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Neonode N2

A new version of the phone that pioneered touchscreens

November 4, 2007 -- This is a review of the Neonode N2, a little multimedia touchscreen phone that almost no one has ever heard of. It's different from anything else on the market, although since the advent of the Apple iPhone no longer quite as different as it once was. Listening to Apple's claims of all the patents covering the iPhone's user interface one might assume the iPhone broke completely new ground and went where no phone had ever gone before.



That is not entirely so. Neonode, a small Swedish company with headquarters in Stockholm and a US office in San Ramon, Calif. (a somewhat complicated merger took place in early 2007 between US-based and publicly traded SBE, Inc and Neonode, with the resulting company called Neonode, Inc.), announced the Neonode N1 back in 2002. It was very small. It had no keypad or keyboard at all. It did not use a stylus either. Instead, it used a swipe and tap system on a novel touch screen that used a grid of infrared beams to sense finger movement.

So those who marvel at how a swipe from left to right unlocks the iPhone, well, the Neonode N1 was unlocking that way more than five years ago. And if the iPhone's swipes and taps seem futuristic, they are not. Neonode has been using them since the first N1 came out. In fact, the company's Neno user interface is based entirely on swipes and taps. With one exception. Just like the iPhone has that one physical button below its display, the Neonode does have a 4-way navigation stick that's used for this and that. It's not even needed much.

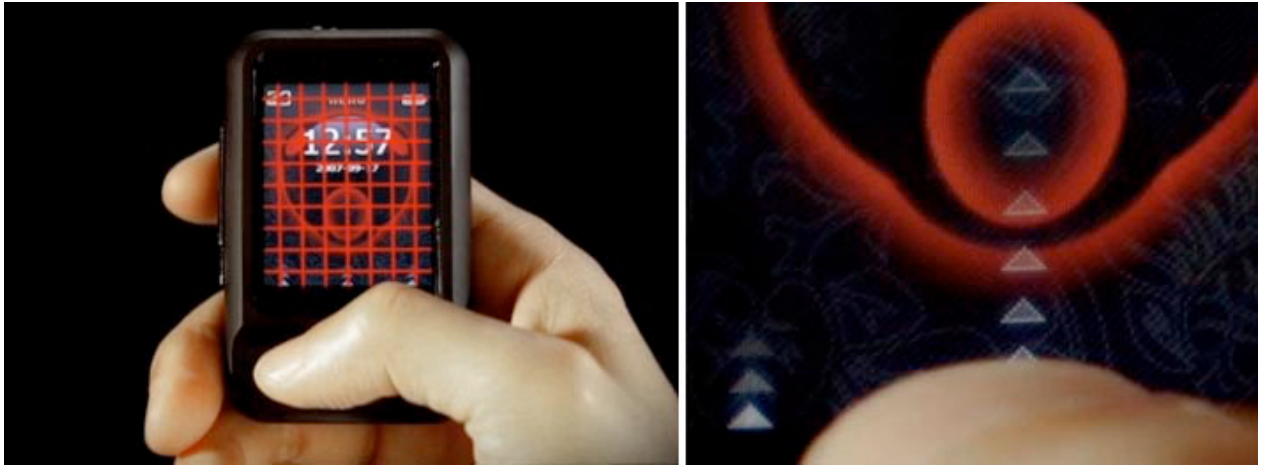
We reviewed the predecessor of the N2, the Neonode N1, in great detail ([see our review of the Neonode N1](#)) and I have now

lived with the new N2 for several weeks. The N2 is different and, coming from a nearly unknown manufacturer, faces an uphill battle to claim its place in the sun. Based on what we've seen, it certainly deserves your attention.

The swipe and tap system

To get right to the heart of the matter, the Neonode N2 is operated by swipes and taps even more so more than the iPhone that still uses some conventional menus. Initially the N2 interface seems a bit confusing and you can get lost. However, play with it for just a few minutes and all falls into place and makes sense. The swipe & tap system is implemented very consistently throughout the N2's applications and setup screens, though there are some exceptions that can throw you.

