Rain and Fluid Discrimination for Touchscreens

Rain and fluids on a touchscreen can wreak havoc with the performance of your system. While resistive touchscreens can operate with water or other fluids on the screen, the durability issues of the resistive membrane make them unsuited for outdoor operation where dust, dirt and other abrasive materials can irreparably damage the touchscreen in a matter of days if not hours. Surface and projective capacitive touchscreens are more durable, but rain and other nastier fluids contain dissolved solids and gases that can make them conductive, resulting in random touches or a total lock up of the touchscreen. Optical systems can detect rain drops and drips on the touchscreen as a touch, making them sensitive to erroneous touch performance as well.

There is a solution. Baanto ShadowSense touch technology is an innovative and patented optical position sensing technology using high performance sensors operating in the analog domain to provide innovative features and unprecedented performance, stability and accuracy. Featuring an efficient sensor architecture coupled with elegant position detection algorithms, ShadowSense touchscreens report not just the position of a touch object, but the size and opacity of the touch object as well.

Baanto has coupled touch size information and opacity, or shadow density with a configuration application called Dashboard, that allows customers to define the size limits of a touch point, the opacity and separation distance between adjacent touch points to reduce or even eliminate false touch reporting due to fluids on the screen. These capabilities, coupled with the robustness and durability of a bezel based touch technology provide designers additional flexibility in designing an end system that can deliver extended performance even in adverse and challenging outdoor conditions.

As an example, consider the progression as a finger enters the touch plane of a ShadowSense touchscreen. From a fully illuminated state when the finger is above the optical plane, the shadow continues to represent a larger percentage of the sensor reading until the finger is totally touching the surface of the touch plane, at which time the maximum shadow is being cast upon the sensors. *Figure 1* illustrates this concept.

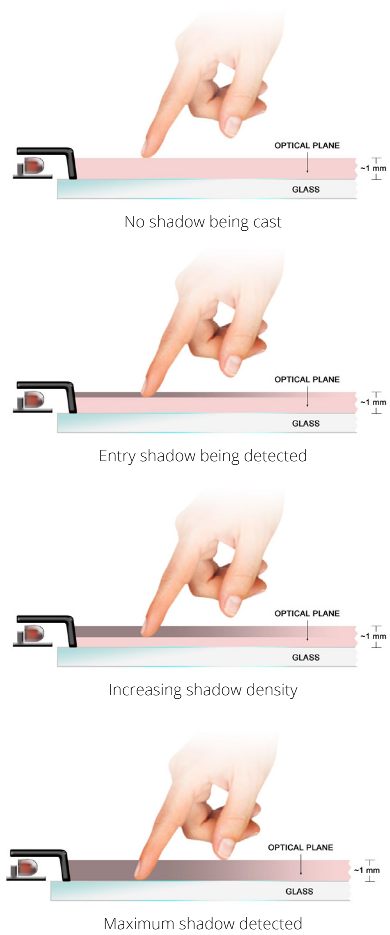

Figure 1: Changes in shadow density

Because the ShadowSense sensors operate in the analog domain, touch detection is not a simple absent/present detection of a light source such as in a beam break system, but rather the progression of a shadow as it is tracked throughout the touch sequence. By logical extension to the example above, if the touch object is not a finger, but a substance that is translucent to IR light, the detected shadow density can be gated so that the opacity of the object becomes a criteria in declaring whether or not an object in the touch field is a valid touch object.

When configured in its "high performance" mode, the ShadowSense touchscreen will detect and report objects as small as the edge of a credit card bouncing off the protective glass with a 4 to 5 millisecond dwell time in the optical plane. However, note that this level of performance and sensitivity isn't required by most applications. *Figure 2* shows the result when a viscous fluid (oil at 37° F) containing particulate matter is splashed upon a touchscreen set to "high performance". The series of erratic touch events is clearly evident.

Since most fluids are translucent to IR light, changing the shadow density parameter to 85% using Dashboard, as shown in *Figure 3*, results in no false touches whatsoever, an incredible performance difference. *Figure 4* shows the result with the same fluid after the configuration change.

Clearly, the type of fluid used in this example is much more extreme than simple rain, but considering the public venues that are part of many system deployments, it wouldn't be unusual to have a touchscreen exposed to viscous fluids such as soft drinks or condiments. Maintaining functionality in these environments is critical to system performance and uptime metrics.

