



UI/UX Considerations

When there is no keyboard or mouse

By Quentin “Q” Alldredge
Q Software Innovations



About Q

Feel Free to call me “Q”

- I got the nickname for both the Star Trek and James Bond references
- Work of the Aerospace and Defense Industry
 - First at ATK (Now Northrup Grumman)
 - Now at Hill Air Force Base
- LabVIEW Consulting as Q Software Innovations

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NI Community Forums: TheQ

LAVA Forums: The Q

stackoverflow: TheQ





Overview

- Requirements
- Types of Touchscreens
- Definitions
- UI Considerations
- UX Considerations
- Summary

Requirements

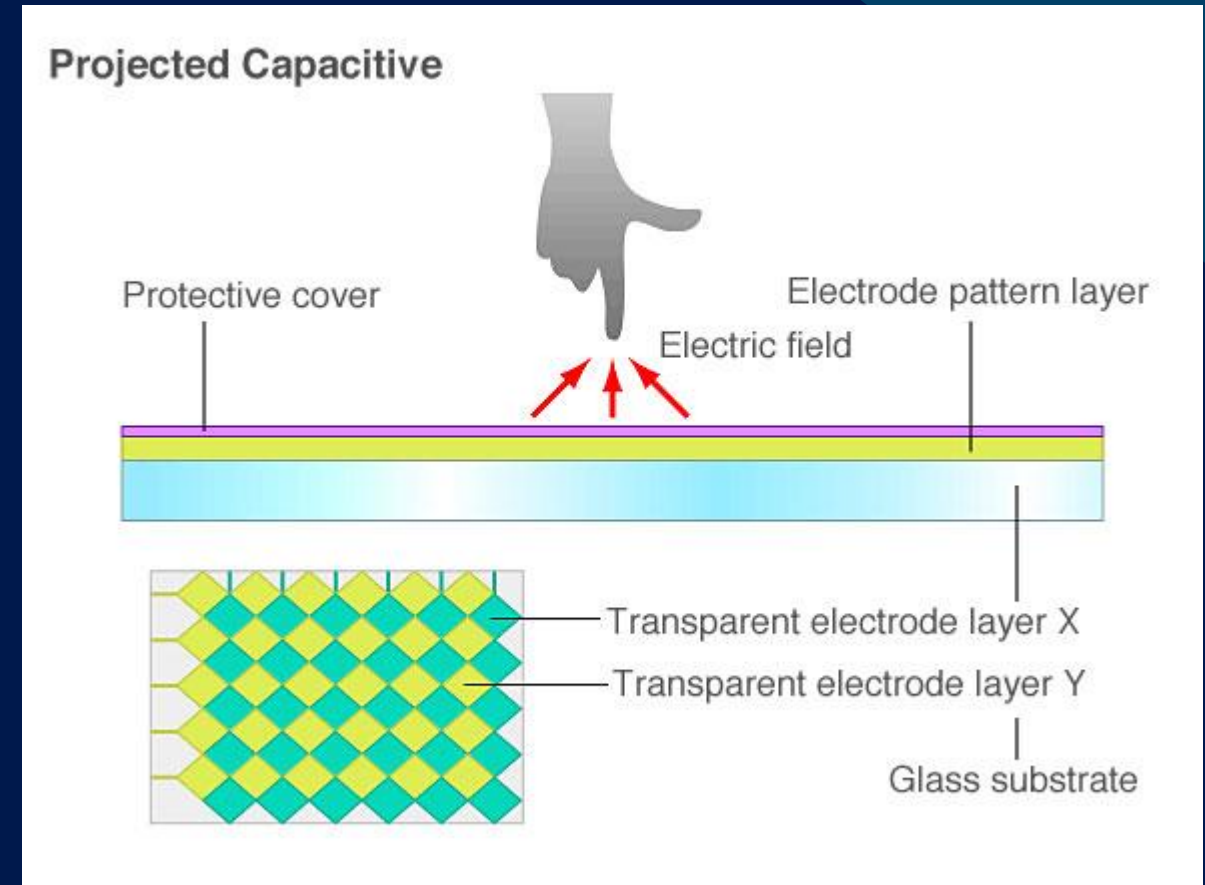
- Upgrade system from Laptop style to Touchscreen Tablet style
- Comply with MIL-STD-1472 Human Engineering
 - Alphanumeric Keyboard Minimum Size 0.5-inch x 0.5-inch
 - Other UI Component Minimum Size 0.65-inch x 0.65-inch
 - UI Component Minimum Spacing 0.25-inch
- Environmental Conditions
 - User must be able to use where gloves



