Stop Compromising My Touchscreen!

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the future at your fingertips

Whitepaper

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Abstract

The choice of touchscreen technologies is commonly focused on a few recognizable touch performance factors. With the emergence of new technologies the touchscreen experience is no longer bound by a few conventional factors. It is now possible to view the touchscreen experience in a much more comprehensive way.

FlatFrog InGlass™ touch is a Frustrated Total Internal Reflection (FTIR) based disruptive touch technology. The technology removes the incumbent large touchscreen barriers, therefore, providing large digital display vendors with previously impossible interactive options. With that, key design concessions are no longer required.

Stop Compromising My Touchscreen!

Introduction

Creating a Complete User Experience without Concessions

Interactive touch displays enhance our usage experience by allowing us to actively engage with the content. Gated by technology options, users have learned to accept suboptimal experience and compromises. Yet, a new technology option is emerging that enables a more complete user experience. We expect the touch interface to be responsive and error free. However, there are other subtle yet essential elements that maximize the user experience.

1. **Look** – The touch technology must not compromise the visual quality of the content or device aesthetics.

2. **Instinctive Touch** – There is touch and then there is natural feeling, instinctive touch.

3. **Accessories** – It must support accessories that are common and inherent to how we interact.

4. **Yes, I want it all** – Furthermore, it is the capacity to provide all of these factors collectively. Our users want an uncompromised look, instinctive touch, and natural accessories without conceding features.

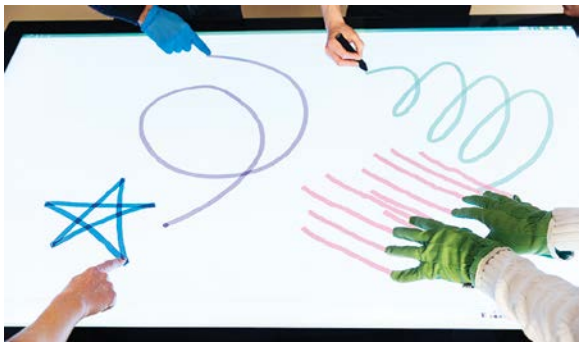

Figure 1: User experience defined by a range of factors

Previously, the combination of these factors was considered to be unavailable for a single technology. However, with the emergence of InGlass™ as a mainstream production capable technology, they are now possible and available.

Look

Look applies to the image quality and the device aesthetics. A tablet-like medium with perfect clarity and the ability to design either a flat or curved screen are factors that enhance our interactive touch experience. It is no longer necessary to choose between a superior image with a bezel or an attractive tablet-like design but with reduced transparency. We can now have them both.

1. **Clarity** – The touch experience is enriched if the content is pleasing, and the touch medium is attractive. 4K and 8K displays create images and content that are more realistic and gratifying than ever before. Beyond a superior visual quality, when zooming into an image the picture does not degrade and more details can be seen. This enables us to engage into and out of the display region.

Figure 2: Zooming while maintaining clarity

So, how does the quality of the image relate to the touch technology? The choice of technology can impact the image quality. For example, Projected Capacitive touch interfaces (P-Cap) utilize conductive sensors in the glass. Fundamental to the technology, the embedded sensors reduce the image quality. Other technology options such as IR-touch and InGlass™ do not.

2. **Tablet-Like Edge-To-Edge Design** – The tablet revolution is moving up in size! A bezel-free design produces a sleek tablet-like display as opposed to an outdated looking computer with bulging borders.

Figure 3: Tablet-like edge-to-edge compared to an IR-Touch based technology

3. **Flat or Curved** – The emergence of curved displays provide a more engaging experience. The user is made to feel that he or she is surrounded by the content. Surface based touch such as IR-Touch are incompatible with curved screens. But both P-Cap and InGlass™ can support a non-uniform glass.

Projected Capacitive touch interfaces (P-Cap) utilize conductive sensors in the glass, which fundamentally reduce the image quality. Surfaced based IR-Touch does not reduce the image quality, but instead requires a protruding bezel and cannot support curved displays. InGlass™ is based on light wavelengths that are injected into the core glass and touch disturbances are detected via novel algorithms. The InGlass™ technology supports an unobstructed image, bezel free and either flat or curved displays.

Instinctive Touch

Instinctive touch means that we interact with the touch panel in the most natural manner to us. The user is not required to adapt their touch to the technology. Instead the technology is adapted to the user. For a natural touch experience, we require a responsive touch, natural feeling gestures, and the freedom to use multi-fingers or even multi-users on the same display at the same time. It is instinctive for us to use all our fingers, not just one. It is natural for us to push and press. And, when we interact repeatedly, we become faster and more demanding.

1. **Latency, Accuracy** – The choice of technology will impact how quickly the LCD responds to the touch. We also expect that when we touch an object on the screen, the touch location will be accurate for a range of finger sizes. Whether we use one or 10 fingers, there should be no detectable degradation of the response time or accuracy. And, whether the touch medium is a smart phone, tablet, AIO, digital signage, or a 100” video wall, we expect the user interface to match our tablet experience. Consequently, performance scalability is essential when considering a technology platform.

