

# A1: Technology Research



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## Input/Output Methods

### Text Input Methods

**Keyboard:** Typing at 50 net words per minute, a person produces a 3-page, 900-word document in 18 minutes. Keyboard in particular is operated with two or three independently moving fingers whereas the operation of the other devices can be reduced to moving one finger on a two-dimensional plane.

Portable keyboard



On-screen keyboard



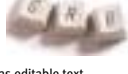
**Handwriting recognition - Graffiti:** Proprietary glyph alphabet. Learning Graffiti takes practice and patience. Once you've learned the special character strokes, it offers an accurate way to input characters with a pen.

Graffiti characters



**Alphanumeric:** Typing text using 0-9 keypad. Due to the inconvenience, cell phone users generate many abbreviated words as shown below.

"Great" alphanumeric



**Free handwriting:** Without being recognized as editable text

Palm NotePad



### Pointing Methods

**Mouse/Trackball:** Mouse and trackball allow several directions to be drawn with single circular movement and thus with lower motor overhead.

Trackball



**Stylus/Finger Stylus:** Stylus presents the potential of full-screen gesture recognition (this use can conflict with using the stylus as a "mouse"). Finger stylus is a solution to the problem that many PDA users, sometimes lose track of where I keep my stylus.

Finger stylus



**Joystick:** Joystick and keyboard both require a discrete finger movement for each direction and therefore they are the slowest.

### Voice Recognition

**What it is:** Voice Recognition allows a user to use his/her voice as an input device.

**What it does (functionality):**

- Dictation: Current software packages are designed primarily to let you dictate raw streams of text into a document.
- Editing/formatting: Writing with your voice is one thing; revising your work orally is something else entirely. Currently, you're wiser to use your keyboard and mouse for these tasks.
- Application support: All four packages let you dictate directly into any text-based application, including Microsoft Word, Excel, and popular e-mail packages such as Outlook Express and Netscape Messenger.
- Command and Control: Besides dictating text, you can tell your apps what to do--open this file, print that page--and navigate around your desktop.
- Vocabulary: Users can turn on specialized vocabularies, called topics. Use these topics to increase accuracy by expanding the base vocabulary. Current products come with 5,000 - 60,000 active words.
- Multiple users: Many products let you set up multiple voice profiles, so different people can use the same PC.

**How it works:** These sorts of programs are very complex and require a fast processor and large RAM system. In order to use the software you would also need to have a good microphone - the microphone makes all the difference in how well the software will perform.

### Experimental Methods

**LumiTouch:** Emotional & tangible communication device

- What it is: Interactive picture frames.
- What it does: When one user touches her picture frame, the other picture frame lights up.
- How it works: User's touch is translated to light over an Internet connection to another user's frame.

LumiTouch



SenseWear



**BodyMedia SenseWear:**

- What it is: A wearable body monitor
- What it does: Continuously gathers the following data: movement, heat flow, skin temperature, ambient temperature, and galvanic skin response.
- How it works: Contains sensors and 2-way wireless communication capabilities, enabling it to act as a third-party data collector (i.e., heart rate monitor).

**ComTouch:**

- What it is: Haptic comm. device that can be grasped in one hand.
- What it does: One user's touching/pushing sensation is transmitted to another user.
- How it works: When transmitting, one device registers the analog force of pressure from each finger as the object is squeezed. This force is transmitted over a wireless connection. At the receiving end, the transmitted force is represented by vibrations under each finger.

ComTouch



## Adaptive Technologies

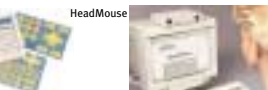
### What It Is

Assistive or Adaptive Technology commonly refers to "products, devices or equipment, whether acquired commercially, modified or customized, that are used to maintain, increase or improve the functional capabilities of individuals with disabilities."

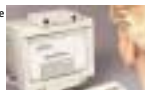
### What It Does / How It Works

**Alternative keyboards:** The products available range from keyguards that prevent two keys from being pressed simultaneously, to alternative keyboards with differing layouts, sizes, etc. for people who have specific needs, to alternative input systems which require other means/methods of getting information into a computer.

