (PI) Information		
PI First: **Noah**	PI Middle: **B**	PI Last: **Jacobsen**
PI Address: **1445 Colby Ave #3**		PI Title: **Ph.D.**
PI City: **Los Angeles**	PI State: **CA**	PI Zip: **90025 - 7844**
PI Phone: **3108578049**	PI Fax: **4242700709**	PI E-mail: **noah@aquerre-technologies.com**
Socially and Economically Disadvantaged PI: **No**	Women PI: **No**	Percentage of Time: **100 %**

Key Individuals		
First Name: **Venugopal**	Last Name: **Veeravalli**	Position/Title: **Professor**
Phone: **2173330144**	E-mail Address: **vvv@illinois.edu**	% of Effort Individual Will Contribute to The Project: **3.8**

Offeror Certification		
As defined in the current Solicitation, the offeror certifies:		
A.	The Principal Investigator proposed in your proposal is employed by your firm/company at the time of award and during the conduct of research.	**Yes**
As defined in the current Solicitation, the offeror qualifies as a: (for statistical purposes)		
B.	Small Business Concern (SBC)	**Yes**

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C.	Socially and economically disadvantaged SBC	**No**
D.	Woman-owned SBC	**No**
E.	HUBZone SBC certified by SBA	**No**
F.	Student/Faculty Owned SBC	**No**
As defined in the current Solicitation, the offeror complies with:		
G.	The provisions of the Civil Rights Act of 1964 (P.L.88-352) and the regulations pursuant thereto.	**Yes**
Additional questions:		
H.	As defined in the current solicitation, will any foreign nationals be involved on this project?	**No**
I.	Will you permit the Government to disclose the title and technical abstract page of your proposed project, plus the name, address, and telephone number of the corporate official of your concern, if your proposal does not result in an award, to the appropriate local and State-level economic development organizations that may be interested in contacting you for further information?	**Yes**
J.	If this is a Phase II proposal, are you proposing outside investment funds under the DHS Cost Matching Program, as defined in the current solicitation?	**N/A**
K.	Has this proposal been submitted to other US Government agencies or their components?	**No**
L.1.	Is the Phase I project Manufacturing-Related or is the resultant Phase II project Manufacturing-Related?	**No**
L.2.	If this is a Phase II proposal, is this project Manufacturing-Related?	**No**
	(Meaning relating to: (i) manufacturing processes, equipment and systems; or (ii) manufacturing workforce skills and protection as defined in Executive Order 13329.)	
M.	Are you working with a subcontractor?	**No**
N.	If your proposal results in an award, will your company give the government permission to include your proposal in the Navy SBIR/STTR search database (https://navysbirsearch.com/)? Inclusion in the database may increase the transition of SBIR technologies and facilitate partnerships between small businesses, large integrators, and program offices. See Solicitation section 5.6 for further details.	**Yes**
O.	Is the Phase I project or Phase II resultant project related to Energy Efficiency or Renewable Energy?	**No**
	(As defined in the Energy Independence and Security Act of 2007 (Act) P.L. 110-140)	
P.	Has your company received Federal & State Technology Partnership Program (FAST) Assistance?	**No**
Q.	Has any individual in your company or your company been convicted of a fraud-related crime involving funding received under the SBIR program or STTR program?	**No**
R.	Has any individual in your company or your company been found civilly liable for a fraud-related violation involving funding received under the SBIR program or STTR program?	**No**
S.	Is your company majority-owned by multiple venture capital operating companies, hedge funds, or private equity firms?	**No**
	(Please note that the S&T Directorate's SBIR Program will not accept proposals from or make awards to small business concerns that are owned by such entities. Small business concerns with such ownership are ineligible to submit proposals under this solicitation.)	

