The Wrist: Information near Your Fingertips

Preface

The next big idea is often a refinement to an idea that has been floating around for a long time.

This is a memo I wrote when I was at Microsoft. It is dated September 27, 1993. Given the renewed excitement about "smart" watches, it seems appropriate to remember that the idea is not exactly new.

I corrected some typos (no need to go crazy on authenticity) and redacted some names – at least until I get permission.

When I wrote this memo Microsoft was already working with Timex so I don't claim credit for the idea of a connected computing device on the wrist. I just tried to take it a step further and argued for the strategic importance of the wrist as real estate.

HP had released one of the first smart watches in the 1970's and Casio had been shipping watches with games on them in the 1980's. The emphasis here is on connectivity and the watch as a companion to the PC.

I was aware of pen computers, having previously worked at Slate (with Dan Bricklin and Vern Raburn) doing software for both Go's tablet and Microsoft's pen computers. Apple was also exploring tablets. This was well before Palm established the PDA marketplace.

Introduction

Dick Tracy had it right. The wrist is a very convenient place for keeping equipment near, if not at, hand. Unlike even pen computers, it can be used effectively with only the occasional use of the other hand. Often it is sufficient to just look at it. Companies like Casio have also sold watches with a significant amount of computing power as in their Databank series. Less well known is Seiko's watch that had an RS-232 connection for downloading appointments (still sold as the wrist Mac). More recently have been the pager watches.

The great appeal is convenience and availability. Despite these efforts and the awareness of this possibilities we've done remarkably little to take advantage of wrist-top computers. The wrist itself is only one of a series of post-desktop computing platforms. Each one has its own considerations. They can also benefit from synergy. It is important to learn by doing. The time is ripe (and has long been?) for these products.

We can place the equivalent of an early personal computer on the wrist. These were sufficient for a significant amount of computing. We have the added benefit of being able to connect to existing desktop (and other) sources of information.

The watch itself is just one aspect of the migration of computation from "computers" to appliances and, eventually, into the woodwork. Why not just implant computers, or computation, where it is needed. The cochlea pager? The wrist is the focus of these particular proposals but they generalize to other devices and to cooperative devices on the "body LAN" — the set of devices that cooperate through proximity networks.

Possibilities

While I don't want to present many scenarios, it does help to consider some possibilities. A first step would be products and projects that can stand on their own with a little assist from the existing computing platforms. While it would be nice to fit all these into an overall architecture we need to remember that we are at a price point that allows the user to simply discard the old in favor of the new. What is more important is continuity of information. But this is less of an issue if we are already favoring an external repository of information such as a user's PC or an information provider.

One frustrating aspect, to those of us used to general purpose platforms, is that the existing products in this area don't provide coverage. For example, if you have to choose between a watch that counts your pulse and one that acts as a compass. A confused jogger will want the combination. As we learn about the platform and the technology improves we can consider porting Cairo[i]. But, for now, we should take advantage of the opportunities we find to open the channel as well as to learn. We need to learn not only about watches but various transducers (such as blood pressure) that allow for new applications.

We can leverage the experience of existing companies to create products and distribute them in the existing channels. [*head of hardware development*] has pointed out that, viewed as a computing platform, we can create our own products. The business case will vary for each product. In general, gaining experience and ubiquity is a first priority.

Creating complete Microsoft products is a possibility as we become more adept at the technology and the market.

PIM/Scheduler and lots more

A PIM is a fairly obvious application. The Casio Databank watches already do this. The key is to be able to take information from one's desktop PC. This is what Seiko already failed on in 1986. The difference now is that there a desktop PIMs in wide use and we have better ways to connect the systems. The Pulsar group, [*group member*] in particular, has been speaking to Timex about a ***Schedule+*** watch that would act as an extension of the current PC product. Timex has already considered some innovative ways to download to the watch without requiring a wired connection. For example, one can sense the PC screen and modulate a portion of the display. This is similar to the light pen and need not be distracting.

A ***Schedule+*** watch makes a nice marketable item. But it can also serve as a cache on one's address book. Given a speaker for appointment notification the watch can also be a phone dialer.

One major difference over the previous generation of products is that we come from a computer background. We take advantage of all that we've learned with desktop products. But we can also benefit from a fresh start. For example, instead of just beeping on an appointment we can support classes of appointments with different alerts and support early warnings. We can also link to the address book and make a phone call at a scheduled time.

If the watch is to liberate use from the desktop, then we need to be able to enter the appointments on the watch. Though I've long had a Casio Databank watch, I rarely enter the appointments on the watch because it is clunky. If there were the reward of sharing the data with a desktop system, then there is a great added incentive.

Having a speaker we'd even be able to transmit new information over a phone line. There is no need to use any standard modulation technique, though doing so would leverage existing infrastructure. Both options would have to be investigated. If we can decide on how to share the phone line with a modem but use a module technique that is robust at low speeds and requires little power in the watch, we can do a full exchange of information with the desktop. Thus I'd be able to enter an appointment by dictating it to an operator (similar to the Sky-Gram solution) and then fill up the watch.

We can then follow this scenario to use the watch to capture and cache other information such as POS purchases. This brings us to

Transducers and data capture

As noted above there are also some specialty watches that keep track of pulse and other health information. We can do more than just display the current information. We can capture it for analysis (and for correlation with the data captured by the shoe (information underfoot? the shoes are real!).

Other devices exist for source data capture and can coexist. For some, the wallet PC can be the focus, for others the wrist. A waterproof wrist computer can be very available.