We captured the below pictures from a video on the Neonode site. **The red grid on the left is not actually visible. That just illustrates the grid of infrared beams the N2 uses to detect your finger.** The close-up on the right shows little arrows. They always show up on the screen to show, or remind, you where you can swipe to make things happen. You operate the N2 entirely with swipes and taps.



Here is how it works and fits together and how you use it:

The Neonode N2's display is separated into functional areas. There are horizontal areas and vertical areas.

Horizontal swipes

Horizontally, the Neonode's display is divided into three areas.

The top is the **"change view"** area. Swiping left and right may move through tabbed menus or bring up different screens of an application.

The center is the **"navigation area"** where you can navigate up and down and left and right within a view.

At the bottom is the **Accept/Close/Notification** area. It is used for two purposes. Swiping right is usually equivalent to "ok" or "accept." Swiping left is generally equivalent to "esc" or close. Sometimes an application uses that area to prompt for input from the user, like tapping on it to bring up options.



Vertical swipes

Vertically, the left third of the screen is the **"Start menu swipe area"**. The center third is the **"keyboard swipe area"**. And the right third is the **"tools menu swipe area"**.

To close an application entirely, you do a diagonal swipe from upper right to lower left. To select an item from a list, you swipe up and down, then tap, just like on the iPhone. With the difference that Neonode phones have been doing it this way since 2002.

How it works and what screens look like

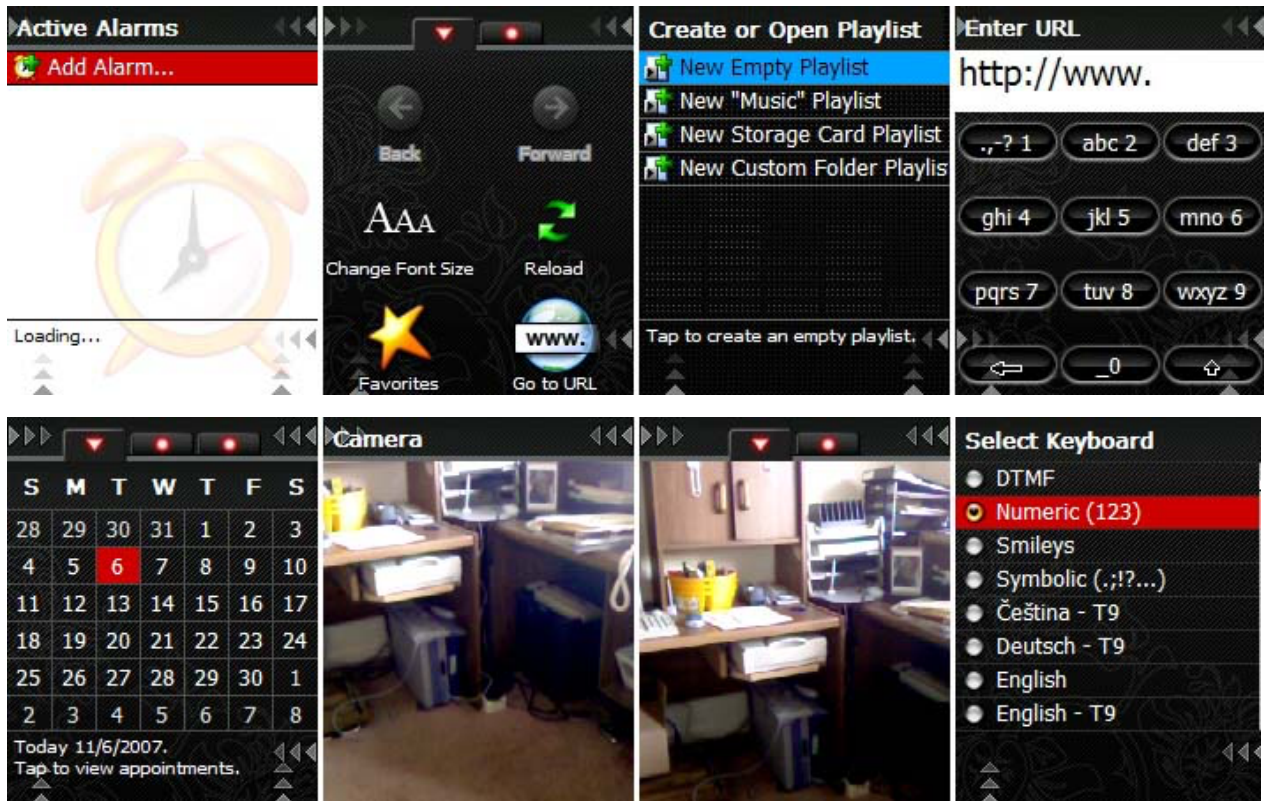
Below are a few N2 screens that illustrate how it works. On the left is the Alarms screen. Swiping up along the left would get you back to the Start menu. Swiping up on the right would bring up a utility/settings screen like the one shown next to it. Swiping right to left at the bottom backs out.