Subcontractor/Partner/Other Participant Information

None

Abstract

The purpose of this work is to advance the research and development of a new gun control technology. The problem of interest is Pre-Shot Sniper Detection in Urban Environments. In this proposal, new video sensor networks and network signal processing algorithms are researched and developed. The proposed research effort includes applications of video source coding and quickest change detection theory. Potential commercial applications of the proposed technology include protection of high value assets and event security scenarios.

Project Aims

None

Summary of Results

S&T Directorate SBIR Cover Sheet

Proposal Does Not Contain Proprietary Information

The results of this Phase I proposal are summarized as follows:
Result 1: The specification of a video-camera sensor network and signal processing algorithms for the purpose of sniper/gun violence prediction and estimation. Result 2: A U.S. patent application comprising the methods developed in the Phase I research effort of this proposal. Result 3: A proposed way forward towards commercialization of the new gun control technology.

Keywords

security networks, sensor networks, control and communication systems, systems theory, source coding, distributed coding, video coding, video compression, cooperative coding, prediction and estimation, quickest change detection

THE DEPARTMENT OF HOMELAND SECURITY (DHS)
SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM
PHASE I PROGRAM SOLICITATION FY 13.2
for the
Science and Technology (S&T) Directorate
Solicitation Number: HSHQDC-13-R-00032

Proposal Number: HSHQDC-13-R-00032-H-SB013.2-008-0024-I
Topic: H-SB013.2-008 - Pre-Shot Sniper Detection in Urban Environments
Proposal Title: Gun Control Network--Technology for Gun Violence Prediction and Estimation
Company: Aquerre Technologies LLC
PI: Noah B Jacobsen, Ph.D.

PROPOSAL TEXT:

I. Identification and Significance of the Problem

[---begin excerpt from solicitation---]

DHS is seeking an advanced product that can reliably detect and locate, in all weather conditions that a sniper would operate in, a sniper amongst the clutter of an urban environment before they fire their weapon. Law enforcement establishes security perimeters and controlling items entering the space, but they are also concerned about threats from outside the security perimeters. These threats include snipers. “Pre-shot” detection allows security forces to better dissuade/prevent an adversary from getting the shot off in the first place.

Several factors challenge today’s detection technologies. Three factors DHS would like to address with this SBIR topic include, but are not limited to, the following three challenges. First, law enforcement needs the ability to locate a sniper amongst objects and people surrounding them at all times of the day and in all weather conditions. Objects commonly found in an urban environment such as traffic lights, signage, vehicles and building features can be distracting to the detection system and create clutter. People also carry objects and devices that create clutter.

Second, a sniper must be detected from a different location than the protection area. Detectors need to protect several high value assets in a wide area such as a large event or a large security zone. Sensors can’t always be located next to the high value asset. Finally, the technology must be portable. The need to detect snipers moves from one location to another. Law enforcement needs to set up the technology and make it operational within hours of events and activities, and then the technology needs

to be dismantled and moved somewhere else for another event.

The proposed solution must be able to detect and locate a sniper amidst the clutter of an urban environment and in all weather conditions sniper behavior, actions, or weapons before a weapon is fired; 200-1000 yd clear condition range is an example. The proposed solution must be able to detect and locate a weapon trained on a target from outside the weapon's line-of-fire (off-axis); 30 ft away is an example. Wide area coverage is highly desirable; 500 ft diameter security zone is an example. The proposed technology must be sized to be moved and set up by one person and moved with a "two man lift" limit of 75 lb for heavier components.

[---end excerpt from solicitation---]

II. PHASE I TECHICAL OBJECTIVES AND RESULTS

Objective A: Specification of a video-camera sensor network and signal processing algorithms for the purpose of PRE-SHOT SNIPER DETECTION IN URBAN ENVIRONMENTS--possibly including but not limited to: a technical memorandum, specification of a prototype system, and/or academic publication of research results.

Objective B: Objective B is to file a U.S. patent comprising the methods developed in the Phase I research effort of this proposal.

Objective C: Identify key partners and opportunities to facilitate successful development and commercialization of the proposed system (Objective A).

