Custom Robot Control

Tutorials and User Manual

Arduino Compatible

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How It Works

The Custom Robot Control app is simple to use, but the inner workings can be complicated for beginners to understand. However, you can think of everything as an array of long integers that is shared between the Arduino microcontroller and the controller app. As long as the microcontroller and the app are connected, they can share data by writing to and reading from the array. See Figure 1 for a visual illustration.

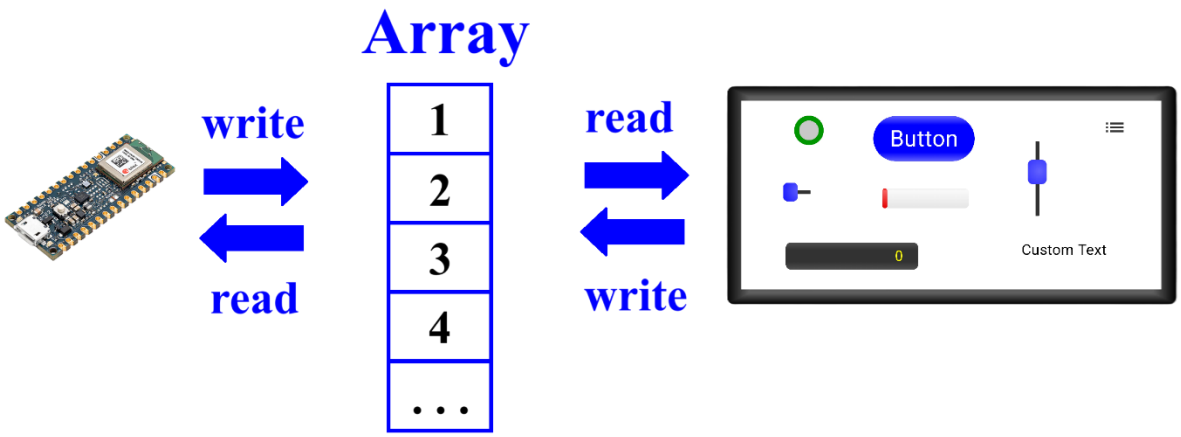

Figure 1. How It Works

The microcontroller can read to and write from the array using the library's "read" and "write" methods. The app can read to and write from the array using the custom interface items (buttons, switches, displays, etc.). Some of the interface items (such as the buttons and the sliders) write to the array. For these items, you can change the array index that the item writes to. You can also change parameters such as the value that is written. Other interface items (such as the progress bars and the LEDs) read from the array. For these items, you can change the array index that the item reads from. There are also other parameters that can be adjusted as well.

Tutorials

Tutorial 1: Getting Started

Requirements:

Custom Robot Control app

Arduino IDE

Custom Robot Control library for Arduino

Arduino Nano 33 BLE, Arduino UNO WiFi Rev2, or a similar supported microcontroller

When you first open the Custom Robot Control app, you should see a screen similar to Figure 2. This is the default interface. This screen is where you will be able to communicate with your microcontroller. You can edit this screen to meet your needs, but for this tutorial we will not need to edit it. Clicking the icon on the top right corner of the screen opens the menu. We will need to do this shortly.