The second screen is the utilities screen for the built-in browser. It, too, is tabbed so you can swipe right along the top to get to the next screen. To select a function, tap on it.

The third screen shows a playlist. Here you'd scroll up and down by swiping, or tap in the Accept/Close/Notification area to create a new one.

The fourth one shows the standard keyboard that is used for phone calls and data entry. Tap in the URL or phone number, then swipe bottom right to enter, or bottom left to back out. Simple as that.

Below that are a few more N2 screen: calendar, camera live view and playback, and the different data entry methods you can select.



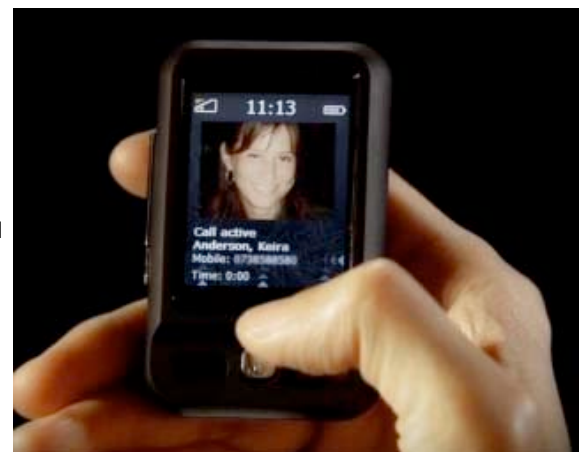
The Neonode phone

When we did our detailed review of the Neonode N1 a while ago we commented on its relatively large size and dated design. That's because it went all the way back to 2002, an eternity in cellphone product cycles. When it was conceived, the N1 had been considered tiny and sleek, but by 2006 it was, for a cellphone, large and a bit dated with its shiny plastic body and overall design. Truth be told, the N1 was no larger than a 2007 Sanyo flip phone I am using, but the Sanyo is an inexpensive, utilitarian lossleader whereas the Neonode was supposed to knock your socks off.

Well, the N2 is a different story altogether. It is tiny: 3 x 1.8 x 0.59, and it weighs 2.1 ounces. That is small, and Neonode claims it's the smallest form factor in the mobile phone industry. It is a marvel in miniaturization in every respect. It's cute and definitely a conversation piece.

The N2 is an **unlocked** quad-band GSM phone, which means you can use it with any GSM-based carrier. You're not locked in like iPhone customers. That is a huge advantage. To insert the SIM card you manipulate a slider on top of the device and then open the clamshell housing. This opens up the entire inside of the N2, but where you'd expect the usual circuitry, all you see is the Sim card slot, the MiniSD card slot, the camera and that's about it. No exposed electronics. They all must be condensed into an incredibly small space on the backside of the display.

The battery is integrated into the back part of the N2's housing. It is a Neonode-branded Li-Ion rechargeable providing 3 watt-hours



(3.7V/820mAh). That's on the order of what you find in today's ultra-slim digital cameras and is supposed to yield up to four hours of talk time and over eight days of standby. But while those camera powerpacks are replaceable and to some extent standardized, it looks like you'll have to replace the entire backside of the N2 if the battery dies. Below you can see what the N2 looks like inside. The picture is actually way larger than the phone is in real life.



