

# **USC Transonic Solutions**

*Enabling Human-Human Communication via  
Automated Two-way Speech-to-Speech Language Translation  
of English-Farsi and English-Dari*

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US federal agencies are seeking new technologies to support multinational, multilingual operations. One significant challenge in such operations is cross-language communication between speakers of different native languages. DARPA and other DoD research groups envision enabling cross-language communication via computer-mediated translation of speech between the native languages of the speakers. The University of Southern California will develop *Transonic Solutions* prototypes enabling human-human communication via automated two-way speech-to-speech language translation of English-Farsi and English-Dari.

The Transonics team will achieve the ground-breaking power of computer-mediated cross-language communication by applying our in depth understanding of multilingual speech recognition in acoustically challenging environments, speech-based machine translation, embedded systems technologies, and human dialogue and communication. We will achieve the following innovations through our proposed program, enabling people involved in field operations to interact directly with people with whom they do not share a language:

- A Machine Translation (MT) system capable of working on small platform hardware in real time for translation of a wide variety of expressions in English/Farsi/Dari in the intended domains that will be robust against speech recognition errors.
- A low complexity, memory efficient, robust multi-language speech recognizer with (a) language independent robust front-end that includes extraction of robust features and novel signal enhancement techniques, and (b) rapid speaker/environment adaptation capabilities.
- The emphasis on using the translation device as an integral part of solving the communication problem, while recognizing that users have additional communicative paths at their disposal, including non-speech modalities; the device will be engineered to fit into the whole communication scenario, and as a result will be much more effective.
- A dynamically adaptive language model in an open dialogue translation system.
- Heavy emphasis on error handling in implementation, training and use.
- Integrating speech-in, speech-out, MT, and interaction management all on a wearable/embedded system.

The impact of the proposed work includes:

- Cross-language communication in critical domains such as medical triage, force protection and refugee processing
- Ruggedizable wearable 2-way speech-to-speech translation system for Farsi & Dari
- Rapid prototyping for new languages & domains, including low density languages