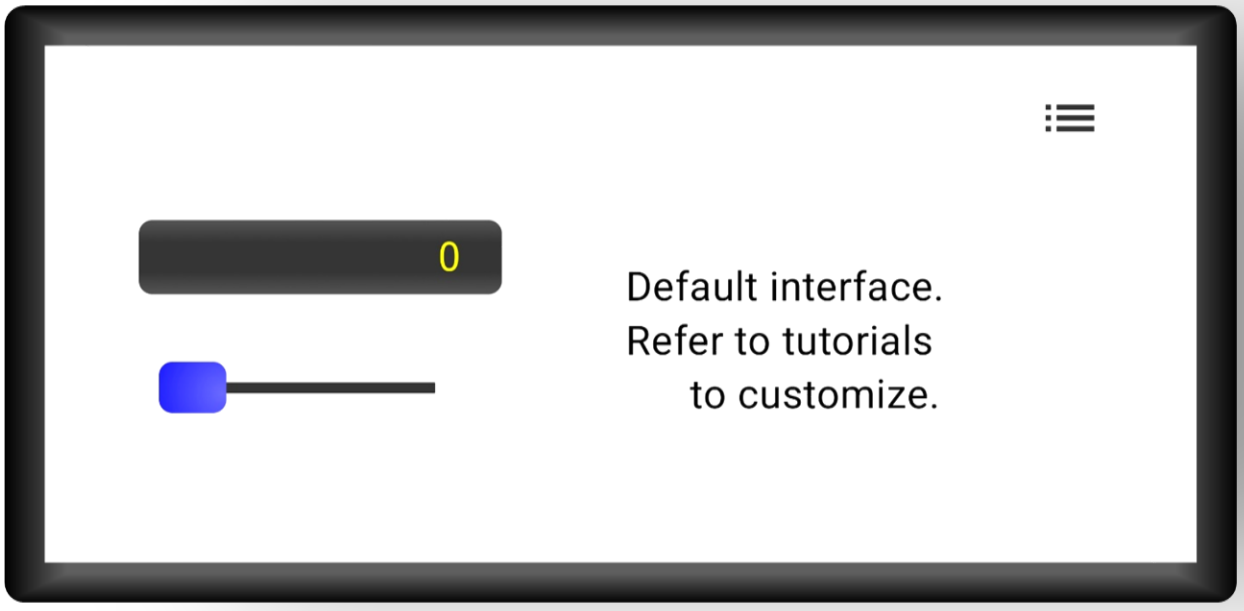

Figure 2. Default Screen

The default interface is configured to work with the “complete.ino” example sketch from the Custom Robot Control library. This library can be installed using the Arduino Library Manager or at this repository. Upload the “complete.ino” example sketch to the microcontroller using the Arduino IDE. Open the menu in the app using the icon on the top right corner of the screen. You should see a screen similar to Figure 3. Make sure that your microcontroller is powered on. Then, press the “connect” menu button. The status should change from “not connected” to “scanning” and finally to “connected.” Close the menu using the “x” on the top left corner. You should return to the main screen (Figure 2). The numerical display should update with information from the microcontroller. Open the serial monitor in the Arduino IDE. Then, adjust the slider in the app and watch as the values are printed to the serial monitor. Take a few moments to look over the comments in the “complete.ino” sketch to understand what is happening. The code should be straightforward to understand for anyone with any programming experience, and the comments within the code explain what is going on. If you haven’t already, I highly recommend reading How it Works to get a better idea of how the app and the microprocessor communicate. When you are finished, feel free to continue to Tutorial 2.