III. PHASE I WORK PLAN

The Phase I work plan consists of 1000 hours of work by the Principal Investigator (PI) and 40 hours of work by the Project Consultant (refer to Section V). The overall requested amount of this proposal is $100,000.00 for the 6 month Phase I project. The majority of work is to be performed by and at the office location of the PI. Interactions between the PI and Project Consultant are assumed to consist of e-mail and/or telephone communications. The project results are scheduled to be delivered at the completion of the 6 month Phase I program. Methods to achieve the delivery of goals include new

research performed by the PI, application of new and existing research and technologies, and consultations with the Project Consultant. Furthermore, the technical objectives of this proposal shall be addressed by the following methods:

Objective A: Objective A comprises the major research effort of this proposal, to be performed by the PI. The key output of Objective A is a written technical description of the proposed solution. The possibility of a conference and/or journal publication is included. Objective A is deliverable upon completion of the Phase I Project.

Objective B: The work plan for Objective B consists of writing and submitting a patent application based on the research results of the Phase I project. The PI is assumed to perform the work associated with Objective B. Objective B is deliverable upon completion of the Phase I Project.

Objective C: The work plan for Objective C consists of developing and documenting a strategy for commercialization of the proposed technology, including the identification of key strategic partnerships and a proposed way forward. Objective C is deliverable upon completion of the Phase I Project.

IV. TECHNICAL SUMMARY OF THE PHASE I R&D AND RELATED WORK

Communication and control systems is a long standing field of research and development in the scientific community. An underpinning theory of systems from the perspective of the control and communication systems engineer has evolved over the course of this century, see for example [1]. Endless applications of systems theory are manifest in modern technologies. In this SBIR research proposal, we propose the application of systems theory to the problem of Pre-Shot Sniper Detection in Urban Environments.

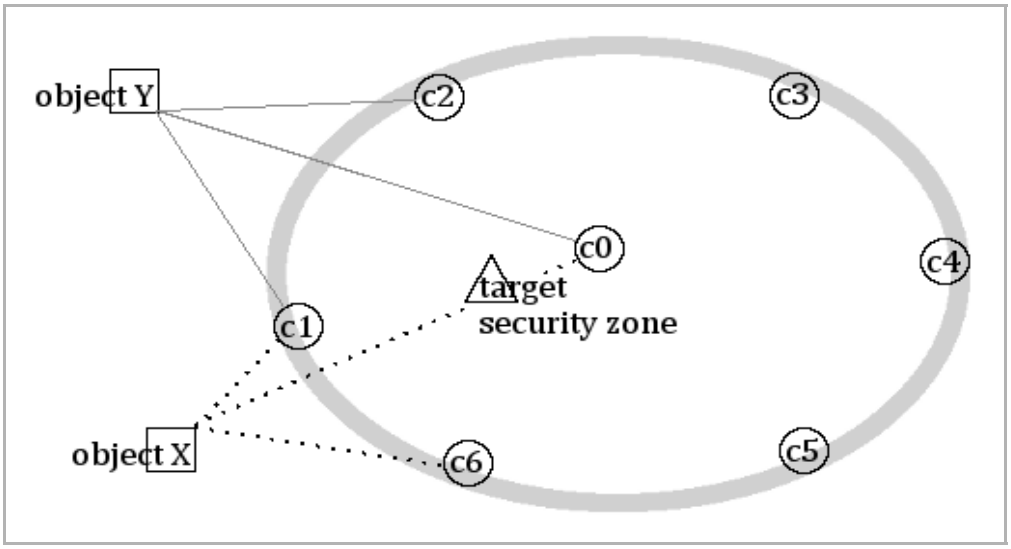

Figure 1. A security network tracking two objects.