Types of Touchscreens

Capacitive Screens

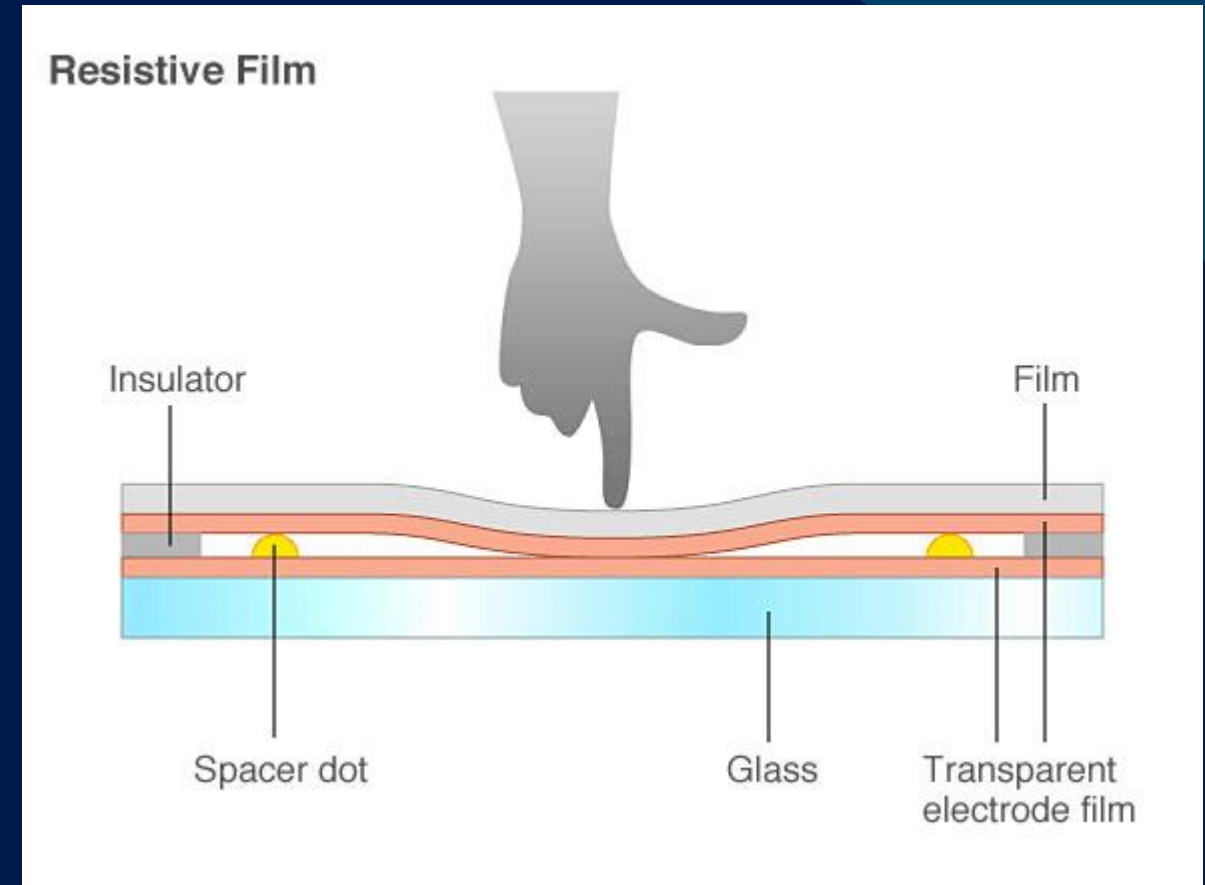
- Pros
 - No force required
 - Accurate
 - Good display quality
- Cons
 - Touch sensing doesn't work with gloves
- Examples
 - Modern smartphones and tablets



Types of Touchscreens

Resistive Screens

- Pros
 - Can use with gloves/stylus
 - Accurate?
- Cons
 - Requires force to sense input
 - Lower display quality due to two film layers
 - No multi-touch
- Examples
 - Older PDA (i.e. Palm Pilot)
 - Industrial Displays





Definitions

User Interface (UI)

The UI is the point of human-computer interaction and communication in a device. This can include monitors, keyboards, a mouse and the **appearance of the application**.

User Experience (UX)

The UX is the overall experience of a person using a software product such as a website or computer application, especially in terms of how **easy or pleasing it is to use**.

These are not interchangeable terms, but they are also not mutually exclusive either.



Definitions

User Interface (UI)

Make User/Software Interactions **Accessible**.

User Experience (UX)

Make User/Software Interactions **Easier**.