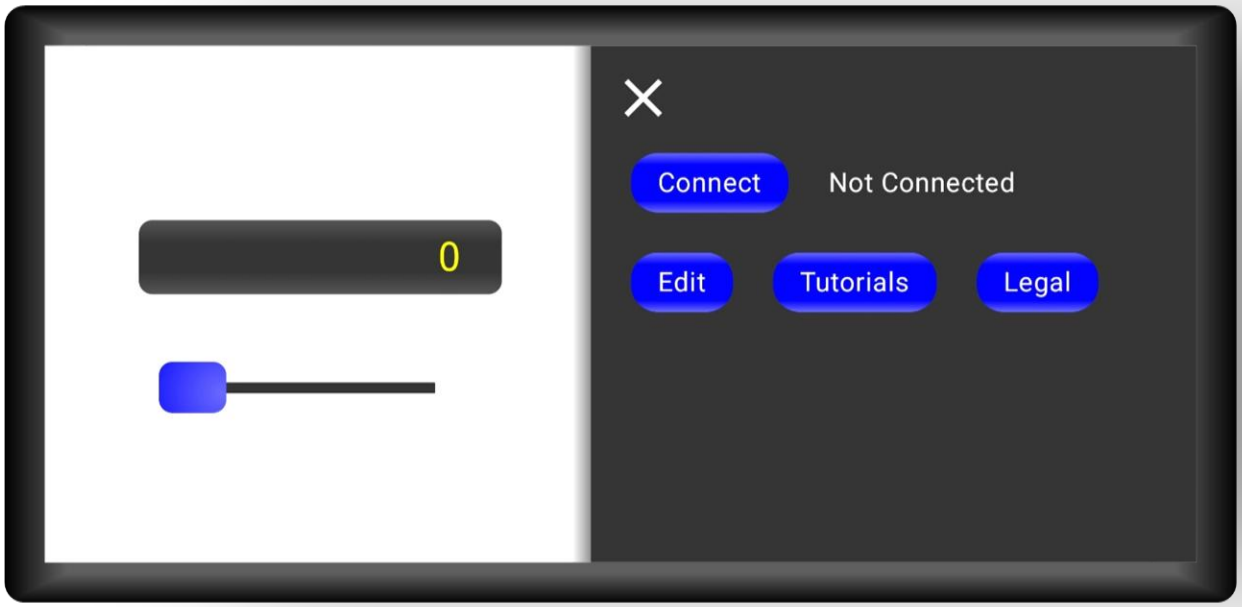

Figure 3. Menu

Tutorial 2: Customizing the Interface

Requirements:

Completion of Tutorial 1

Custom Robot Control app

Arduino IDE

Custom Robot Control library for Arduino

Arduino Nano 33 BLE, Arduino UNO WiFi Rev2, or a similar supported microcontroller

The robot controller interface on the home screen can be customized to fit your needs. Go to the menu and tap the “edit” button. Then close the menu. There should be two new buttons on the home screen: “add item” and “save” (Figure 4).