The problem is illustrated in Figure 1. A security zone is established to protect the target. We assume an urban environment. We further assume the use of a video camera sensor network. The goal of the system is to identify potential threats to target. The application of interest is pre-shot sniper detection. Note that video-camera sensor inputs are assumed due to their practical application to the sniper detection problem. A more general gun control network uses multiple inputs (e.g. any measured EM signal) and yields multiple outputs (e.g. the response to an arbitrary query). Appendix I contains an input-methods-output abstraction of a generalized system in development by Aquerre Technologies.

Label	Function
`Process1`	Identification, categorization, and tracking (of objects in the field)
`Process2`	Detection, prediction and estimation (of threats to target)

Table 1. Components of proposed gun control system.

Summary of proposed system:

The proposed system comprises two processes, defined in Table 1. The first process, labeled

"`Process1`", is an algorithm for the purpose of identifying, categorizing and tracking objects in the field of view of the camera array. The second process, labeled "`Process2`", is an algorithm for estimating the level of threat posed to target by an object(s) in the field.

The following two subsections outline a proposed research and development strategy corresponding to the component processes defined in Table 1.

(i.) `Process1`: Proposed research and development activities pertaining to the identification, categorization, and tracking algorithms.

In this proposal, `Process1` algorithms are assumed to be relatively mature in the systems research community. We propose the application of open research and/or off the shelf libraries for the purpose of identification, categorization, and tracking of digital objects per video-camera and between video-cameras. New research on the topic of multi-camera `Process1` algorithms may be required and is included in Objective A of this proposal. Existing research in the field of video-compression is expected to have applications to this problem. Object tracking and prediction across consecutive video frames is known to be an efficient method of compressing digital video information. Therefore, video compression algorithms, such as the MPEG-4 digital video codec, have potential application to the sniper detection problem.

`Process1` algorithms might employ standard or newly developed libraries of digital objects, e.g. objects typical of an urban environment. Object libraries may further facilitate multi-camera cooperation. For example, suppose that the micro-processor corresponding to any individual camera sensor maintains a list of objects for which it has observation data. Cameras with data on same or similar objects could then cooperate to efficiently achieve the objective function of `Process1`. Cooperative strategies are expected to improve system performance [4].

(ii.) `Process2`: Proposed research and development activities pertaining to the detection, prediction and estimation algorithms.

The problem of threat detection may be posed as a hypothesis likelihood problem and more generally as a Bayesian inference problem. In this proposal, we apply the work of Prof. V.Veeravalli [3],[5],[7] on the topic of change-point detection and quickest change detection in sensor networks.

(Note: this proposal includes a consulting arrangement with Prof. Veeravalli as described in Section V.) Change-point detection theory and quickest change detection have applications to the threat prediction and estimation problem (and anomaly detection in networks, failure detection in manufacturing systems, and detection of the onset of an epidemic [3]). In particular, a key strategic approach for the implementation of `Process2` algorithms is to apply change-point detection theory for the development of advanced algorithms for pre-shot detection of sniper threats and events of gun violence.

V. CONSULTANT TO PHASE I PROJECT

This Phase I proposal includes a consulting arrangement with Professor Venugopal V. Veeravalli of the Dept. of Electrical and Computer Engineering at the University of Illinois at Urbana-Champaign. Prof. Veeravalli is an innovator of fundamental control and communication systems research including research on sensor networks and quickest change detection theory. For additional information about Prof. Veeravalli, please find his bio summary attached to this proposal and for further details visit his web page at: http://www.ifp.illinois.edu/~vvv/index.html

The consulting arrangement with Prof. Veeravalli is proposed to comprise 40 hours of consulting work over the course of the 6 month Phase I project for a total consulting fee of $10,000.00.

VI. FACILITIES/EQUIPMENT

The majority of the research and development activities of this Phase I proposal are to be performed at the primary office of Aquerre Technologies, in Los Angeles, CA. The primary office of Aquerre Technologies provides all requisite functionality for the completion of the goals of this proposal, and further complies with all environmental laws and regulations of the federal, state, and local governments.

VII. BIOGRAPHIES OF KEY INDIVIDUALS

See attachments to this proposal.