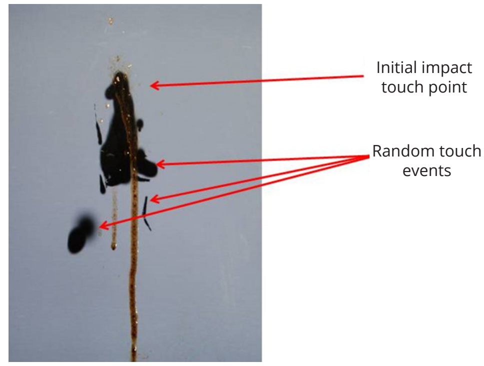

Figure 2: Oil Detection in high performance mode

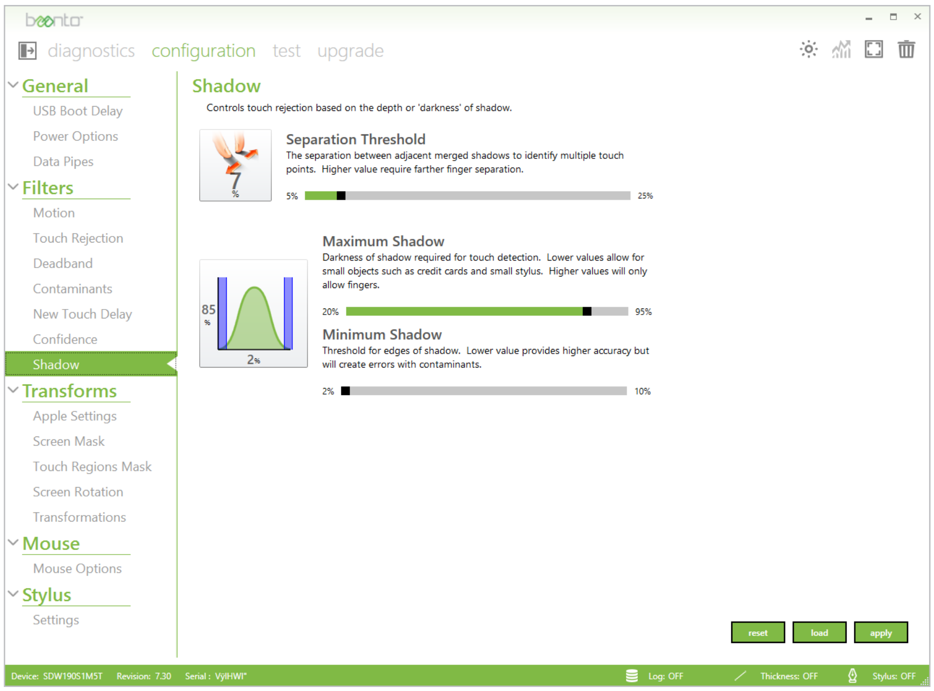

Figure 3: Using Dashboard to change the shadow density

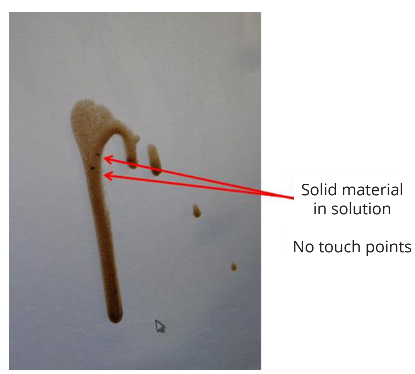

Figure 4: Oil Detection after changing shadow density

Baanto also allows the touch size information to be used to define the size limits associated with expected, desired, or required touch objects to reduce or even eliminate false touch reporting.

Referring to *Figure 5*, adjusting the touch gate to a minimum touch area of 7 mm^2 (diameter of 1.6 mm) and a maximum touch area of 3,340 mm^2 (diameter of 52.6 mm) will screen out small touch points (rain drops) as well as eliminate palm touches in a multi-touch system.

Lastly, an additional parameter to further enhance spurious touch rejection is the "dwell time" before a new touch is acknowledged and reported to the host PC. Also controlled by Dashboard, the "New Touch Delay" feature, shown in *Figure 6*, allows an application developer to control the number of frames a touch object must be present before reporting a valid touch event. This setting further enhances the ability to differentiate low opacity touches which are characteristic of rain and other fluids.

The combination of Shadow Density, Touch Area Detection and New Touch Delay provides users unprecedented control over the performance of a Baanto ShadowSense touchscreen. This creates an opportunity for application developers to exploit the advantages of optical touch systems with a much higher degree of reliability and control.

The results of this innovation are products featuring some of the highest performance, most robust, multi-touch capabilities available in the market today.