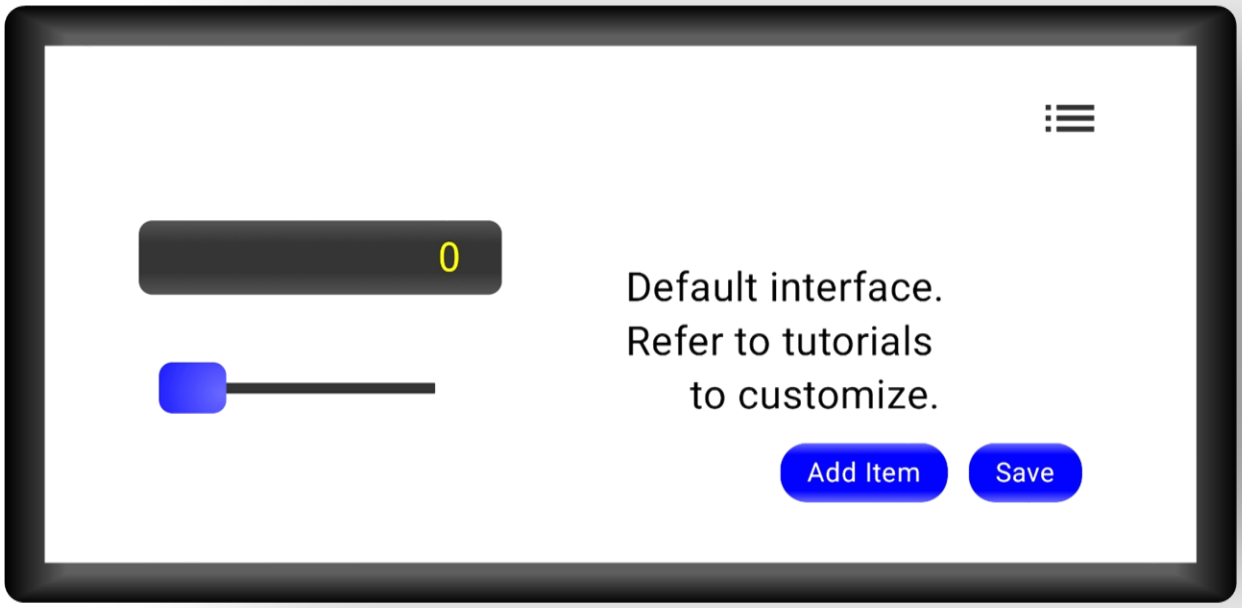

Figure 4. Editing the Home Screen

All of the custom controls on the home screen can be moved. Experiment by dragging the numerical display to the top center of the screen. Many controls can also be resized by dragging the bottom right corner. Experiment by resizing the slider. Double-tapping on each item brings up more options. Double-tap on the first line of text that says, “default interface.” You should see the options page (Figure 5). You can edit the text in the white box, but you can simply delete the text for now by tapping on the “delete” button. Repeat for the other two lines of text. You should then find yourself on the home screen.

Figure 5. Menu Options for the “Custom Label”

You can add another item by tapping on the “add item” button. You should see a list of options. Tap the item that you want to add. The item should appear on the top left corner of the home screen. In my case, I added a button. Feel free to move and resize the item. Double-tap the item that you added to display its menu. The menu options are explained in the manual. To close the menu, scroll to the bottom and tap the “exit” button. Tap the “save” button on the home screen to save your changes.

If you haven’t already, feel free to add and remove items to create your desired controller. Up to ten items can be added. The manual discusses each interface item, how to use it, and the options available to configure it.

Manual

Button

The button sends one value when it is pressed and another value when it is released. The button can be moved by dragging it while in “edit” mode. The button can be resized by dragging its bottom right corner while in “edit” mode. The menu can be accessed by double-clicking the button while in “edit” mode.

Menu Options:

- Array Index — This is the array index that the button writes to.
- Text — This is the text that appears inside the button.
- Default Value — This is the value that is written to the array when the button is released.
- Value when Pressed — This is the value that is written to the array when the button is pressed.
- Delete — This deletes the button.
- Exit — This closes the menu.

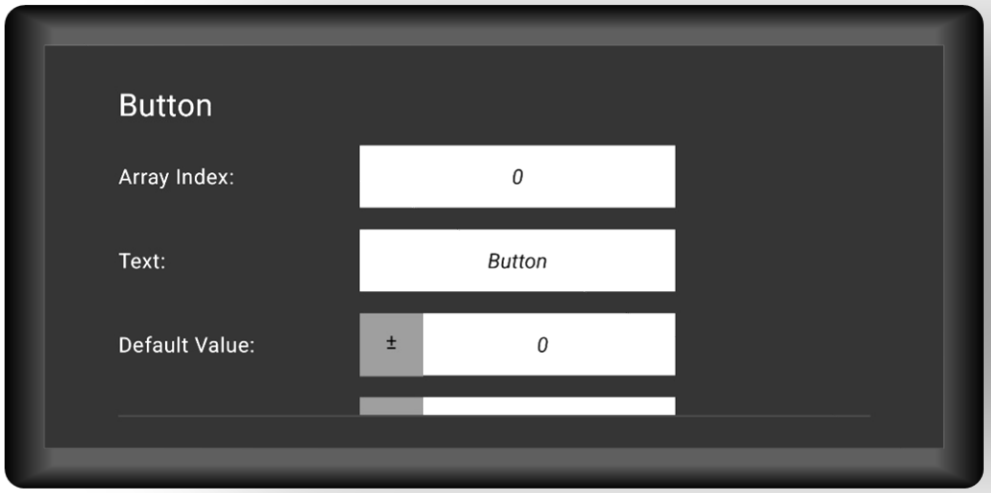

Figure 6. Menu Options for the Button

Switch (Horizontal / Vertical)

The switch can be on or off. The switch sends one value when it is turned on and another value when it is turned off. The switch can be moved by dragging it while in “edit” mode. It cannot be resized. The menu can be accessed by double-clicking the switch while in “edit” mode.

