EMERGING TECHNOLOGIES
MOBILE-COMPUTING TRENDS: LIGHTER, FASTER, SMARTER

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We are moving into a new era of mobile computing, one that promises greater variety in applications, highly improved usability, and speedier networking. The 3G iPhone from Apple is the poster child for this trend, but there are plenty of other developments that point in this direction. The Google-led Android phone will make its appearance this year, offering a compelling open-source alternative to Apple's device. New, faster networking, particularly WiMax, is rolling out, allowing these devices connection speeds that approach wired broadband. This will also benefit the new crop of ultra-light laptops. The significant innovation in this area is the famous $100 XO computer (now $188; all prices are USD). Previous surveys, in LLT, and by researchers (PDF) at the UK's Open University, have highlighted recent projects in mobile assisted language learning. In this column I will be focusing primarily on the changing computing and networking environment and what it might portend for future language learning applications.

ULTRA-MOBILE PCs

When I last wrote a column dedicated to mobile computing, nearly 10 years ago, there were few lightweight laptops, and the existing models all had major drawbacks. Today there are many more models and sizes available, but not all the shortcomings have been addressed. In fact, in comparison with developments in the area of mobile phones, it might not seem that a great deal of progress has been made. With the exceptions of a faster processor, larger memory/hard drive, and a higher resolution display, the Toshiba Libretto of 1998 is not that different from the Sony Vaio UX of 2008. The size, weight, and, crucially, battery life are similar. There is, however, a different kind of portable computing device that was not available in 1998, the Tablet PC.

The first Tablet PCs, announced with great fanfare in 2002, were not a runaway success, but in 2005 Microsoft introduced the Origami Project with new software enhancements. Models like the Samsung Q1 and the eo series from TabletKiosk feature smaller, more powerful Tablets. They use a 7-inch display and weigh just under 2 lbs. These ultra-mobile PCs are designed to be used for both work and entertainment but are best suited for note taking and editing. They offer multiple options for creating documents: voice recognition or handwriting recognition, a virtual keyboard or an external keyboard. They are not well adapted to intensive computing tasks such as graphic editing or gaming. A recent entrant in this field is the Nokia Internet Tablet, which runs Linux rather than Windows. The absence of a traditional keyboard in small Tablets has been an impediment for many users, making it awkward to use in situations such as instant messaging or entering text in Web forms. The latest Nokia Tablet (N810) addresses this issue by adding a physical keyboard. Chip manufacturer Intel is promoting what it is calling "Mobile Internet Devices", based on its low-power Atom microprocessor and aiming with partners to develop small Tablets for under $500. Actually, miniaturized laptops (complete with keyboards) have proven to be more popular than Tablets. Minis such as the Sony Vaio UX series or the OQO models are very compact, weighing 1.2 lbs, with 41/2 to 5 inch screens. They feature both WiFi and cellular data network connectivity.

A device with a similar form factor (but no keyboard) that has proved to be surprisingly popular is Amazon's Kindle. It is not a full-featured computer, but rather a dedicated e-book reader. However, its networking capabilities (through a EVDO cellular network) allow it also to be used as an Internet device. It has a 6-inch screen, weighs 10.5 ounces, and is very thin. Its principal selling points are excellent readability (using e-paper display) and long battery life; drawbacks are its relative high cost ($359) and

limited format compatibility. Amazon recently purchased Audible.com, which has led to speculation over the opportunity for combining print and audio versions of texts. Of particular interest to language learners would be the possibility of simultaneously listening to and reading a text (as in selected texts on Loudlit) or working with interactive exercises that leverage the availability of both spoken and written versions. This is not possible on the Kindle (you can either read or listen, not both), but it could be done on other mobile devices, possibly through the Daisy Talking Book XML standard.

The mini laptops such as the Sony Vaio are quite expensive, well over $1000. Even more expensive are the new full-featured, lightweight laptops from Apple (MacBook Air) and Dell (Latitude D430), which feature more power and larger screens than the ultra-mobile models. For less affluent consumers, a new crop of small portables has arrived that are much more affordable. These are bare bones models that typically run Linux rather than Windows and sport a 7-inch display. The best known are the Asus Eee PC and the Everex Cloudbook, currently available in the US from Wal-Mart for $299. They are designed to be starter computers for first-time users or as second, travel computers. They work well for Internet access (Web browsing, e-mail, VoIP) and general computing, using the OpenOffice Suite as an alternative to Microsoft Office. However, the fact that they run Linux limits software choices. Some models can be configured to run Windows, but this adds significantly to the cost.