Alternative keyboard



HeadMouse



**Alternative mouse systems:** Mousekeys, trackballs, Head motion controlled functions without wired headset (above), switches, etc.

**External speech synthesizer:** An external speech synthesizer is a hardware device used for speech output. Typically, they are used with screen readers or OCR/scanning software [Optical Character Recognition] programs for people who are blind or visually disabled.

Speech synthesizer



Haptic device



**Haptic device:** The word "haptic" means "of or relating to or proceeding from the sense of touch." A haptic interface is a device which allows a user to interact with a computer by receiving tactile feedback. This feedback is achieved by applying a degree of opposing force to the user along the x, y, and z axes. These devices can be used by people with disabilities or people who learn best through tactile or kinesthetic experiences.

**Screen magnification:** Screen magnification software are used by people with visual disabilities to access information on a computers screen. The software enlarges the information on the screen by pre-determined incremental factor [for example, 1x magnification, 2x magnification, 3x magnification, etc.].

Magnification



OCR



**Optical character recognition (OCR):** The process of converting an image of text, such as a scanned paper document or electronic fax file, into electronic text.

**Voice mouse:** Voice Mouse can control the pointer by using vowel-based utterances and can be adapted to any particular user and workstation thanks to a short learning session.

Refreshable braille displays



**Refreshable braille displays:** Electronic devices that are used to read text that a computer sends to the monitor.

## GPS (Global Positioning System)

### What It Is

A collection of 24 Earth-orbiting satellites that enables anyone with a receiver to locate themselves on Earth.

### What It Does (Functionality)

#### 1. Basics

GPS receivers can:

- Give you the coordinates of your location on Earth in latitude, longitude and altitude
- Display your location on a map
- Trace your path on a map as you move (breadcrumb" trail)
- Tell you how far you've traveled (odometer)
- Tell you how long you've been travelling
- Tell you your current speed and your average speed (speedometer)
- Tell you the estimated time of arrival if you maintained your current speed

#### 2. User input

Since GPS receivers come with certain amount of memory, users can input waypoints (the coordinates of a particular location) and save them into the memory by following methods:

- Tell the receiver to record its coordinates when you are at the location
- Find the location on a map (internal or others) and enter the coordinates

You can combine the waypoints to form a route.

#### 3. Computer connections

If your receiver has a data port, you can download/upload your routes to/from a computer, which has much more storage memory. You can also update your computer maps.

#### 4. Add-ons

Recent receivers let you download detailed maps or supply them with plug-in cartridges.

### How It Works

GPS is based on trilateration, that you can determine your precise 2-D location if you know your distance from 3 different locations.



"200mi from Boise": you are somewhere on this circle

"200mi from Boise & 250mi from Minn": you are located on one of the x's

"200mi from Boise & 250mi from Minn" & 200mi from Tucson": you are in Denver!



When it comes to 3-D coordinates, you need 4 locations instead of three. The heart of a GPS receiver is the ability to find the receiver's distance from 4 (or more) GPS satellites. GPS satellites send our radio signals, then a receiver calculates the time the signal travels to the receiver in order to measure the distance from each satellite.

## CD / DVD

### New Improvements

New technologies have been pushing old in many markets lately, such as with CDs and DVDs. New advances have made for new products, such as Sony's new MVC-CD1000 CD Mavica digital camera, and the process of DivX technology which is taking the mainstream idea of movie (DVD) rental and pushing it to a new level.

### CD Cameras

With digital cameras such as Sony's MVC-CD1000, one can take pictures on the spot, then in seconds download them to a computer for instant distribution and modifying.

In the Mavica MVC-CD 1000 photo camera the mini CD-R disc 8 cm in diameter is used as a storage device. The Mavica name (Magnetic Video Camera - a class of digital devices from Sony based on data recording electro-magnetic technology appeared in the early 80s of the last century) descends from the MVC - FD95. It is the same powerful and weighty camera with 10x optical zoom, Super Steady Shot system and 2.1 Mpixel charge-coupled device matrix.