VIII. REFERENCES

[1] N. Wiener, “Cybernetics: or control and communication in the animal and the machine,” Second ed., MIT Press, Cambridge, Mass., 1965.

[2] A. Nosratinia, “New kernels for fast mesh-based motion estimation," IEEE Trans. on Circuits and Systems for Video Technology, 11(1): 40-51, Jan. 2001.

[3] V.V. Veeravalli, “Decentralized quickest change detection,” IEEE Trans. on Information Theory, 47(4): 1657-1665, May 2001.

[4] N.B. Jacobsen, “Practical cooperative coding for half-duplex relay channels,” In Proc. Conf. on Information Sciences and Systems, Baltimore, MD, Mar. 2009.

[5] V. Raghavan and V.V. Veeravalli, “Quickest change detection of a Markov process across a sensor array,” IEEE Trans. on Information Theory, 56(4): 1961-1981, April 2010.

[6] N. Jacobsen and R. Soni, “Method and system for encoding data using rate compatible irregular LDPC codes based on edge growth and parity splitting,” U.S. Patent No. 7966548, Jun. 2011.

[7] V.V. Veeravalli and T. Banerjee, “Quickest Change Detection,” To appear in the E-Reference on Signal Processing, Elsevier, 2013.

IX. APPENDIX I

Inputs	Electromagnetic Signals; Identification Tag Tracking; Gun Powder/Chemical Detection; Explosives Detection; Gas Spectrometry; Particle Detection; Metal Detectors; Radiation Detectors; Radio Frequency Signals; Telephony Signals; Internet Content and Social Media Content; observations of animal behavior; Electronic Wave Sensors; Antenna Based Signals; Electronic test and measurement devices; Chemical and heat sensors for the detection of explosives; Sensors for determining position, velocity, acceleration and temperature; Sensors for measurement of pressure, acceleration, force and flow; Active detectors (radiate and detect reflection); Passive detectors (deviations from ambient radiation)
Methods	Systems modeling; models of physical systems; Data representation; structural and relational modeling of data sets; organization, characterization and interconnection of data sets; Discovery of relational connectedness across a plurality of data inputs relevant to a given query; Data management, network science, operations research; Methods of estimation, prediction, and filtering of random processes; Methods of processing signals with networks; Methods of actuation and control with networks, Data analysis and synthesis; Knowledge discovery and learning with sensors, detectors, networks, data compression, signal processing, query processing, inference processing, automated learning, artificial intelligence, communications signals, error control codes, network codes, cooperative codes, source codes, channel codes, control signals, communication theory, information theory
Outputs	Weapons detection and tracking; Interface for situational, forensic and anticipatory information; Data for estimation and prediction of gun violence; Interface for alert response; Response protocol development; Public policy development; Education program development

Table 2. Description of general system.

Noah Jacobsen, Ph.D.
Curriculum Vita

Citizenship	United States Citizen
Date of Birth	02/15/1978
Contact	• Home address: 1445 Colby Ave #3, Los Angeles, CA 90025 • Cell phone: (310)-857-8049 • Fax: (424)-270-0709 • E-mail: noah@aquerre-technologies.com • Web page: http://aquerre-technologies.com
Objective	I represent my company, Aquerre Technologies LLC. We are seeking industry, academic, and government partnerships for a new project to research and develop a new gun control technology.
Experience	
Research Scientist	• Aquerre Technologies (present) • LGS Innovations, Alcatel-Lucent, Lucent Technologies (Jul. 2006--Oct. 2011) ◦ Signal processing and error control coding for wireless communication systems
Adjunct Professor	• Columbia University, Dept. of Electrical Engineering ◦ Linear Systems Theory, Spr. 2012 • Polytechnic Institute of New York University, Dept. of Electrical and Computer Engineering ◦ Probability Theory, Fall 2010
Education	• University of California, Santa Barbara ◦ Ph.D. Electrical and Computer Engineering, Sept. 2005 ◦ M.S. Electrical and Computer Engineering, Jun. 2003 • Cornell University ◦ B.S. Electrical Engineering, Jun. 2000
Publications	