One of the more interesting computers in this group is a device designed for a special purpose and population, the XO from the OLPC (One Laptop Per Child) Foundation. It features a 7 1/2 inch screen with two different modes, either full-color for indoors or non-backlit, black and white for outdoors. It can be used as a regular laptop or swiveled to form a tablet. It is very rugged, with a rubber membrane keyboard, and features unique power-charging options including solar and pull-cord chargers. In additional to conventional WiFi networking, it also incorporates mesh networking, which allows XO users to connect to one another even in the absence of a WiFi connection. Its bundled software (running on Linux) is simple and easy to use, designed for first-time computer users. One of the more interesting features of the software is the ability to press a button in virtually any program to see the underlying code. The HTML of Web pages, for example, can be easily viewed, edited, and resaved. While the computer itself is designed for children (the keyboard especially), the innovative features it introduces are likely to spur widespread interest.

MOBILE PHONES: THE iPHONE FACTOR

The XO was designed to be used in developing countries to provide universal access to computing and networking services. For a variety of political and practical reasons, adoption has been slow, with few country-wide contracts so far. One obstacle to effective wide-spread usage of even inexpensive laptop computers is the absence of Internet access. On the other hand, in countries such as India, cell phone ownership is growing fast. As a result, many educational projects are taking advantage of that development to create applications that run on mobile phones. This includes programs for language study. A project out of the University of California at Berkeley, MILLEE (Mobile and Immersive Learning for Literacy in Emerging Economies), has designed e-learning games for mobile phones which deliver English language instruction in an engaging way in India. There are similar programs to teach Irish in the Dublin area (County Meath Project - PDF) or to provide English instruction to small children in Asia (the L-Mo project). Other projects using mobile phones prepare ESL students for the workplace (Athabasca University's mLearning pilot project) and bring basic language and literacy to unschooled Indians (TeachMe Akshara). In fact, there have been for some time quite a few language-related applications available for mobile phones and PDAs, principally for the Windows Mobile and Palm platforms. These range from dictionaries and phrasebooks to flashcards and full-fledged interactive lessons. Increasingly, such programs incorporate audio and, more recently, video. Fluenz Mandarin, originally developed for standard computer access, is now available in a Windows Mobile version that contains the same content, including high quality video segments.

In terms of application development, the Apple iPhone has recently opened up significant new opportunities. When the iPhone was first released the only third-party applications possible were AJAX-based Web applications. Such programs need a network connection to run as there is no local file access. With the release of the 3G iPhone, Apple opened up the iPhone to regular third-party applications. A SDK (Software Development Kit) for the iPhone was released and Apple set up an "Apps" store for iPhone applications, accessible from the iPhone or through iTunes. While these applications appear as equals alongside Apple's built-in programs, they do not in fact have equal access to all components of the iPhone. They cannot access information from or interact with other applications. Most significantly, third-party applications cannot run in the background but only when they are the currently active application. Apple's explanation to developers unhappy with this restriction is that running programs in background could cause memory problems and lead to crashes. As a solution Apple has recently added to the iPhone SDK "push notification", the ability for iPhone apps not currently running to get status updates, in the form of pop-up notices or through other means.

Despite the limitations, there has been a flood of applications developed for the iPhone, from games (many of which build on the iPhone's tilt sensing capabilities) and utilities (including one that turns the iPhone into a flashlight) to instant messaging and word processing. Some applications offer integration with desktop applications. The Stanza e-book program, for example, allows iPhone users to browse both the library of e-books stored on their local computer and in public e-book repositories, then to add them to their iPhone for off-line reading. A few apps for language learning have been released, most similar to what is available on other mobile platforms including dictionaries, phrase books, and flash cards. AccelaStudy offers a variety of language flashcards, as does StudyCards and Flash My Brain. The latter two incorporate a version of the Leitner system, a repetition spacing method in which typically a card is deleted from an active stack after a number of right answers. This is true as well for Lexicon, which also takes advantage of the kind of network connectivity used in Stanza to link desktop and mobile databases.

Innovative Language Learning has introduced vocabulary and pronunciation building tools (MyWords) for multiple languages that allow comparison of learner's pronunciation with that of a model native speaker using the iPhone's recording and playback functions. In addition to language reference and practice applications, there are also a number of applications in the travel category, which highlight cultural sites.