UI Considerations

Making User/Software Interactions
Accessible



UI Considerations

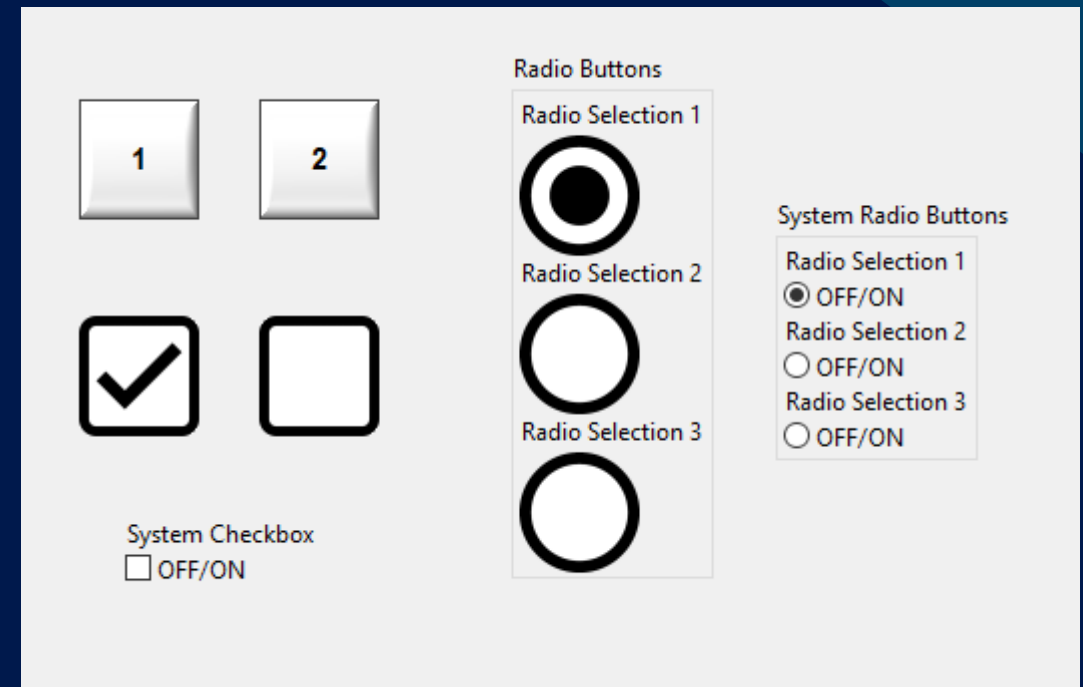
Controls

- Most regular Controls are too small for this application
 - Checkboxes
 - Radio Buttons
 - Lists
 - Scrollbars
 - Menus
 - Dialogs
 - On-Screen Keyboard

UI Considerations

Buttons, Checkboxes, and Radio Buttons

- **Size:** Minimum 0.5-inch x 0.5-inch
 - 1024x768 at 10.8-inch screen (9.41-inch x 5.29-inch) → 119 pixels/inch
 - Minimum \approx 60 pixels x 60 pixels
- **Spacing:** Minimum 0.25-inch
 - Minimum \approx 30 pixels
- **Made library of custom controls with Strictly Typed Buttons**



Front Panel grid spacing at 12 pixels



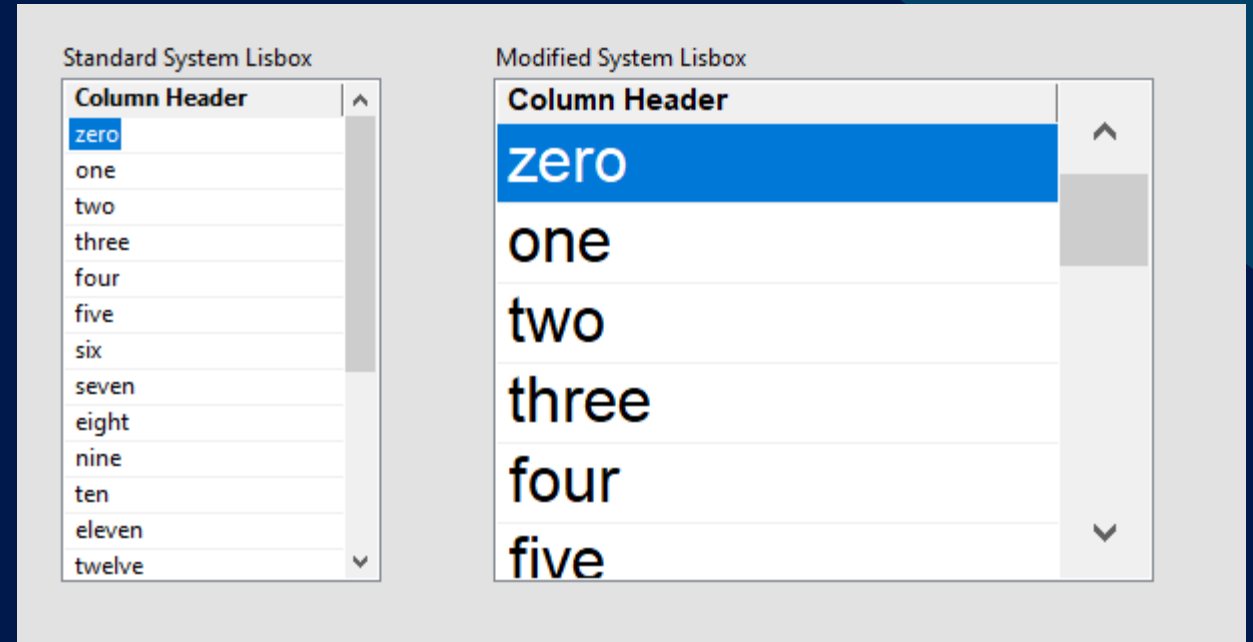
UI Considerations

Listboxes for Selection

- **Standardized on:**

- **Font:** Arial
- **Column Header:** 18pt Bolded
- **Body Text:** 36pt font for selectable text if single row
- **Color:** Black regular, White in selection
- **Highlight Entire Row:** True
- **Control Style:** System Controls

- Create **Scripts (VI Scripting)** to set Standard and/or **VI Analyzer Tests** to check Standard is followed.





UI Considerations

Scrollbars: Listboxes, Trees, and Tables

- **Customize the Control**
 1. Create a new Control (.ctl) file
 2. Add the control {Listbox, Multicolumn Listbox, Tree, or Table}
 3. Change to Customize Mode
 4. Select and Drag Parts to Size {Table/Tree Area, Scrollbar(s), Corner Box}
- **Alternatively:** You can change the Scrollbar Setting, pre-Windows 10 in:
 1. Control Panel -> Appearance and Personalize -> Change window glass colors -> Advanced appearance settings.
 2. Select Item = Scrollbar, change the size.