- Method and system for encoding data using rate-compatible irregular LDPC codes based on edge growth and parity splitting," N. Jacobsen and R. Soni, U.S. Patent No. 7966548, Jun. 2011.
- "Practical cooperative coding for half-duplex relay channels," N. Jacobsen, In Proc. Conf. on Information Sciences and Systems, Baltimore, MD, Mar. 2009.
- "Coded noncoherent communication with amplitude/phase modulation: from Shannon theory to practical turbo architectures," N. Jacobsen and U. Madhow, IEEE Trans. Communications, 56(12): 2040–2049, Dec. 2008.
- "Noncoherent eigenbeamforming and interference suppression for outdoor OFDM systems," N. Jacobsen, G. Barriac, and U. Madhow, IEEE Trans. Communications, 56(6): 915–924, June 2008.
- "Design of rate-compatible irregular LDPC codes based on edge growth and parity splitting," N. Jacobsen and R. Soni, In Proc. IEEE Vehicular Technology Conf. (VTC), Baltimore, MD, September 2007.
- "Robust image-adaptive data hiding using erasure and error correction," K. Solanki, N. Jacobsen, U. Madhow, B.S. Manjunath, and S. Chandrasekaran, IEEE Trans. Image Processing, 13(12):1627–1639, December 2004.
- "Image adaptive high-volume data hiding based on scalar quantization," N. Jacobsen, K. Solanki, U. Madhow, B.S. Manjunath, and S. Chandrasekaran, In IEEE Military Communications Conf., Anaheim, CA, October 2002.
- "Beyond BAD: A parallel arbitration framework for low-complexity equalization," G. Barriac, N. Jacobsen, and U. Madhow, In Proc. Allerton Conf. on Communications, Control, and Computing, Monticello, IL, October 2001.

Venugopal V. Veeravalli

Professor, Department of Electrical and Computer Engineering
Director, Illinois Center for Wireless Systems
University of Illinois at Urbana-Champaign, Urbana, IL 61801
Phone: (217) 333-0144, FAX: ((217) 244-1764, e-mail: vvv@illinois.edu

Education/Traning

University of Illinois at Urbana-Champaign	Electrical Engineering	PhD 1992
Carnegie Mellon University	Electrical Engineering	MS 1987
Indian Institute of Technology, Bombay	Electrical Engineering	BS 1985

Research and Professional Experience

2005- Professor, Electrical &Computer Engineering, *University of Illinois at Urbana-Champaign*
2003-2005 Program Director (IPA), CISE/CCF/TF, *National Science Foundation*, Arlington, VA
2000-2005 Associate Professor, Electrical &Computer Engineering, *University of Illinois at Urbana-Champaign*
1996-2000 Assistant Professor, Electrical Engineering, *Cornell University*
1994-1996 Visiting Assistant Professor, Electrical Engineering, *RiceUniversity*
1993-1994 Assistant Professor, Electrical Engineering, *City University of New York*
1992-1993 Postdoctoral Fellow, Division of Engineering and Applied Science, *Harvard University*

Publications

S. Nitinawarat, G. Atia and V.V. Veeravalli. "Controlled Sensing for Multihypothesis Testing." To appear in the *IEEE Transactions on Automatic Control*, 2013.

T. Banerjee and V.V. Veeravalli. "Data Efficient Quickest Change Detection with On-Off Observation Control." *Sequential Analysis*, 31(1):4077, January 2012.

V.V. Veeravalli and P.K. Varshney, "Distributed Inference in Wireless Sensor Networks." *Philosophical Transactions of the Royal Society A,* 370: 100-117, January 2012. (**Invited survey paper.**)

J. Unnikrishnan, V.V. Veeravalli and S.P. Meyn. "Minimax Robust Quickest Change Detection." *IEEE Transactions on Information Theory,* 57(3): 1604-1614, March 2011.