### DivX

The biggest effort to date by Hollywood to beam movies to viewers via the Internet, has been made with DivX and its recent deals in the field with such studios as Paramount Pictures, Sony Pictures Entertainment, Universal Studios, and Warner Bros.

DivX involves master DVDs which you can rent that act as keys which can log you directly to a server where you can pay for a movie everytime you want to watch it, or pay for the whole license at once. Movies from theatres can be available within weeks from their actual release date from local cinemas, but for the time being computers are the main way to access the hardware and software needed to run DivX.



## MP3s

### What It Is

MP3 (MPEG-1 Audio Layer-3) is a standard technology and formatted for compression a sound sequence into a very small file (about one-twelfth the size of the original file) while preserving the original level of sound quality when it is played.

### What's New

Technology has brought about a new form of music storage called MP3s. They have been known for some time now within the computer realm, but are now making their name known with portable and home devices, as MP3 players are growing in number. The process to make a MP3 is by copying your music files from CDs then making them into individual files. The idea is simple, easy, and more popular than ever.



Compaq's new iPAQ Digital Music Center is an MP3 storage device that can hold up to 20 GB on its hard drive. Which means that it can compress and store up 400 CDs or 5,000 songs.



If you want to go portable then look into the Archos HD-MP3 Jute box is portable and can hold 6000 megs total of MP3 goodness. And then there is the Olympus DM-1 Voice and MP3 Recorder with up to 22 hours of dictation and 1 hour of MP3/WMA music playback. You pick.



## Identity Management

### What It Is

From personal to financial there is an identity crisis, but not in the mentally stressed form of the word. There are privacy matters that many are contemplating since the latest forms of information gathering has been sweeping the web, brought to us by such companies as Microsoft and Gator.



These personal databases that many companies are gathering, take all of your information from last name to credit card numbers, and after asking what your favorite magazine is, these companies have all the information that any financial document would ever need about you.



The main idea across these "smart online companions" is to make filling out forms quick and easy with a fast download of all your information to the forms that would otherwise take time and the risk of mistakes. It's fast but distressing for some who see this as becoming a standard in the future. The intent for the companies is to offer a service, but also be able to give each person just one identity on the web, instead of having multiple identities and the ability to take multiple goods from a company who only want to give out one per person.

## Haptic/Sensory Interfaces

### What It Is

"Haptic" refers to the sense of touch. A haptic interface is one that uses touch as an input and navigation tool. Haptic interfaces can also be used with other senses such as audio or visual displays, in order to convey even more information.

### Magnetic Levitation Haptic Interface



This interface is based on Lorentz force magnetic levitation. The user interacts with a levitating handle to explore an onscreen environment. The magnetic properties of the handle unit allow for differences in motion, shape, resistance, and surface texture of objects.

### SensAble 3D Touch Technology



This system uses a combination of PHANTOM hardware and GHOST middleware, as well as application software, to provide a product used to model digital forms. With PHANTOM, users can deal with familiar elements such as location, mass, friction, and stiffness in molding a model. Two way interaction (positioning input and force-feedback output) allows the user to manipulate onscreen objects digitally as they would in reality.

### Talking Fingertip Technique

This technique combines a touchscreen with additional audio guides and commands. When the audio mode is on, objects on screen with specific actions can be verbally named and described. Navigation was accomplished by dragging a fingertip onscreen until the appropriate command was found, and lifting the finger to select that command. (The navigation proved difficult, as inexperienced users would lift their finger accidentally and get lost in selected commands.)

Touchscreen technology, combined with verbal guidelines, not only assists the blind, but also those in low or no visibility situations.

### IFeel Mouse

This product combines visual and sensory clues to help guide the user on the screen. The mouse vibrates when the pointer is over an active link, such as a folder on the desktop or a link on a website.

## Virtual Reality

### What It Is

Virtual reality refers to the creation of an artificial digital space, which can then be explored and interacted with by the user. The highest goal of virtual reality is to be realistic and engaging enough to convince the user that they are actually *there*, or that the characters in a scenario are actually real.