UI Considerations

Scrollbars: The INI Flag

- If you do change the scrollbars this way,
DON'T FORGET TO ADD THIS TO THE LabVIEW.ini FILE

autoResizeScrollbars=FALSE

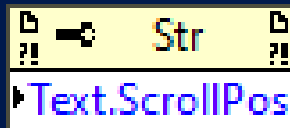
- If you don't, next time you open all scrollbars will reset to default size
- **You don't know pain until you must go through 50 modules fixing this...**
- Fortunately, we were able to script a search and replace for all these controls



UI Considerations

Scrollbars: Strings and other uses

- **Not customizable** like Listboxes, Trees, and Tables
- First used **XControls...** then **crashiness**
- Invented **QControls...** then **awesomeness**
- Used **LargeScrollbar QControl** to control String scroll position via property **Text.ScrollPos**



Note: You will need the QControl Toolkit to run this.

String

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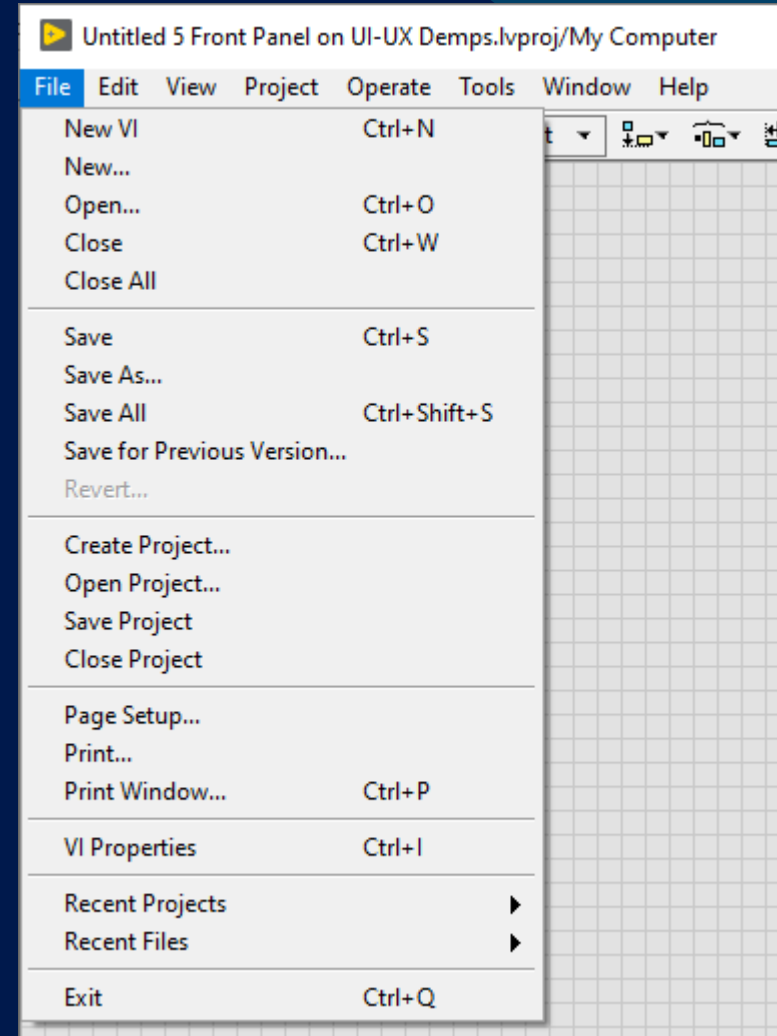
Toggle String's Built-in Scrollbar off