For more information about ShadowSense, please contact a member of our sales team at sales@baanto.com.

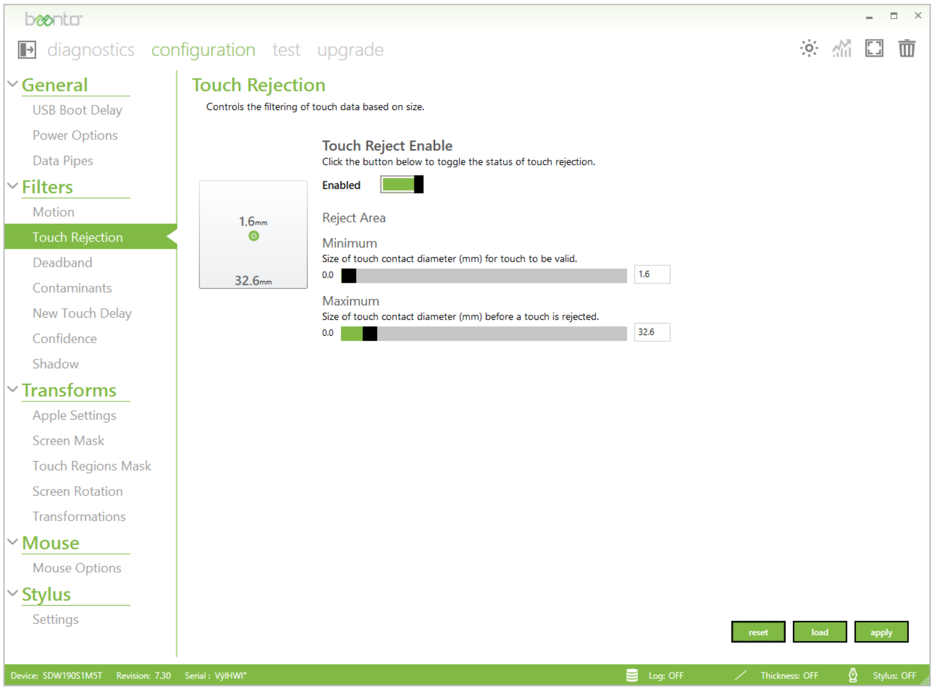

Figure 5: Using Dashboard to enable touch rejection

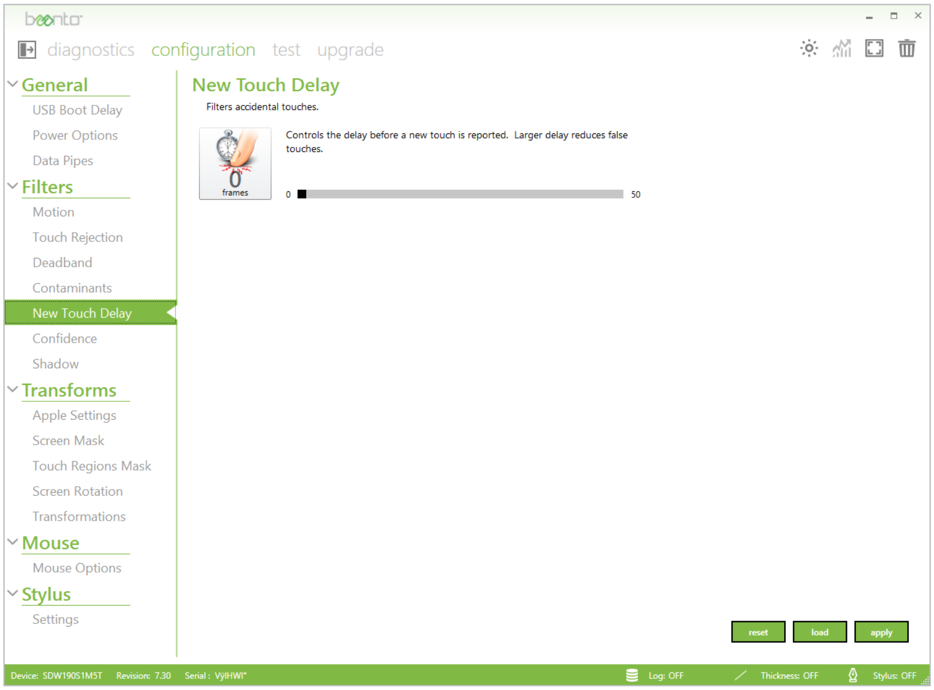

Figure 6: Using Dashboard to change new touch delay