Menu Options:

- Array Index — This is the array index that the switch writes to.
- “Off” Value — This is the value that is written to the array when the switch is in the “off” (far left or bottom) position.
- “On” Value — This is the value that is written to the array when the switch is in the “on” (far right or top) position.
- Delete — This deletes the switch.
- Exit — This closes the menu.

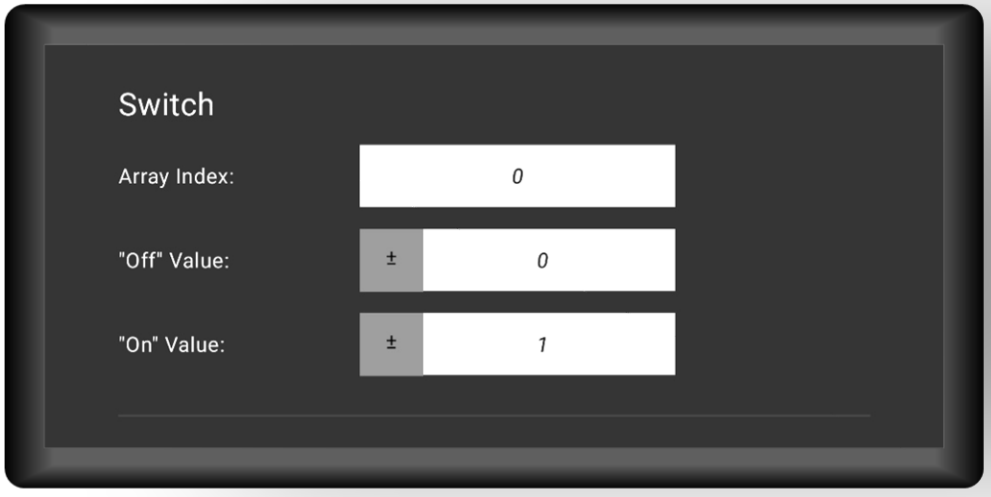

Figure 7. Menu Options for the Switch

Slider (Horizontal / Vertical)

The slider sends a value within a numerical range. This value depends on the position of the slider. The slider can be moved by dragging it while in “edit” mode. The horizontal slider can be resized by dragging its far-right corner while in “edit” mode. The vertical slider can be resized by dragging its bottom corner while in “edit” mode. The menu can be accessed by double-clicking the slider while in “edit” mode.

Menu Options:

- Array Index — This is the array index that the slider writes to.
- Minimum Value — This is the value that is written to the array when the slider is at its far left (or bottom) position.
- Maximum Value — This is the value that is written to the array when the slider is at its far right (or top) position.
- Delete — This deletes the slider.
- Exit — This closes the menu.