UI Considerations

Menus

- Menu text is too small
- Difficult to select near edges

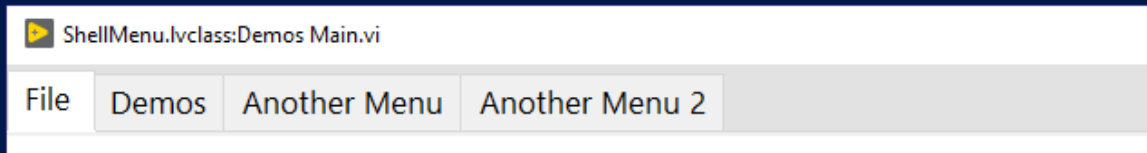




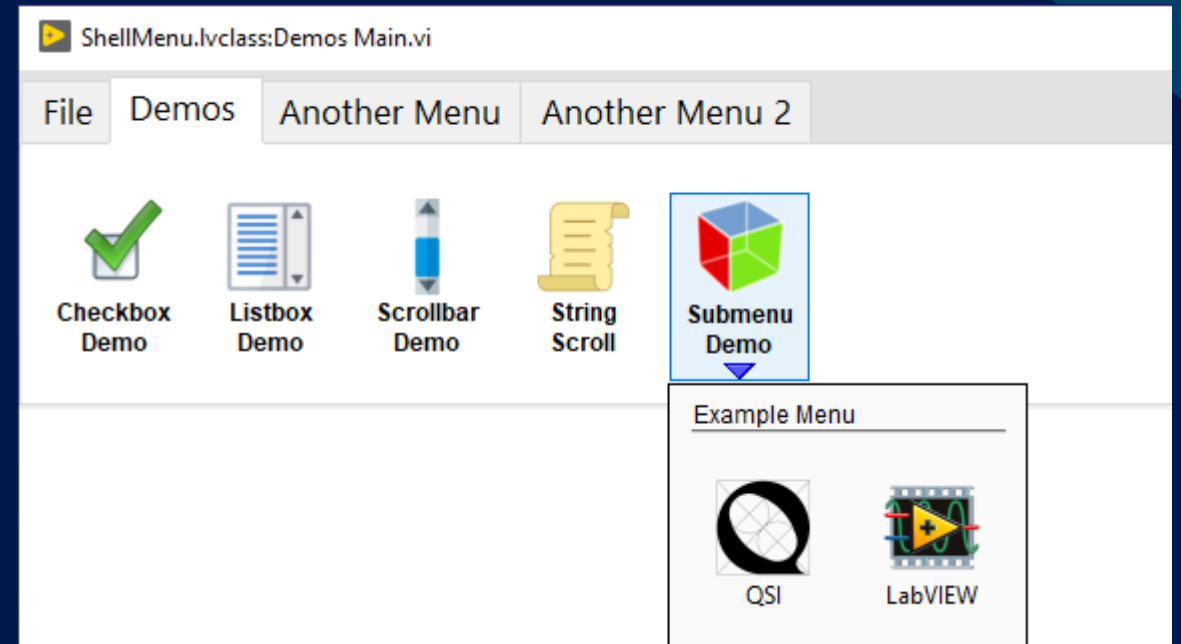
UI Considerations

Menus

- Used Tab Control, Buttons, Splitter, and popup VIs



Menu as Tab Control cutoff by Splitter Bar



Menu Open with Submenu Popup

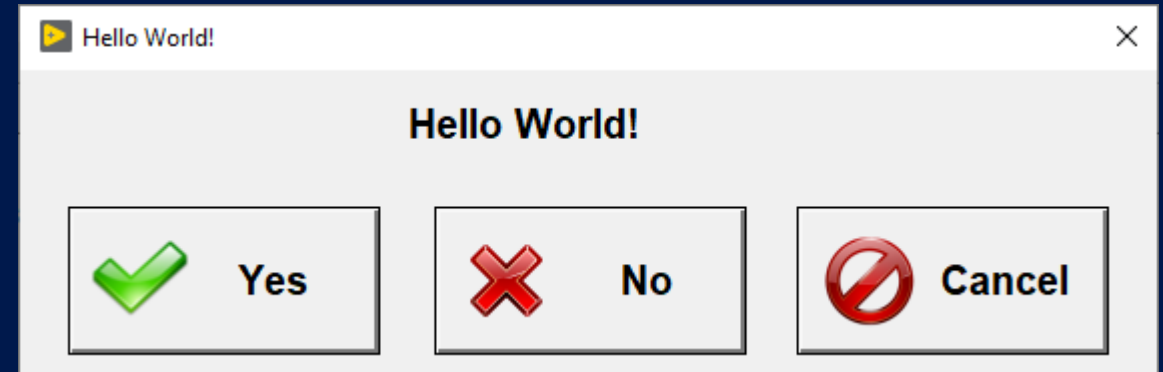
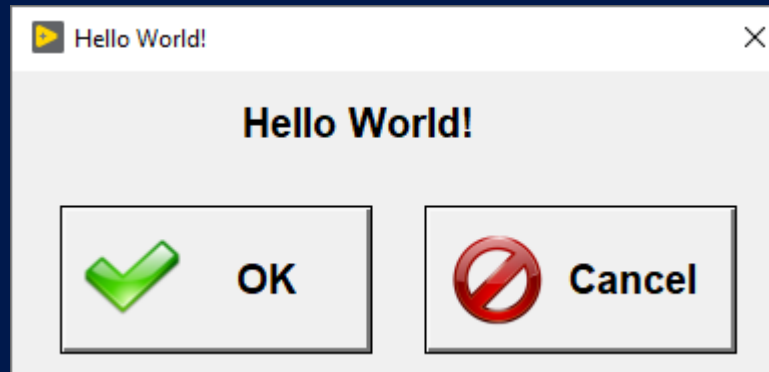
UI Considerations

Dialogs

- Standard Dialogs have too small of buttons



- Created Dialogs reuse library

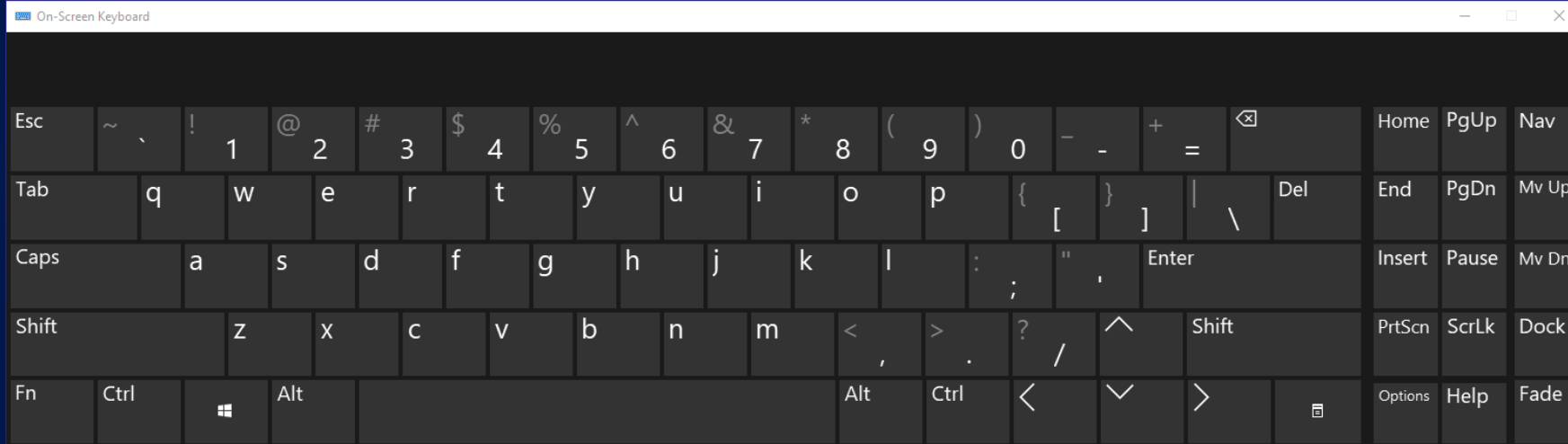




UI Considerations

Keyboard

- Built-in OS Keyboard is too small
 - Keys too small
 - Does not fulfill spacing requirements between keys