One program which works well on the iPhone is ChinesePod, a popular Web-based application for learning Mandarin; there are also sites for French, Italian, and Spanish. ChinesePod began as a series of podcasts to which ancillary materials have been added. The podcasts are free; the other materials are not. When Praxis Language, which offers ChinesePod, created a special view of their Web offerings formatted for the iPhone, they received an interesting reaction. The new site was immediately popular with mobile users, but was also a hit with those accessing the site from desktop computers. Users praised the simplicity of the interface and the ease in finding resources, resulting from the simplified presentation needed for mobile phones. This is a phenomenon others have commented on. Powerset, for example, designed for use with the iPhone, offers an interesting alternative to regular access to Wikipedia, featuring an easy to navigate search. This is true as well for Google Translate for iPhone. In fact, many services and institutions have created simple, easy-to-use mobile views of their sites, spurred by the popularity of the iPhone. The ironic aspect of this development is Apple's bally-hoed insistence that the iPhone works with the "real" Web without the need for special mobile-oriented, alternative Web pages. Many Web users would probably agree that, if the iPhone has encouraged less cluttered Web page development, that is in itself a positive trend.

ANDROID: THE FUTURE?

We seem likely to see in the near future another mobile phone with considerable promise for the development of educational applications, the Android phone. While Android phones will also feature

advanced capabilities and encourage third-party applications, this is not a single phone offered by a particular company. Google, with a coalition of companies under the rubric of the Open Handset Alliance, is actually developing an entire mobile phone platform and operating system using embedded Linux. The phones themselves will come from a variety of manufacturers, including HTC and Motorola. The first Android phones in the US will be offered through T-Mobile, and possibly Sprint. There has been tremendous interest in Android, principally because of Google. The Android platform promises to be competitive in features with the iPhone and in some areas eclipse it. It will feature, for example, background access to networks, shared copy and paste, and support for Flash, all missing on the iPhone. Prototypes that have been demonstrated show an optimized user interface similar to the iPhone with added features such as home screen customization and an always-available pull-down window for access to newly received data. Development for the Android platform has been spurred by the $10 million that Google is making available through the Android Developer Challenge.

There are some challenges facing Android. There have been a number of complaints from developers concerning missing elements in the Android SDK, frequently changing code parameters, and poor documentation. While these issues are likely to be fixed in the short term by Google, a deeper concern has to do with handset compatibility. In contrast to developing for the iPhone, Android developers do not know what the features of the phone will be for which they are developing applications. The handsets, for example, might have a touch screen like the iPhone or a traditional keypad. Of course this is an issue developers for Windows Mobile have had to face as well. The ambitions for Android, however, are higher than for Windows Mobile devices. The selling point for Windows Mobile has principally been the integration between desktop and mobile applications, particularly in the area of email synchronization and mobile access to MS Office documents. The vision for the Android phone is to become a full-fledged computing and networking device in its own right, not just an adjunct to a desktop computer. This adds a higher level of challenge to Android application development, and having application developers settle for the lowest common denominator among possible phones is probably not the most effective means to reach Google's lofty goals. In this sense, Apple has an advantage in controlling both software and hardware for the iPhone. On the other hand, this places limits on hardware features, which Android does not face.

The Android platform is built on a version of Linux. This is true as well for a competing mobile phone platform, LiMo (for Linux Mobile), an open source project supported by a consortium that includes Mozilla/Firefox, Panasonic, Samsung, and others. There are already LiMo phones available from Motorola and Samsung. OpenMoko is another open source project for phones. Neither at this point can compete with the iPhone or Android in the sophistication of the user interface. For mobile phone carriers, open source operating systems and third party applications are a source of worry, as they threaten loss of control and loss of revenue. Cellular carriers want to continue to charge a monthly fee for photo transfers, for example, which is compromised if users are able to do so for free through a third party application. It's perhaps no surprise that the two largest carriers in the US passed on the Android phone. On the other hand, an operating system used by some 60% of phones worldwide is following the lead of Android in the direction of openness. The Symbian OS, recently purchased by Nokia, is to be unified into one platform (instead of the current three different versions) and is to become open source by 2010. Given Symbian/Nokia's large client base, this is likely to force carriers to accept the inevitability of users being able to customize their phone's functionality. Meanwhile, the other major smartphone manufacturer, Research in Motion, maker of the Blackberry, is pursuing a path similar to Apple's with the company controlling both hardware and software.

