Back to the Future

Or Why the Luxury Gadget from the 80's Should be Redesigned

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The forward observer company I was assigned to had this concept of time discipline. You had to be at certain location at certain time. Not too late nor too early. As a result the past six years or so—the time after my demob—I haven't had a watch. I have always consulted my cell phone if I need to know how late I am.

Since the watch I received was the one on my wish list I made the consumer decision and I picked *Axcent of Scandinavia's zero*. I picked the watch completelly based on the looks. The wide black bracelet and orange retro-ish digital display was something I could not walk by.

It was quite pricy compared to the ten buck digital watch which kept me out of trouble in the army so my expectations were quite high. They were met only halfway. Still, I like the design so much that I would recommend it to anyone who is bying an expesive bracelet. This rant is about why I'm not evangelising by beautiful Axcent watch and what I think should be done for the defacto four-buttons-and-guess digital watch user interface which demotes the functionality of this georgeous watch to a bracelet.

1001 Digital Features

The watch has been around for so long time that each revolutionary step forward will propably create something else than a watch. For example my zero has this cool feature to type in 10 names and phone numbers in a database. When entering a message the two upper buttons scroll through the selection of characters and the two lower buttons move the caret. Simple and intuitive, even if it is very slow. It has very natural mapping once you get it. The funny thing is that with my zero it is much easier to type these messages than to set the correct time! It took me two days to figure out how to do that.

Ever since the digital watch new features have been added. Since the technology enables to add new features easily the challange to create a watch is not anymore the durability of the spring or small form factor but the user interface. I can imagine how cool it was to operate a clock using just few hard to press silver buttons instead of the knob that had bee around for so long time but I don't think we should still suffer from the mistakes done centuries ago. We don't need to use the MS-DOS either.

The best clock interface ever is the one found in your

I received a watch as a present recently. It was on my Christmas wish list so I kind of knew to expect it. I have not been using one since my army days simply because a great deal of my time in army was spent obeying the time.

grand fathers silver pocket watch. The watch has excatly one knob and a small button to open the cover. When the knob is pulled out the time of the clock can be set by rotating the knob. You practically move the minute hand. When the knob is in the normal position the clock can be winded by rotating it. Simple and effective. That covers all the functionality the clock requires.

Adjusting the time using a revolving knob is very natural since the time is cyclic as is well as the motion of the knob. The procedure of adjusting the time is carried over to a wide range of analog clocks powered electronics from the cheapest alarm clocks to the state of the art analog watches.

I believe the ease of use can be used to the digital watch user interface too. The rest of this article will tell you how this can be done.

The functionality of a Watch

The zero watch has following features: t*ime & date, alarm, stop timer, data base*. It did not come with manual so those are the features I could find. At the era of cell phones the phone number database of obsolete. It might have been cool at the 80's back then I could remember more than those ten numbers with ease! Nowadays I tend to trust more on the quick dial on my cell and I can only remember one number. Comparing the time related features on my cell phone-which I have been using to check the time past few years-I got two more features to add: *countdown timer* and *calendar alarm*. One can make one quite interesting rough observation here. The transition from analog to digital only gave us a timer and bad user interface.

For me the stop timer is the least used feature in a clock. Even at the army where we had many task where the stop timer would have been very useful no one used that. The reason was that there was no time to change the mode of your clock to the ST setting and the reset and all that fiddling. The accuracy of a second were often enough and it

> Time keeping features found in a digital watch and a cell phone:
>
> - **Time**
> - **Date**
> - **Alarm**
> - **Stop Timer**
> - **Data Base**
> - **Countdown Timer**
> - **Calendar Alarm**

Time	14:39 24
Date	16.02.06
Alarm	18:45
Timer	00'00''00
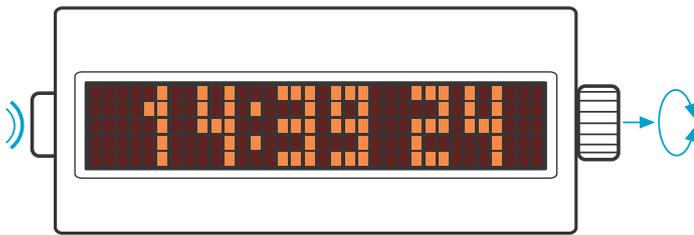
The watch user interface has 5x35 dot matrix display, one button on left and a knob which can be rotated and pulled out like on analog watches on right.