Figure 4: InGlass™ based 100” video wall with a tablet-like performance

2. **Force Touch** – When we engage with touch displays, the interaction requires feedback. As we move or select an object, the LCD refreshes and it provides us with a visual X-Y feedback. If we relocate an object, we expect the object to move under our touch. It is intuitive for human to use force to move objects closer or further away. Force based gestures are now emerging where touch pressure is available. The content responds to Z-based (Force Touch) gestures, which is another dimension for our senses to engage. An example usage case is to preview a web menu, calendar appointments, or to open applications by applying pressure.

Figure 5: FlatFrog InGlassFORCE™ provides over 1000 pressure levels

3. **Multi-Touch, Multi-Users** – As touchscreens increase in size, we are no longer bound to 1 or 2 fingers. We can use our entire hand, or instinctively use both hands to reach all around the display. We are not even limited to a single user! We can engage multi-users in the most natural and intuitive way on multiple applications at the same time or in multi-player gaming.

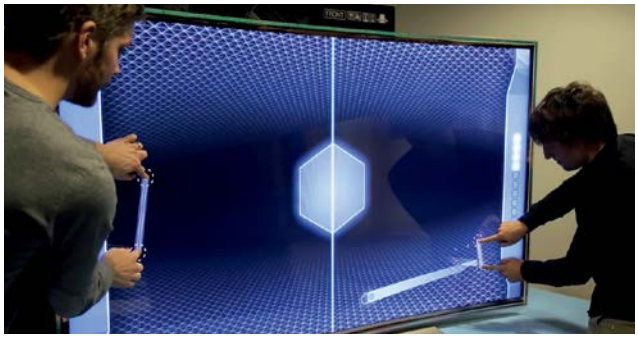

Figure 6: Intuitive usage case – finger, fingers, hand, hands, user or users.

P-Cap can provide adequate latency, and accuracy in small to medium sizes. However, driving conductive sensors at large form factors is problematic therefore, limiting the size the technology can support. IR-Touch depends on an above-the-surface light matrix. These type of matrixes can be tricked into erroneous touch detection when encountering multi-touch, multi-users. Neither IR-Touch nor P-Cap technology are capable of high resolution force gestures.

InGlass™ touch performance scales well from 15–110” and can handle up to 80 multi-touches. It is ideal for a multi-touch, multi-user environment. And impressively, it also supports more than 1000 pressure levels.

Accessories

Stylus and glove supported touch interfaces allow for expanding the usage case. Stylus opens another means of interface using a pen. This allows for writing, drawing and marking documents in the most basic way that goes beyond mere touch. Glove support opens the touch interface beyond the casual use into medical and industrial environments. It also expands the environmental constraints into colder environments and outdoor use without the need to expose our skin.

It is possible for various technologies to handle stylus, glove, or touch interactions. However, it is not trivial for a single technology to support glove, stylus and multi-touch fingers all at the same time. A natural touch experience means that the user can use a stylus while still selecting or moving objects with or without a glove.

P-Cap based technologies struggle to support glove because of the non-conductive nature of the fabric. For pen operations the technology requires either an expensive active pen or a wide pen surface. IR-Touch can support stylus, glove and touch. However, as the IR projection and detection occurs above the surface of the panel, non-touch event can also be interpreted incorrectly as touch. The unique attribute of InGlass™ allows support for multi-touch, stylus and glove interaction. Furthermore, it is capable of supporting all three interface options at the same time.

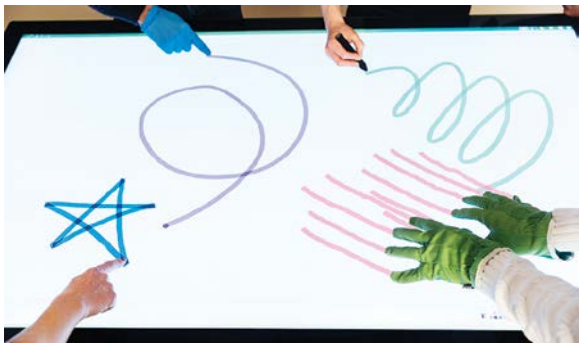

Figure 7: InGlass™ supports multi touch, glove and stylus

Summary

The touch experience is evolving to the point where flawless touch is no longer a feature, but expected. For an intuitive and natural interactive touch experience, it is no longer sufficient to focus simply on a single factor. We must also consider the look, instinctiveness of the touch, and the interface means such as a stylus and gloves. By removing technology constraints that degrade the visual quality or require a protruding bezel, we can enhance the touchscreen usability resulting in a more complete and gratifying interactive experience. Stop compromising on look, touch, and interfacing accessories. Our users want it all.

Figure 8: Enabling a complete user experience

Look	Instinctive	Accessories
☐ Perfect Clarity	☐ Latency, Accuracy	☐ Stylus
☐ Flat or Curved	☐ x-y-z Gestures	☐ Gloves
☐ Tablet-Like, No Bezel	☐ Multi Touch, Multi Users	☐ Stylus and Gloves

Figure 9: Enabling a complete user experience checklist

Nate Moyal is the GM of FlatFrog Asia. He graduated from LSU with a BS in Electrical Engineering, Engineering Masters from the University of Texas and an MBA from Concordia. He has extensive experience in developing and introducing new technologies such as Touchscreens, Haptics, IR sensors, and High-Speed Interface products. Nate Moyal also holds 34 circuit, system and architecture patents.

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