EXPANDING NETWORKS AND OPPORTUNITIES

In addition to the arrival of many more applications and services for mobile users, another major change is in network speed. 3G cellular networks, available for some time in Asia and Europe, are recent arrivals

in North America. 3G is the third generation of standards for mobile phones and features more efficient transmission of data than previous networks. 2G networks were designed for voice transmission and don't do a good job with data transmission. While 3G is an improvement on data speeds, the future 4G networks will be even faster and more reliable through sending data as IP packets. The change from reliance on the slower Edge network (a 2.5G network) to 3G has been a big boon for sales of the iPhone. The faster connection speeds do not just provide a quicker way to access existing services like browsing the Web; they also enable advanced services, such as high-quality video streaming. Ubiquitous, high-speed access to the Internet through 3G or WiFi is becoming much more common in industrialized countries, and as prices fall with more sales, the new networking situation is likely to bring significant opportunities for educational uses. These could range from anywhere/anytime delivery of lectures and demonstrations to group video conferencing. For language learning, reliable, high quality audio and video delivery to user-friendly mobile devices can provide valuable (and enjoyable) language input to learners. Video clips could also be incorporated into learning programs such as simulations, practice dialogues, short biographies, subtitled music videos, or other language use scenarios.

A new network protocol arriving in the US and other countries is WiMax (802.16). This may sound similar to the wireless networking standard known as WiFi (802.11) but in practice is quite different. It is designed to operate at long distances (several kilometers) and to provide reliable connectivity (so called Quality of Service), which is so important for demanding applications like two-way video. WiMax has been used in emergency situations in which traditional networks have become unavailable, such as after the tsunami in Indonesia or in the wake of hurricane Katrina in the U.S. gulf coast. It appears to be a standard well suited for deployment in rural areas and in countries lacking an infrastructure to support landline connections. In the US a consortium of companies has joined to offer WiMax service through Clearwire. The first commercial WiMax service in Europe is being offered by WorldMAX in the Amsterdam area. A partner in the Clearwire group is Google, which will support WiMax in selected Android handsets. WiMax will also be supported on some laptops as well as on other devices such as game consoles.

Another change in the 3G iPhone is the inclusion of a GPS chip. This is a trend in both mobile phones and some laptops. GPS allows not only help in finding one's way but also provides an opportunity for location aware applications. Some of the more interesting applications for the iPhone are those which use GPS to enhance social networking. Apps such as Nearby, WhosHere, or Whrrl allow users to find nearby services, friends, or restaurants and also to view information on local sites. The popularity of Twitter (a continuous short-form diary) and sites such as Facebook or MySpace, along with their mobile versions, demonstrates how comfortable young people are with using technology for social interactions. Any such tools that enhance communication and human interaction can potentially be harnessed for language learning.

In terms of language support, the 3G iPhone supports many more languages than the original phone. As the phone is marketed in more countries, more languages are likely to be added. Language support for Android is uncertain at this time, but given the investment Google is putting in its success, it seems highly likely that Android will eventually support major world languages and alphabets. For mobile devices to become optimally useful in language learning, this kind of language support needs to carry over as well into areas such as text entry, auto-correcting, and spell checking. Currently, the functionality in these areas is limited but improving. In the most recent upgrade to the iPhone software, for example, text entry is possible in non-Roman writing systems. For Chinese, for instance, text can be entered in Pinyin with a pop-up showing possible characters (user's choice of simplified or traditional) or characters can be entered in a text entry window with one's finger, again with a pop-up showing possible intended characters. In my experience, this works well with simple characters, but is a challenge with high stroke characters, for which a stylus would be more efficient. Switching language keyboards can be done easily on the iPhone, by tapping on the globe icon, which then cycles through keyboards the user has chosen to

make active. Given sufficient language display and writing support, mobile devices can provide services such as text flagging for spelling or grammatical problems. Since these devices typically have always-on network connections, it is also possible to incorporate word look-up in dual-language dictionaries. The iPhone flashcard program Lexicon allows such dictionaries, once downloaded, to be stored locally for fast look-up.

With robust language support, mobile devices may open up new vistas for language learning. In particular, it would seem logical to leverage the current student generation's heavy reliance on social networking in support of language learning, with uses such as text messaging for language partners, language class linking through Facebook updates, or Twitter updates as part of a lesson on verbs describing ones daily routine. Of course, all of these uses presuppose student access to mobile devices (and services) as well as compatibility among different mobile devices students may be using. If Android becomes a popular platform, it may lead to more third-party application development for mobile phones, and perhaps encourage more use of open platforms by phone carriers.

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- Samsung Q1 Ultra-Mobile PC (Origami) Review by BostonHerald
- Samsung's 'Origami' Device Poorly Designed, Hard to Use Review from FOXNews.com
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