

***For troops deployed in Afghanistan and Iraq, overcoming communication barriers could be the difference between life and death. But thanks to a new translator, connecting two people that don't speak the same language may be as easy as speaking into a PDA.***

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A pocket-sized instant translator sounds like a gadget from a Star Trek movie -- speak a phrase in English, and the device spits out the translation in any language you want, and vice versa. Now, gadgets with this kind of technology aren't just for Starfleet officers. The "Phraselator," a uni-directional language translator, is being used in Afghanistan and Iraq to communicate with hard-to-reach locals -- and can save lives in both medical and security scenarios.

"The idea is relatively simple," says Horacio Franco, chief scientist at SRI laboratories. "We aimed to create a phrase recognition system that could handle up to several thousand phrases, and, in real time, recognize a phrase and look up the translation in any language that's loaded into the system." All the recognition software and the entire phrase database fit neatly into a ruggedized PDA.

### **Neat Little Package**

While the concept is simple enough, the project was executed in staggered phases, testing out the technology in steps. Development started in 2000 with the initial one-way phraselator, a prototype of which was fielded in 2002. Around 5,000 copies were deployed to U.S. troops in Iraq and Afghanistan in 2003, and were met with glowing reviews.

A key feature of the device was its portability. "We were able to make it work in a very simple, small handheld computer," Franco says. "That was one of the important features of this technology -- to be able to put it into a small platform with no loss of accuracy, speed and capability." The phraselator's success was boosted by the fact that they could adapt a program that they developed on a much larger and complex platform to as small a system as a palm pilot. Soldiers can carry it around at all times, since the PDA is ruggedized and has a battery life of about a week.

### **Learning Curve**

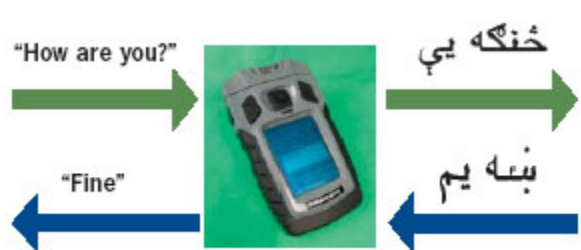
The biggest challenge that faced the Phraselator team was developing data for a language that had virtually no unified writing convention. Lengthy user studies were done on Pashto, one of the major languages in Afghanistan and Pakistan. "People really had to discover what the words were -- because we only had the sounds. It took about a couple of years." In the case of a language with such little resources, the team had to literally define a transcription system, in order to input the phrases into the software.



The "Phraselator" spits out realtime translation between people who don't share a common language.

While the uni-directional phraselator could easily be programmed with most major languages, the more advanced bi-directional phraselator would focus only on Pashto. Data was collected to determine which Pashto responses were important and most common enough to be included in what Franco termed as a "finite set of semantically different answers." The research team found out what answers to cluster together, and the software would automatically detect the variations and translate the meaningful one back into English. Value-structured questions, or ones involving quantities, such as "How old are you?" or general quantities for ordering medical supplies, could also be processed.

Originally intended for use in a medical scenario, the phraselator also includes general-use phrase translations, like introductions and questions about demographics (i.e. "How old are you?" "Where do you live?" etc.). General health questions might also prove useful for deployed troops. "Was somebody injured? Were they shot? Did they step on a landmine?" Using these basic questions, soldiers can hint at what might have happened, and solicit a meaningful response.



For a bi-directional phrase-based translation system, translation can be done almost immediately -- in a fraction of a second. "We want to hint the recipient to the type of answers that are programmed in the database, so that they speak with concise answers that the system can handle."

As of now, only the uni-directional device can learn new phrases. The bi-lingual phraselator is so complex that new phrases can only be added in-house, but Franco explains that, "If it was requested, the capability could be added."

### Field Test

With 5,000 copies deployed in the military, servicemembers have found the one-way translator very useful. Units in the Coast Guard and the Navy have used the phraselator to communicate with people who need to be rescued at sea. Troops performing force protection and security have found it useful in communicating with

the local population. "I heard a story where soldiers were in a city and asked young boys if they knew where the arms were hidden. The local boys understood the translation, and the troops were guided to a house where they found a bunch of enemy weapons," Franco says.

For maximum accuracy however, Franco explains that it must be used in the particular domain it was created for -- the medical scenario. "It's targeted to the specific domain of a medical interview. When it's used in its particular domain, 90 percent of phrases would be translated accurately." Doctors trying to communicate with foreign patients can overcome cultural differences through the small gadget. In one case, a doctor was able to ask questions to female patients that wouldn't have been possible using a male interpreter, because of cultural differences. Through the system, she was able to communicate and diagnose her patients.

Despite the phraselator's medical usage, troops are getting more creative in adapting it to their specific needs. Security and force protection units have been known to connect the phraselator to a blow horn through the audio jack included on the PDA. Troops could then easily get their messages out to a wide area of civilians.

### **Bi-Directional and Beyond**

The bi-lingual phraselator has been sent to a handful of users in the field, and Franco and his team are integrating feedback from the military regarding user interface. "We and the DARPA managers agreed there would be next steps, in a staggered approach. At the same time, we are doing research and development on more advanced systems."

Besides research on the bilingual phraselator, Franco's team is working on a free-form prototype, that isn't based on phrases. With a free-form translator, you won't be forced to use a specific phrase structure, but it also limits the domain in which translations can be performed. "This system is more experimental, it's more of a prototype," Franco says.

For now, the uni-directional and bilingual phraselators are providing meaningful research and important steps to a more complex system like the free-form translator. "This limited capability doesn't allow free interaction, but it at least it create the possibility of dialogue between people who don't share a language," Franco says. For troops deployed in foreign countries, this possibility is most welcome.