Enter Example String:

Cancel

1 2 3 4 5 6 7 8 9 0 - = X

q w e r t y u i o p [] \

↑ a s d f g h j k l ; ' ↵

↑ z x c v b n m , . / ↵

Something

Cancel

1 2 Select Select All Paste - = X

Something

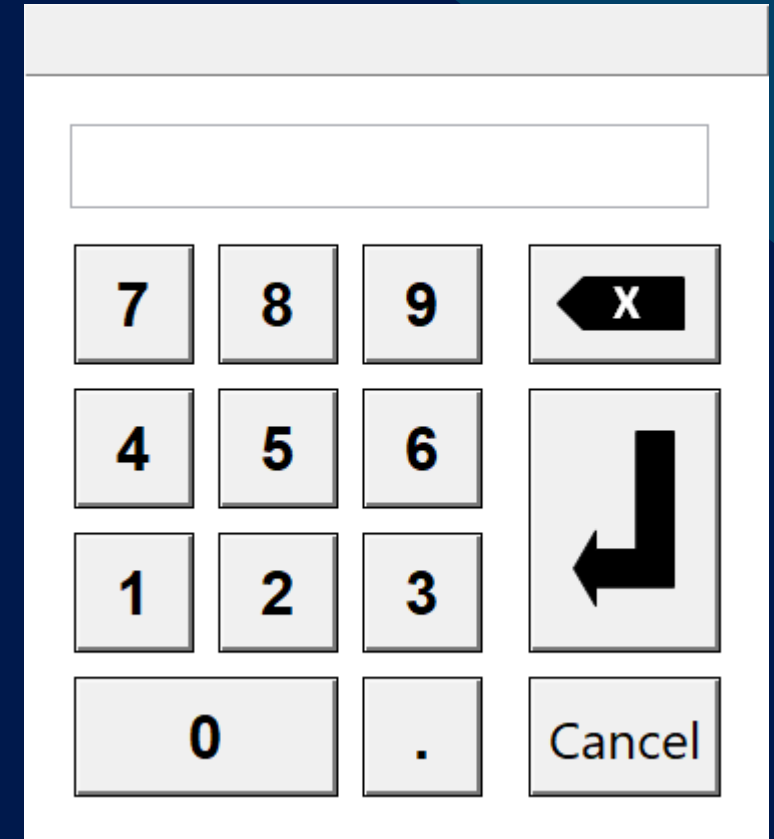
Cancel

1 2 Cut Copy Paste - = X

UI Considerations

Keyboard: Lessons Learned

- Implemented as popup dialogs
 - Does not implement actual key presses through the OS
 - Edits the values of the controls directly
- Ended up having 3 keyboard types:
 - Standard Alphanumeric
 - Standard launches to allow field to be visible without being off the screen, if possible, but was movable
 - Must be launched asynchronously to show the entry as its typed
 - Full Screen Alphanumeric
 - Cover the screen
 - Provides a visible field as part of the keyboard
 - Numeric Only
 - Work essentially the same as the Standard





UX Considerations

Making User/Software Interactions **Easier**



UX Considerations

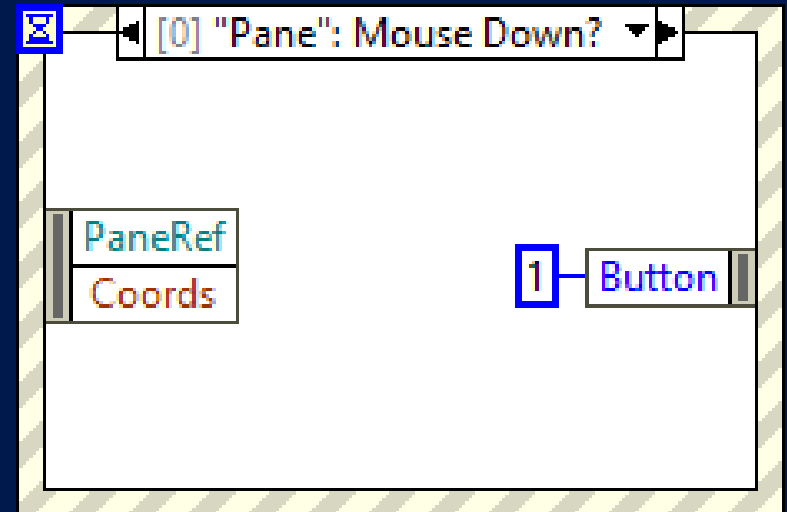
No Keyboard Navigation

- Keyboard navigation doesn't make sense or doesn't work well
 - No need Enter/Return for Buttons on Dialogs or otherwise
 - No need for Tab order to Tab through controls
 - No need for Alt+Keys for Menus/Buttons
 - No numbers for Selection from lists
- Work only with the system On-Screen Keyboard
 - Won't work with custom keyboard unless the functionality is purposely added
- Therefore, this is not for the sight impaired