V. Raghavan and V.V. Veeravalli. "Quickest Change Detection of a Markov Process Across a Sensor Array." *IEEE Transactions on Information Theory,* 56(4): 1961-1981, April 2010.

A.G. Tartakovsky and V.V. Veeravalli. "Asymptotically Optimal Quickest Change Detection in Distributed Sensor Systems." *Sequential Analysis,* 27(4): 441-475, October 2008.

V.V. Veeravalli. "Decentralized Quickest Change Detection." *IEEE Transactions on Information Theory.* 47(4): 1657-65, May 2001.

J.A. Fuemmeler, G.K. Atia and V.V.Veeravalli. "Sleep Control for Tracking in Sensor Networks." *IEEE Transactions on Signal Processing*, 59(9): 4354 - 4366, September 2011.

J. Unnikrishnan, D. Huang, S.P. Meyn, A. Surana and V.V. Veeravalli. "Universal and Composite Hypothesis Testing via Mismatched Divergence." *IEEE Transactions on Information Theory,* 57(3): . 1587-1603, March 2011.

J.-F. Chamberland and V.V. Veeravalli. "Wireless Sensors in Distributed Detection Applications." *IEEE Signal Processing Magazine Special Issue on Resource-Constrained Signal Processing, Communications, and Networking*, 24(3): 16-25, May 2007.

A.G. Tartakovsky and V.V. Veeravalli. "Change-Point Detection in Multichannel and Distributed Systems With Applications." In *Applied Sequential Methodologies: An Edited Volume,* N. Mukhopadhyay, S. Datta, and S. Chattopadhyay (Eds.), Marcel-Dekker, 2004.

J.-F. Chamberland and V.V. Veeravalli. "Decentralized Detection in Sensor Networks." *IEEE Transactions on Signal Processing,* 51(2): 407-416, February 2003. (**IEEE Signal Processing Society 2006 Young Author Best Paper Award.**)

Synergistic Activities

Associate Editor, *IEEE Transactions on Information Theory*, 2000-2003
Editorial Board, *Journal of Statistical Theory and Practice*, 2007- present
Editorial Board, *Communications in Information and Systems (CIS)*, 2000-present
Associate Editor, *IEEE JSAC – Wireless Series*, 1999-2000
General co-chair, *IEEE International Symposium on Information Theory*, Honolulu, HI, 2014
Co-Chair, *Allerton Conference on Communications, Control and Computing*, 2003 and 2004
Coorganizer of *National Academy of Engineering*, 2001 Frontiers of Engineering Conference
Member of the Board of Governors of the *IEEE Information Theory Society*, 2004-2007
Member of the SPTM Technical Committee of the *IEEE Signal Processing Society*, 2011 -
Guest Editor, *IEEE JSTSP Special Issue on Learning-Based Decision Making*, 2013.
Guest Editor, *IEEE JSTSP Special Issue on Anomalous Pattern Discovery*, 2013.
Guest Editor, *EURASIP Journal on Advances in Signal Processing (JASP) on Wireless Location Estimation and Tracking*, 2008.
Guest Editor, *IEEE Signal Processing Magazine, Special Issue on Resource-Constrained Signal Processing, Communications, and Networking*, 2007.

COST PROPOSAL BREAKDOWN ITEMS GUIDANCE

Proposal Information		
Proposal No.: **HSHQDC-13-R-00032-H-SB013.2-008-0024-I (Phase I)**	Topic No.: **H-SB013.2-008**	Solicitation No.: **HSHQDC-13-R-00032**
Proposal Title: **Gun Control Network--Technology for Gun Violence Prediction and Estimation**	Topic Title: **Pre-Shot Sniper Detection in Urban Environments**	
Amount: **$100,000.00**	Proposed Duration: **6 months**	Start Date: **01/01/2014**