Each the time related data has easily recogniseable formatting which acts itself as a symbol for the function. Since the current time and alarm time has similar formatting, the seconds are only shown at the current time display which makes them visually different again.

was usually possible to wait that few seconds to get nice round starting number.

My conclusion from past experiences with watches is that stop timer is only useful for sporty people. If I buy expesive designer watch I'm not going to ruing it getting all sweat. So there are very few cases where a stop timer could save my everyday life. Yet alone if I cannot use enable it with one button press.

Comparing the my watch and my cell phone again I can say that the time keeping features in my cell are feature complete. I can only think few little tricks which could make certain niche cases better. The interface to those features are similar to the rest of the cell phone interface, which is ok considering the context, but requires to travel menus and press a lot of buttons to accomplish the task.

The watch features often lack a lot and are complex to use even if they are faster to access than the counter art in cell phone. One thing I always miss from a watch is the ability to set the formatting of the date. The default US formatting is backwards to what I have used to and it is just damn annoying not to be able to change that.

My redesign will not be as feature complete as the cell phone and it will not be targeted to the sporty nerd niche as the traditional digital watches (even if that targeting was not intentional when the digital watch was given birth). My new watch user interface design is targeted to handle the most common tasks swiftly and the secondary tasks at least well.

The Redesign

I chose to implement following features to my watch in order of importance: 1) *Time*, 2) *Alarm*, 3) *Date*, 4) *Timer*.

The phone number database is just plain stupid to implement and the calendar feature requires complex user interface in order to be really useful. Even the cell phone is a bit limited because it needs way too many steps to set up an event and to later view them.

The timer is able to count both up and down so it can be used both to time how long it takes to run to the fridge and back during a commercial break or to alarm in 5 minutes to get your pizza out of the oven.

The hardware part of the user interface consists of *one button and one knob.* The knob can be pulled out like the knob in old watches. I call this pulled out state *armed* and the normal position *unarmed*. The knob has 12 notches and rotating the knob will jump from notch to notch.

The Knob

The core of the whole user interface is the knob. It has similar two state functionality as the old counter part. The knob pulling is associated with adjusting in the language of clock usability. The unarmed state is not winding the watch but selecting the current function.

All the features that can be changed using the knob can be thought to be arranged on a cylinder. When the unarmed knob is rotated a notch the next function will display. Rotating to opposite direction will bring back the previous function. Or when armed knob is rotated the digit will roll. This mental model emphasised with small scroll animation on the displayed data when rotating the knob.

When a function is selected its data can be adjusted by pulling the knob. The data, let it be time or date ir treated like a long number and you are adjusting the lowest digit. For example when a full 60 minutes are dialed next hour will be incremented.By pressing the button (there is only one) at the same time as adjusting the values the second group of digits will be changed directly. This will allow large quatities like changing the year to become less frustrating task.

The Button

In the unarmed state pressing the button will light up the display as long as it is pressed and 3 seconds after that. This will allow to see the time in dark and to save batteries too.

In armed state the button press has different meanings in different functions. In general it is different if the button is

pressed or pressed long (2 seconds) or if the knob is rotated while the buttons is pressed. The first two cases depend on the current function and the last one means that the dialed value changes faster as described previously.

When adjusting the time, pressing the button will change the time formatting from 24h display to the AM/PM display. While adjusting the date the formatting of the date will cycle through six possible options (these are the ones I could select from my feature complete cell phone).

When adjusting the alarm time pressing the button will set and unset the alarm. Or when pressing the button while using the timer in armed mode the button will start and stop the timer or if it is pressed for more than a 2 seconds the timer will reset.

In the unarmed state the button has one more special feature. If it is pressed for 4 seconds a stop timer will start automatically. It has already counted the 4 seconds by the time it is displayed on screen. This way one of the "I need it now" features can be accessed quickly.