UX Considerations

Right Clicks

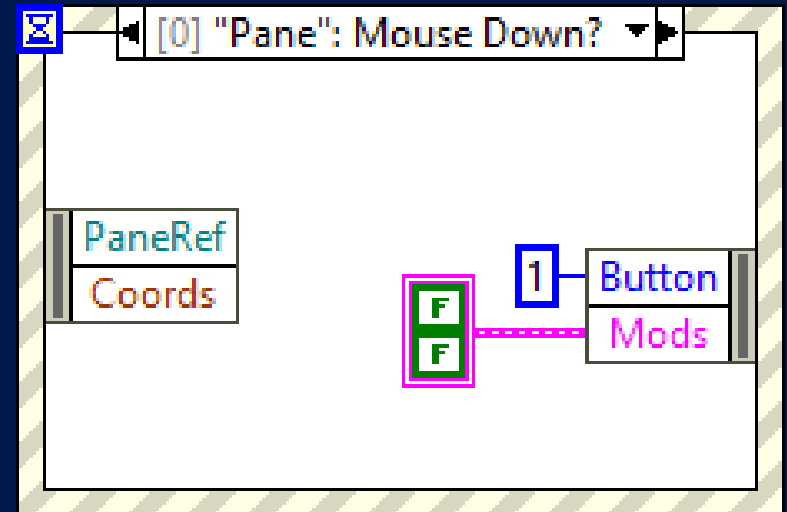
- Right clicks on touchscreens is just a **touch and hold a little longer**
- Its **confusing** when right click is triggered accidentally
- Instead **do not have any right-click menus**, make everything available through other means
- To **safeguard against accidental right clicks**, use the Mouse Down? filter event
 - Converts Right clicks to Left clicks
 - **Executes before Mouse Down notify event** which would still execute but now as a Left click
 - **Pane Mouse Down** events occur before control Mouse Down Events



UX Considerations

Double Clicks

- Same as right clicks:
 - Difficult to execute on purpose
 - Easy to accidentally execute or execute single clicks or right clicks instead
- To **safeguard against accidental double clicks**, add to the Mouse Down? filter event





UX Considerations

Minimize Text Entry

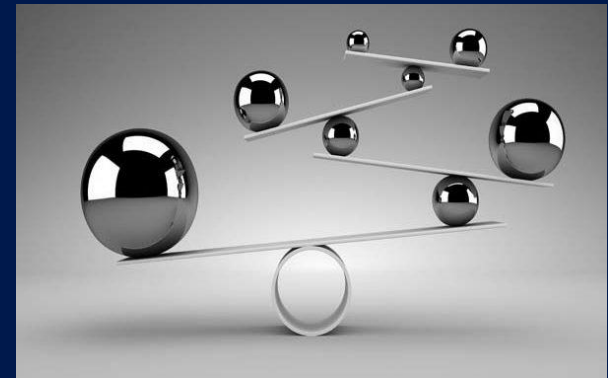
- **Selectable Lists** – Large list won't fit on screen, requires scrolling
- **Enums/Rings** – Smaller list, should fit on screen, shouldn't require scrolling
- **Combo Boxes** – Good if not all options are covered, then require text entry
- **Numeric Controls** – Use Increment/Decrement Buttons, consider programming large jumps if held down
- **Also Numeric Controls** – Use sliders/knob if they fit the data type. Consider them the enums and ring of numerics.



UX Considerations

Minimize Clicks

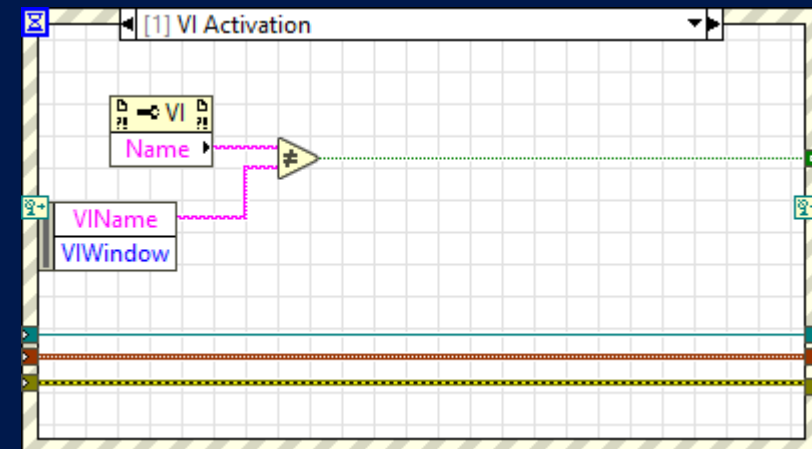
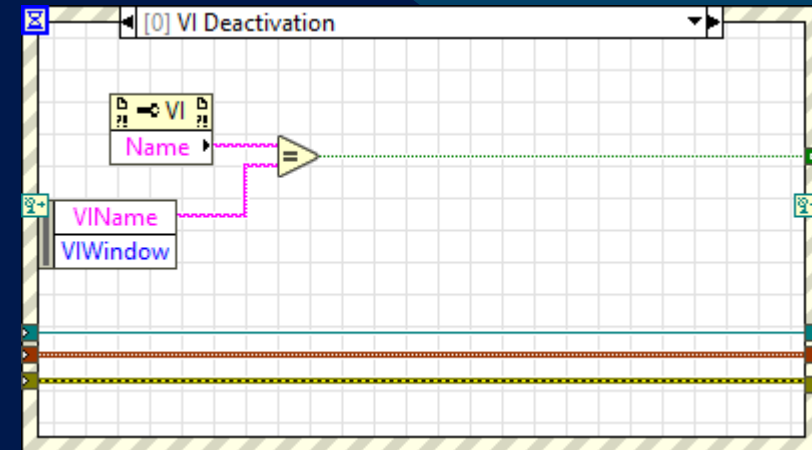
- Hard to define in bullet points
 - Think about how many clicks it takes to get to/performance functionality
 - Can this be reduced by button placement?
 - Can this be reduced by using a different control?
 - Can the multiple actions be merged?
 - Should multiple actions be separated to prevent mistakes/redo?
- Balance between **Ease of Use** and **Screen Real Estate**