### LifeFX Facemail



This online service allows members to send and receive email spoken by one of the LifeFX virtual characters. These artificial faces are extremely lifelike, and can add a human element to electronic communications. Currently available for email, this technology will soon be used in instant messaging as well.

### VRTV Max

In this software, simple text is typed into the program, which is then converted into a 3D virtual character speaking. This technology also has the ability to replicate real people, so that an image of yourself would be able to guide people around your website, or give them information.

### Facial Expression Recognition

A system being developed at Carnegie Mellon University detects facial features, such as smile lines and wrinkled brows, and converts them into raw data. This data is fed into a network, and then different combinations of features correlate to different possible emotions that the user may be having.

## Displays

### What It Is

A display is the visual element of a product, where the user can view information and navigate through sites and functions.

### Candescent "Thin CRT"



A radical improvement on cathode ray tube (CRT) technology, flat panel displays allow for quality picture with very limited screen depth. This technology is being used in the Thin CRT, for use in notebook computers, games, and smaller handheld devices. Benefits include: high brightness; good contrast, rich color, fast video response time, ability to operate under varying temperatures, and low power consumption.

### Head Mounted Displays



Head mounted displays offer the advantage of portability and immersive properties, which is particularly important in virtual reality, to convey a realistic experience.

### Virtual Retinal Display



In this display, no actual image is produced. A light beam, scanned to place each pixel in the correct position, is then directed directly onto the viewer's retina. The image is created on the retinal wall, directly in the eye. Developers expect that a head-mounted version will soon be available.

## Wireless Communications

### What It Is

There are a number of technologies that allow information to be transmitted from one place to another without the use of wires.

### 3G

The next generation of mobile telephones is expected to be able to communicate at speeds up to 5mbps by 2004. This will make it possible to stream CD quality sound and fairly high quality video to properly equipped mobile devices. Mobile phones that utilize this technology are currently available in Japan. Services in the US should kick off in mid to late 2002.



### IEEE 802.11

This protocol is designed to allow computers to communicate with each other or with a network without wires. The current protocol, 802.11b and better known as Wi-Fi, allows for speeds from 2 to 11mbps though the upcoming 802.11a will support speeds up to 54mbps and maybe even higher. 802.11b devices have a range of up to 1750 feet (without interference) while 802.11a is limited to 175 feet. This technology allows computer users to transfer information at a speed similar to that found on a wired network. Where 802.11b conflicts with bluetooth, 802.11a does not.



### Bluetooth

Named after the 10th Century Viking ruler Harald Bluetooth, this wireless technology allows electronics devices to communicate with each other over distances up to 30 feet with a bandwidth of 1 mbps. It was specifically designed to be a small, easy, low cost, low power way for electronic devices like computers and phones to communicate with each other without cables.



## GPS User Interaction Scenarios

### Assumption

Assuming that a GPS user can locate other GPS users on their receivers real-time and that two or more users can share maps/routes/waypoints, then GPS could be very much similar to IM, only with map displays. Thus, following scenarios are conceivable.

### Group of Individuals

**Situation:** Individuals in separate locations form groups or buddies.

**Everyday tasks:** Locating each other and sending messages at a mall, theme parks, within a town.

**Privacy?:** Users must be guaranteed the freedom from being visible by others against their will



Individuals in separate locations can freely form groups; Group members can locate each other and send messages to other group members

### Group Collaboration

**Situation:** Family members or friends going on a picnic or road trip

**Collaborative tasks:** A group of people collaboratively work, trying to locate a place of interest

**Participation?:** Would people share one display? Or would everyone utilize their own, separate receiver?; Who would be in charge of map-reading? One person? Could it be everyone?; Could GPS displays present new opportunities for elders, kids and moms?



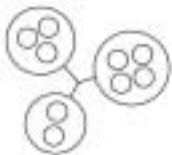
A group of individuals share one task and work collaboratively using one or more GPS receiver(s).

### Multiple Groups

**Situation:** Multiple families or buddy groups communicating over maps

**Tasks:** Finding a family reunion place, locating homecoming party place

**Representation?:** Would one person represent each group?



One group of individuals instructing their groups of individuals

### User-to-User Knowledge Transfer

**Problem with current GPS:** Information from GPS is rigid and number-oriented – may not be useful when you're staying in a town.