Using the phone

The N2 is, of course, foremost a phone, and a pretty good one. There are no green and red buttons. Swipe right to answer or place a call, swipe left to hang up. When you make a call with the N2, you hold its backside against your ear, and not the screen. That results in far fewer greasy smudges and really makes more sense, though you have to get used to it.

You swipe up the middle to bring up the keypad, dial, then swipe right to call. When you're done, swipe left to hang up.

In Phone mode, swiping right brings up Contacts either as icons or as a list of contacts. Swiping left terminates the Phone mode and returns to the status screen.

Like with most phones, you can use the "Call History" screen to quickly place a call. Select a call and you can see what number it was to, who it was to, what time the call was placed, and how long it was.

Alternately, you can use the Address Book. Addresses are listed alphabetically either by last name or first name. You can toggle between address book and favorites, and there are various settings. A neat touch: if an explanation does not all fit onto a line, the text moves backwards and forwards so that you can read it without having to do anything at all. The screen on the right above shows the N2's sial pad. Below are a few of the phone options: the address book, telephony settings, phone options and keyboard settings.





Sending an SMS

To send a SMS text message to someone, you select them from the address book, swipe up into utilities, select "Send Message" and type the message. Alternately, you can tap on the Messaging icon and start a new message. You can select from numerous keyboards (or rather keypads, including the standard cellphone way of doing it, Tegic T9, numeric, Smileys, symbols, and, this being an international phone, half a dozen of the world's major languages.

The display

The N2's display measures 2.0 inches diagonally. It is 176 pixels wide and 220 pixels tall. That makes for a resolution of about 141 dots per inch. That is less than the iPhone, but still considerably sharper than most computer displays. It can show 65k colors and it is significantly better readable outdoors than most phones. Of course, it needs to be readable as there is no hardware keypad. The display surface seems to be plastic, which makes it more prone to scratches than glass.

Built-in 2-megapixel camera

There's a 2-megapixel digital camera that can take very passable pictures. The camera application uses the entire screen with the exception of the tab bar on top of the display. There you toggle between camera and image viewer.

You can select from picture resolutions from 174 x 144 all the way up to 1600 x 1200. You can set White Balance (auto, home, office, outdoor, cloudy, sunny), Brightness, Color Saturation with sliders on a 1-8 scale operated by the joystick, and also set vibration and sound on or off.

In playback mode you can make pictures fit the little screen in width or height, view them in actual size (you pan around), rotate them, add them to a contact, save them as wallpaper, or even send them as a MMS or via Bluetooth.



In a comparison with the iPhone's highly touted camera that also does 2-megapixel, the N2's camera does quite well. Snapshots were of similar quality.

NeoMagic MiMagic 6+ processor

Interestingly enough, while the Neonode N2 runs its Neno interface on top of Windows CE 6.0, the hardware is based not on one of the better known Marvell XScale chips or ARM-based processors from Samsung and others. Instead, Neonode has a long-standing relationship with NeoMagic Corporation (the similarity in names is totally coincidental), a semiconductor company headquartered in Santa Clara, Calif. NeoMagic very much believes in a great future for multimedia phones and aims to cover that market with high performance application processor chips that run on very little battery power.

To do that, they use a technology called APA, which stands for Associative Processing Array -- programmable parallel processing where multiple operations are performed in each processor cycle. In essence, NeoMagic seeks to replace all the complex and powerhungry specialized hardware accelerators and DSP chips with one programmable parallel processing chip that can run MPEG-4, H.264, full duplex 2-way video and such. The chip itself, the MiMagic 6+, combines an ARM 9 core with an APA-based multimedia engine (see [MiMagic 6+ block diagram](#)). Performance is very good. There is virtually none of the delay you've come to expect from a Windows Mobile device. Everything happens instantly -- likely a benefit of having an optimized proprietary interface interacting directly with embedded Windows CE.

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