The user interface is laid out so that adjusting the knob will always make something to happen. Once the knob is pulled out, again rotating the knob will do excatly what it is expected to do adjust the currently displayed data. Even it takes quite some time to adjust time for example, I find it surprisingly rewarding. I liked it already when I was kid and had analog watch and it still feels nice.

In order to make the adjusting faster the button can be used to speed up the rate of change. This is not very intuitive but something that can be learned from a manual. The task can be accomplished without this key so it is thought to be advanced feature.

One feature which I find very important-especially after it is missign from my zero whose display is just barely visible without being back lighted-is that when in adjusting mode the back light of the display will be on constantly.

Typography

The numbers are displayed in a 36x5 display. This is no problem since most of the display is numbers anyway. I wanted to completelly avoid using any text or symbols which are not necessary (AM/PM in small caps being the only letters that are shown).

One thing that totally broke the elegancy of the zero watch was the use of letter characters and flashy effects on the display. Since the screen is small the required font is often very rough and the message has to be abbreviated too.

One good thing about time is that the format is very well defined and known even if it varies in differetn countries. Since each of the functions have distiguishable formatting there is no reason to display any additional information which function is selected. Alarm time and current time were the only conflicting data and that could be easily solved by displaying seconds together with the current time.

The Watch Functions
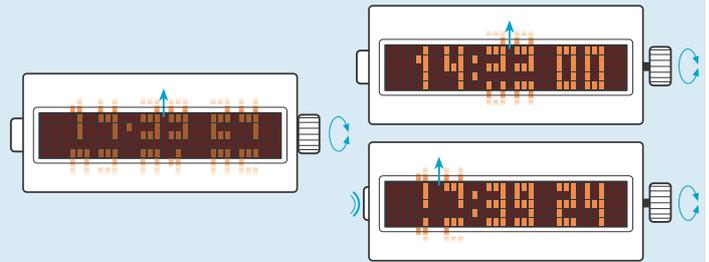
Rotating the knob when the watch is not armed scrolls through the different displays.

When the watch is armed the knob can be used to adjust the data. If the button is begin pressed while adjusting the knob the next group of digits will be adjusted directly.
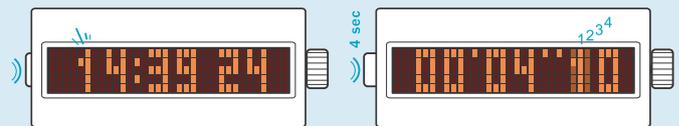
Unarmed Rotating the knob will select one of the four available functions. Time function displays the current time, date function displays the current date, alarm displays the set alarm time and timer displays the current time of the timer. If nothing has happened for 8 seconds the display will revert back to time display or timer display if a timer is active.

Pressing the button will light up the display. The display will remain lighted 3 seconds after the button is released.

SMALL IMPORTANT FEATURE If the button is pressed for more than 4 seconds the stop timer will start. The time will count from the moment the button was pressed, so by the time the timer will display the read out is 4 seconds.

Time The time can be adjusted in 1 minute steps using the knob. If the button is being pressed while adjusting the time will be changed in 1 hour increments.The formatting of the time can be selected between 24h and AM/PM by pressing the button.

SMALL IMPORTANT FEATURE The time stops and the seconds zero out when editing. This will allow to sync clocks among a group easily if necessary. Kind of no brainer but some clocks forget this one.
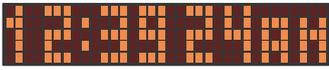

Alarm The alarm time can be set in 5 minute steps using the knob. If the button is being pressed while adjusting the time will be changed in 1 hour increments. The reason to change the alarm in 5 min steps is that the alarm setting is usually the most used setting so it is more convenient to adjust it faster.

The alarm is set and unset by pressing the button. The hour and minute separator colon will blink as indication that the alarm is set. Also the main time display separator colon will blink when the alarm is set.

SMALL IMPORTANT FEATURE Fast and convenient setup of the alarm time. 5min granularity should be enough for everyone, other kind of smaller alarms can be handled using the timer.