Principal Investigator (PI) Information		
PI First: **Noah**	PI Middle: **B**	PI Last: **Jacobsen**
PI Address: **1445 Colby Ave #3**		
PI City: **Los Angeles**	PI State: **CA**	PI Zip: **90025 - 7844**

Company Data		
Company: **AQUERRE TECHNOLOGIES LLC**		
Address: **1445 COLBY AVE #3**		
City: **LOS ANGELES**	State: **CA**	Zip: **90025 - 7844**
DUNS + 4: **078829869**	TIN/EIN: **462755575**	CAGE Code:

Cost Proposal Breakdown

Cost Breakdown Items *(in this order, as appropriate)*	**Funds Requested**	**Funds Awarded**
1. Total dollar amount proposed:	$100,000.00	
2. Direct labor cost:		
a. Enter labor categories proposed (e.g., Principal Investigator/Project Manager, Research Assistant/Laboratory Assistant, Analyst, Administrative Staff), labor rates and the hours for each labor category.		

Labor Category	**Hours**	**Rate**	**Cost**
PI	1000	$90.00	$90,000.00
Consultant	40	$250.00	$10,000.00

b. Total hours	1040	
c. Total direct labor cost (dollars)	$100,000.00	
3. Overhead cost:		
a. Rate	0.0	
b. Cost (0.0% of Total Direct Labor) (dollars)	$0.00	
4. Other direct costs (ODCs):		
a. Direct material cost		

Category	**Cost**

Total direct material cost (dollars)	$0.00	
b. Special testing (include field work at government installations)		

Category	**Cost**

Total special testing cost (dollars)	$0.00	
c. Special Equipment		

Category	**Cost**

COST PROPOSAL BREAKDOWN ITEMS GUIDANCE

Total special equipment cost (dollars)	$0.00	
d. Travel (if direct charge)		
Category / **Cost**		
Total travel cost (dollars)	$0.00	
e. Subcontracts (e.g., consultants)		
Category / **Cost**		
Total subcontracts cost (dollars)	$0.00	
f. Other		
Category / **Cost**		
Total other cost (dollars)	$0.00	
g. *Explanation:*		
h. Total other direct costs (dollars)	$0.00	
5. Subtotal (dollars):	$100,000.00	
6. General and administrative (G&A) cost:		
a. Rate	0.0	
b. Cost (0.0% of Subtotal) (dollars)	$0.00	
7. Profit/Cost sharing:		
a. Rate	0.0	
b. Cost (0.0% of Total Cost) (dollars)	$0.00	
8. Total proposed amount (total cost plus profit) (dollars):	$100,000.00	
9. Deliverables and audit info :		

Upon selection, Companies will be required to submit mandatory deliverables such as progress reports, final report and updated Company Commercialization report as per their contract. If your company is proposing any additional deliverables, list them below:

Additional Deliverables	Quantity	Project Delivery Milestone

b. GOVERNMENT FACILITIES AND EQUIPMENT: If you require the use of Government Facilities or Equipment, identify the Government Facilities or Equipment below:

c. AUDIT AGENCY CONTACT INFORMATION: If a federal agency has ever audited your accounting system, specify the agency, office location, and contact information below:

Agency	
Office/Location	
Phone	
E-mail Address	

SBIR.gov SBC Registration Control ID Form

SBC CONTROL ID	SBC_000001433

FIRM INFORMATION					
Company	AQUERRE TECHNOLOGIES LLC				
Address	1445 COLBY AVE 3				
City	Los Angeles	State	CA	Zip	90025-7844
TIN/EIN	462755575	DUNS	078829869		
Company URL		http://aquerre-technologies.com			
Number of Employees:		1			
Is this SBC majority-owned by multiple venture capital operating companies, hedge funds, or private equity firms?					No
What percentage (%) of the SBC is majority-owned by multiple venture capital operating companies, hedge funds, or private equity firms?					0%

SBC CONTROL ID	SBC_000001433