We can also capture speech – at least a few seconds worth. Even some still pictures in the future. Both of these scenarios benefit from auxiliary storage in the current technology.

The Body LAN

This is my term for a proximity network that allow for cooperation among appliances one can carry. In such a configuration, the wrist is a great place for the display for a wallet PC. It seems to be silly to have to fish into one's wallet, or purse, in order to see why the appointment alert is going off. With some simple UI innovations one can also interact through the watch. Ideally this would be done through a "smart", i.e. touch sensitive, surface or through keys and sensors as on current watches. There have already been watches that have done gesture recognition but these have not been physically robust.

One characteristic of such a network is that it is, and should be, unreliable. Thus the watch is more than a terminal but a participant in its own right. Even if the wallet PC is a major computing platform, the relationship of the watch to the wallet is similar to that of the watch and the desktop except that it is possible to load up the watch more frequently. And to unload captured information back to the wallet to free up capacity on the wrist.

The great communicator.

(Apologies to Abe Lincoln)

Getting back to Dick Tracy, the watch is a great place to display pages. No fumbling, just a glance. Of course, paging watches need to be smaller than the existing models. And, as with other such visible products, they need to be reasonable fashion accessories as the Motorola/Swatch demonstrates. Even pagers now come with designer covers to match one's clothes. We are beyond the Model T ("any color you want as long as it's black") philosophy of Henry Ford.

Seiko is already trying some services in the Seattle area (alas, for those of us in the technology backwater of the Northeast). Services like a personalized news stream make a lot of sense. One might even choose to store the news

profile in the watch rather than at a head end services. One can even pair a watch with a pocket pager. They'd both get the same newsfeed but the watch might store much less of it but emphasize alerts. The devices need not even coordinate but can follow their own rules.

Two way paging is an obvious extension to this. But we can also support asymmetric scenarios such as use phone lines and (nonstandard?) modulation techniques to upload the data to one's server or a third party service.

and so on

Obviously these ideas are only some first steps. The key is that the wrist is valuable real estate. Microsoft should stake its claim early. Location, location, location as they say in the real estate business.

Mouse replacement

Once someone has a transducer that moves with one's hand, can we add some motion detection such as a piezoelectric strain gauge and eliminate the mouse? Would be very nice.

Relationships

Timex

The Pulsar Group and [*group member*] in particular, have already been talking to Timex about their Gauntlet project. This is the group that has already produced a pager watch and is looking for additional products. The estimate is that they can produce a schedule watch in about a year.

The business terms are still open. I personally see the main value is opening up this market. Toward this goal, we want to maximize the participation so we should favor an open platform – at least published protocols so that we can support a number of PIMs including Lotus Organizer and other products. This also reduces the likelihood of a Lotus Organizer watch (though their HP-100LX relationship might help them there).

We can share the revenue stream with Timex but the watch business is a very competitive business that seems to depend on a family of products for its revenue rather than a particular product. I would not argue on this particular product as a major source of revenue in its own right.

The priority is to reduce this product to practice as soon as possible. I'd argue for a reasonable combination of scheduler and address book with some ability to add data locally. Of course, it needs to be able to accept data from the PC without wires. Ideally, automagically by proximity.

Others

We need to actively pursue other relationships. Seiko and Casio come to mind as companies that have been producing watches with many of the capabilities we are interested in –at least at a technical level. We should not do anything with Timex that would inhibit such relationships.

We also need to learn more about fashion. Swatch is a particularly interesting player here. There are also the higher end prestige watches. Casio has a traditional watch face that hides a digital interface. Can we synthesize such a watch at the high end? Or would compelling utility make headway against fashion?

Microsoft

I take [*head of hardware*]'s suggestion of creating our own computing platform very seriously. One possibility (reminiscent of MSX) is to create a reference platform for low end computing. This is in conflict with my attitude is that if it is has an operating system it is too big. But we can consider a low end monitor, something less than an operating system that provides standard access to a bitmap screen and some operations. It can also provide a standard way to access communication devices. This is, in a sense, pulsar-light (lite??). This is also the Winpad approach but at a lower technology point.

Since this is a new class of machine, can we eventually manufacture our own without jeopardizing PC relationships?

Competition

As I've noted there are already a number of high tech watches. So far, they each have one shtick and none seem to mesh smoothly, bidirectionally, with the personal computing platforms. But this does mean there is awareness and with awareness comes competition. I don't know of any at the moment.

Communications

There are companies and component technologies we need to track. Obviously both the pager hardware companies and the service providers. For data captures, we need to integrate the transducers. We also need to be able to use the data. For example, how does MS Money relate to such data? In general, the wrist is an enabler for many products and services are approaching from other directions. Microsoft has the opportunity to be the market maker here in the sense of bringing the parties together and, ideally, garnering a small fee (but not enough to give away the market) for relationships and transactions.

Action

We are already talking to Timex who approached us. We also need to form relationships with other companies in-

cluding Casio and Seiko. In the case of Seiko, what do we know about their pager services?

We need to create an architectural document on what the Schedule+ watch should do and the over the wire protocols. How proprietary and exclusive should it be?

We need to learn how the current paging watches work and we need to integrate them with a version of the Schedule+ watch. Who has experience? Timex, Motorola and Seiko are the obvious ones here.

We need to start gathering knowledge to build our own devices. How do we obtain raw, programmable watches with bitmap services? What about other form factors and analog watches? Which group?

Longer term, we need to mesh this with Winpad, Pulsar and other (truly) personal computing technologies.

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[i] This was to be an advanced version of Windows.