The AM and PM are often displayed using seprate small icons at the border of the main display. Since the display that is used is already a dot matrix display the information can be easily display along the time on the main display. I chose to use small caps (one pixel smaller than the numbers) to help to read the time. The only problem remaining is that the difference between AM and PM in the display is just one pixel but the continuous mirrored L shaped counter form

The difference between the AM and PM is just one pixel but the negative shape helps to recignise the difference.

that is formed between the P and M should make it clear enough.

Second problem realated to the running time and alarm is to display whether the alarm is set or not. It would be really nice to have it displayed on the main time display too. I solved this problem by making the blinking hour/min seprating colon a signal of the alarm being set. This is clearly visible when the alarm is anabled and should be relatively easy to connect to the alarm in the main display too.

Blinking is often considered to be bad taste and bad design especially in web-design. Since a clock is a ticking machine I think it is more than approriate emphasis method especially since the amount of tricks are often very limited anyway.

I have used the blinking here in three special cases: *alarm set, alarming* and *timer freeze*. The alarm set is used as mentioned above. When an alarm is triggered the display will blink fast for a while and then stay still for a while and same continues. When the timer is split, that is the time is still ticking but the display is frozen the minute/second separator will blink at the rate of 1Hz and the second/micro second seprator will blink at the rate of 10Hz. The reason for this is to signal that the timer is still ticking, potentially even allowing to stay in pace too.

The only special effect that is used is scroll effect. This is used in order to emphasise the function of the knob and to create a mental model of continuous and cyclic data which is being manipulated. The result is meaningful, easy to read and elegant display.

Conclusion

The result of this design is more coherent than the defacto digital clock user interface at the moment. The whole thing is based on one mental model which has been in use for a long time. By dropping functionality the user interface can be reduced to the knob only.

The only feature that was slightly degraded (especially for athletes) is the timer. I accept this as a trade off for more consistent design and the added functionality (count down timer). I feel that a stop timer is a special equipment and that the target niche can be better satisfied by designing the

Date The date can be adjusted in 1 day steps using the knob. If the button is being pressed while adjusting the time will be changed in 1 month increments.The formatting of the time can be selected between following formats by pressing the button: YY-MM-DD, DD-MM-YY, DD/MM/YY, MM/DD/YY, DD.MM.YY, YYMMDD.

SMALL IMPORTANT FEATURE Possibility to change the date formating! A major drawback in most clocks. Trying ti guess foreign date is like trying to guess foreign currency, takes a lot time to relearn.
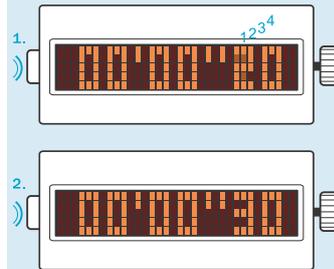
Timer The timer time can be adjusted in 1 second steps using the knob. If the button is being pressed while adjusting the time will be changed in 1 minute increments

The timer can be used to either count up or down. This function is selected based on the set time on the timer. If the time is 00'00"00 the time will count up or of time is greater the timer will count down. When the count down reaches zero alarm will be played.

The timer is started and stopped by pressing the button and reset by pressing the button long (2 seconds). When reset the last set time will be set on display.

If the watch is unarmed while the timer is on pressing the button will freeze the display leaving the seprator marks to blink. Pressing the button again will display the running time again. If the watch is armed again while the display is frozen, the timer will stop and the displayed time will remain. This allows to use the freeze as stop too.

SMALL IMPORTANT FEATURE Ability to count down from set time. Likely more useful option that the stop timer usually found in digital clocks. At least I cook more than sprint.

whole clock around the stop timer and adding the clock as additional feature.

Another feature I'm not completely happy with is the use of the button to speed up the data manipulation. It either needs user with flexible fingers or two hands to operate. The use of hte button is not mandatory. It just makes some things like setting the year much convenient. That operation is propably something that is done without wearing the clock anyway. Another maybe more elegant solution could be to allow to pull out the knob one notch further.

One feature that was on and off the implementation list was snooze. The idea was that pressing the button in unarmed mode would enable the snooze and to totally dismiss the alarm one would need to go to the alarm function and unset the alarm. I could not really decide if this was good or not. ¶