**Alternative:** Could other people's know-how be transferred? I.e., could other people draw/transfer maps or routes on my receiver, letting me know of shortcuts, detours, etc.?

## Identity to MP3s What's next?

### CD / DVD

Technology has opened new doors for the product market, with new ways to incorporate high technology into normal lives. So you go to a christmas party with family and take tons of pictures while having a great time. After which you can go home download these super high quality images, print them from your high quality printer, and send them out the next day with the frames you order last week. You are so clever.

Then after a great day of holiday cheer, you can go home pay for access to your favorite new release with DivX, and enjoy the week off from work with style. Just access the server from the display on your coputer (or soon TV) and see how many movies you have paid for in advance. You are pleased to see that your wife has already paid for a holiday package, that gives you 10 movies passes for any movie you want. Enjoy these from the comfort of your livingroom.

### MP3s

At this little Party that you and your family had, all your favorite CDs were stolen during the trip. Must have left them on the plane, but that's okay. Since you know all the CDs you had, or at least you favorites you just access a MP3 online site from your Uncles computer, pay a base fee for a such and such amount of songs, and download them to the gift you got from Grandma, you new Archos HD-MP3 Jute box. Holding enough info for those 20 CDs you just lost the day before.

### Identity Management

Because of all the technology that your Grandparents (on you mother's side) don't understand, they ask how everything went so quick. You explain to them that you have an account with the Microsoft Passport, and that the billing for the MP3 went so quick because you did not have to fill out 50 forms, just one. "Everytime that I have a form to fill out, Passport automatically gives the proper information that it is need for billing and things like that. Address, social security, etc. And while I was downloading my songs to my MP3 Jutebox I registered the gift you gave me. It's all good Grandma," you say to her, as you Parents call you. It is time to go home.

## Haptic Interface and Virtual Reality

### Design Opportunities

By combining several of the different technologies that are already in production, both virtual reality and haptic interfaces can be used to make people's digital lives more connected, more fulfilling, and more human.

### The Human Element

With new face mapping technology, realistic 3D virtual characters, and more lifelike human motion and speech, soon a realistic digital version of yourself will be able to carry out many of your online tasks. Whether reading email to a loved one far away, communicating on instant messenger with your own face and voice, or comforting your children from far away, the idea of a digital you is not far away.

### Emergencies

The combination of a haptic and/or audio interface lends itself to the creation of an emergency communication device that would be ideal for low or no-visibility situations, as well as for those with general impaired vision. This combination, with a GPS, would allow a person to contact and direct aid to their location, even if they are not sure where they are and can distinguish no landmarks.

### Communicating With the Dead

When a loved one dies, especially suddenly, it can be hard to deal with, especially if you never got to say goodbye. How will your family react when you are gone? What do you want them to remember about you.? By creating a digital self, recording not only your image but also your voice, you can be around to give your family one final message. When a child just needs to hear from her dad once more, "I love you," the digital self can be called up, and some measure of comfort gained. Emotion recognition programs could be used, in order to give an appropriate message.

### To Live A Fuller Life

The virtual reality interface has already been used as a pain management tool, providing a distraction for burn patients in hospitals when their wounds are being attended to. A virtual replication of the real world, with real people and environments, can also be used to help those paralyzed or bed-ridden to carry out everyday tasks. Grocery shopping, meeting with a child's teachers, taking a class...by replicating these situations in a digital environment, virtual reality can help the immobile to live a fuller life.

**Input/Output Methods**

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 IBM Voice Systems, <http://www-4.ibm.com/software/speech/>  
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 PC World.com, <http://www.pcworld.com/>  
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**Adaptive Technologies**

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 Univ. of Toronto, <http://www.utoronto.ca/atrc/>  
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**GPS**

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**CD / DVD**

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**MP3s**

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**Identity Management**

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**3G**

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**IEEE 802.11**

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**Bluetooth**

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**Wireless Communications**

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**Technology Devices**

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**Haptic Interface**

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**Virtual Reality**

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**Displays**

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