UX Considerations

Dismissing Popups

- Usually done like the dialogs by OK/Cancel/"X" Buttons
- Can be done by simply clicking off the VI
- Don't have to dedicate space to buttons
- Accomplished through VI Activation or VI Deactivation Events
 - These are enabled through scripting but are available in the Run-Time Engine (can be used in an executable)



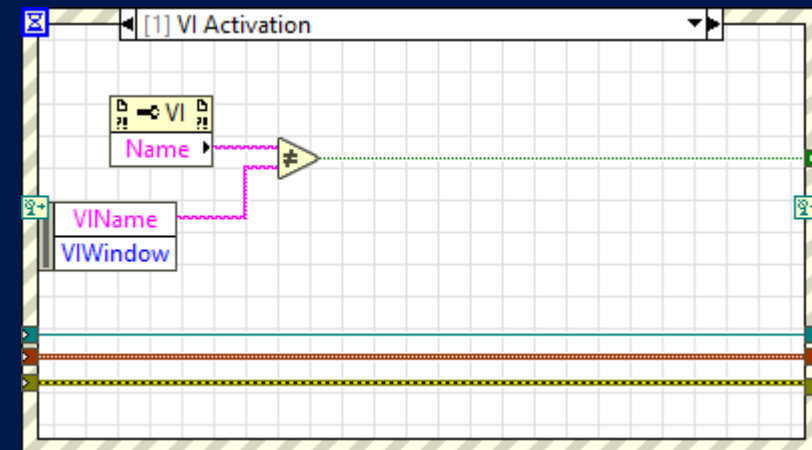
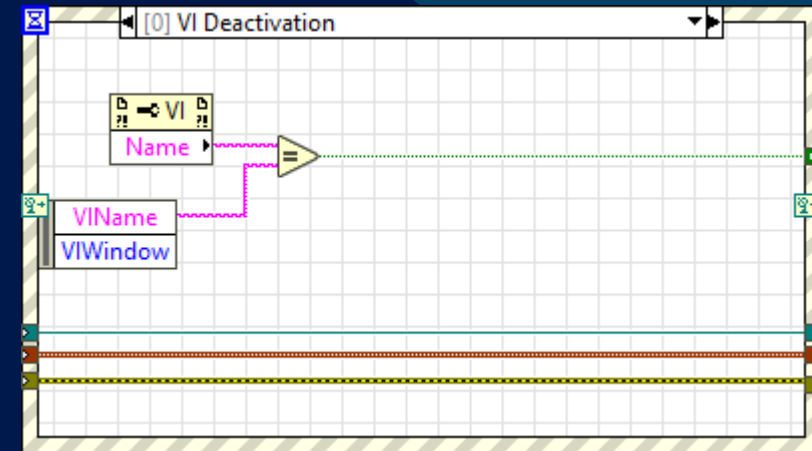


UX Considerations

Dismissing Popups

- **Caveats:**

- Popups can be modal or floating:
 - If **modal**, it automatically gets activated
 - Clicking a VI in the application will cause the blocked-by-modal audible warning
 - If **floating**, “Hide when LabVIEW is not active” must be set to FALSE to get activated automatically
- Deactivation event won’t fire unless VI is activated first
- Deactivation Event must be **limited to 1**





UX Considerations

Swipe / Gesture Control

- Windows gestures do not pass to LabVIEW
 - **Approximate with** Mouse Down, Mouse Move, Mouse Up, and Mouse Leave
 - Dynamically register event for **Mouse Move, Mouse Up, and Mouse Leave** on Mouse Down, Mouse Enter
- Use to replace scrolling, selection



Summary

- **Touchscreen**
 - Capacitive Screens – No Force, Can't use Gloves, Accurate
 - Resistive Screen – Uses Force, Can use Gloves, Accuracy Varies
- **UI Considerations** - Making User/Software Interactions *Accessible*
 - Make UI Elements Big Enough
 - Standardize on a Set of Controls
 - Beware the Scrollbar Sizing Gotcha
- **UX Considerations** - Making User/Software Interactions *Easier*
 - Plan to Minimize Clicks, Text Entry, Difficult Gestures
 - Balance between Ease of Use and Screen Real Estate



Summary of Links

Where do I go again?

This presentation and video will be accessible at:

- https://labviewwiki.org/wiki/Americas_CLA_Summit_2019



Summary of Links

Where do I go again?

G Community Links

- www.gcentral.org
- www.lavag.org
- www.labviewwiki.org
- www.gpackage.io
- www.gdevcon.com

Independent Source to find G Libraries (coming soon)

Independent Source for G Discussion

Independent G Knowledge Base

Independent G Packager/Repository

Independent Graphical Programming Conference