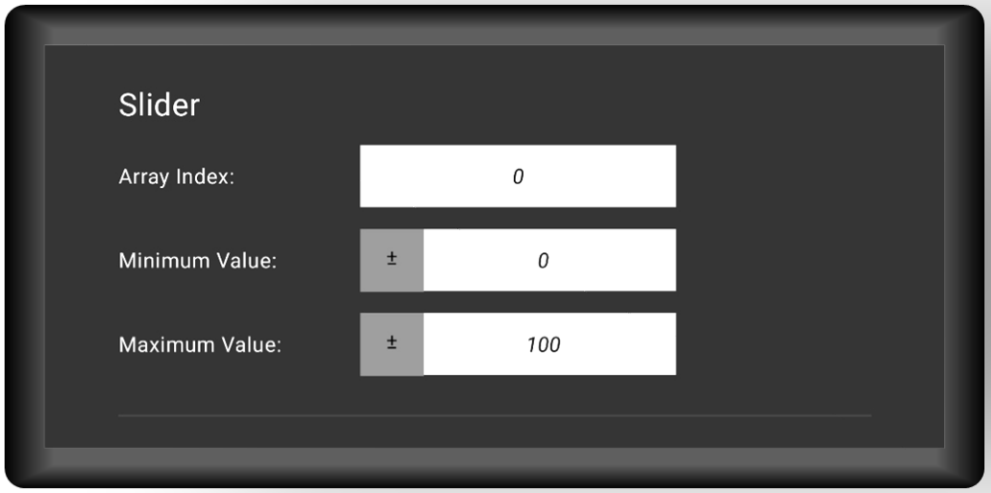

Figure 8. Menu Options for the Slider

LED

The LED turns “on” or “off” depending on its array value. “Off” is represented by a transparent white color, and “on” is represented by a color that can be chosen. The LED can be moved by dragging it while in “edit” mode. It cannot be resized. The menu can be accessed by double-clicking the LED while in “edit” mode.

Menu Options:

- Array Index — This is the array index that the LED reads from.
- Threshold Value — If the array value is greater than or equal to this value, the LED turns on. If not, the LED turns off.
- Color — This is the color of the LED.
- Delete — This deletes the LED.
- Exit — This closes the menu.

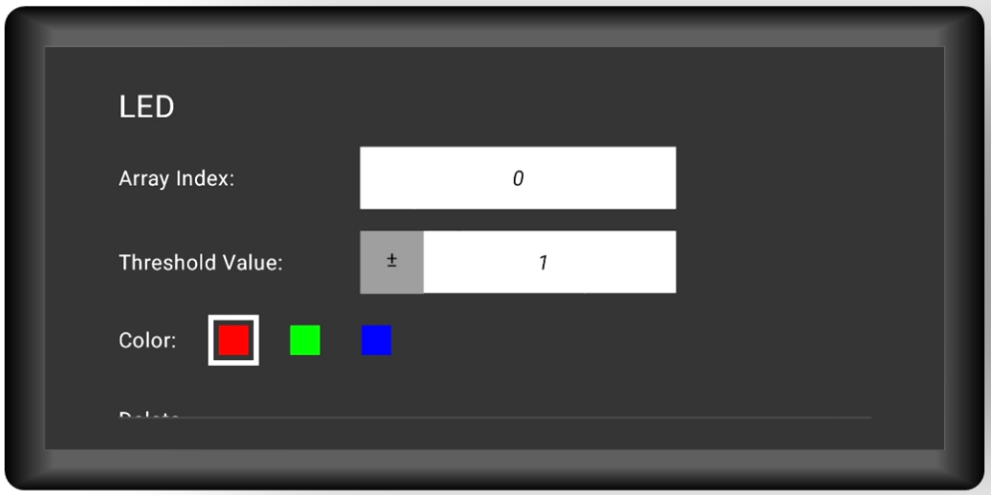

Figure 9. Menu Options for the LED

Progress Bar (Horizontal / Vertical)

The progress bar displays a visual representation of its array value. It corresponds to the slider. The progress bar can be moved by dragging it while in “edit” mode. The horizontal progress bar can be resized by dragging its far-right corner while in “edit” mode. The vertical progress bar can be resized by dragging its bottom corner while in “edit” mode. The menu can be accessed by double-clicking the progress bar while in “edit” mode.

Menu Options:

- Array Index — This is the array index that the progress bar reads from.
- Minimum Value — This is the minimum value that can be displayed by the progress bar.
- Maximum Value — This is the maximum value that can be displayed by the progress bar.
- Color — This is the color of the progress bar.
- Delete — This deletes the progress bar.
- Exit — This closes the menu.

Figure 10. Menu Options for the Progress Bar

Numerical Display

The numerical display directly displays its array value as text. It is especially useful for debugging. It can be moved by dragging it while in “edit” mode. It cannot be resized. The menu can be accessed by double-clicking the numerical display while in “edit” mode.

Menu Options:

- Array Index — This is the array index that the numerical display reads from.
- Delete — This deletes the numerical display.
- Exit — This closes the menu.

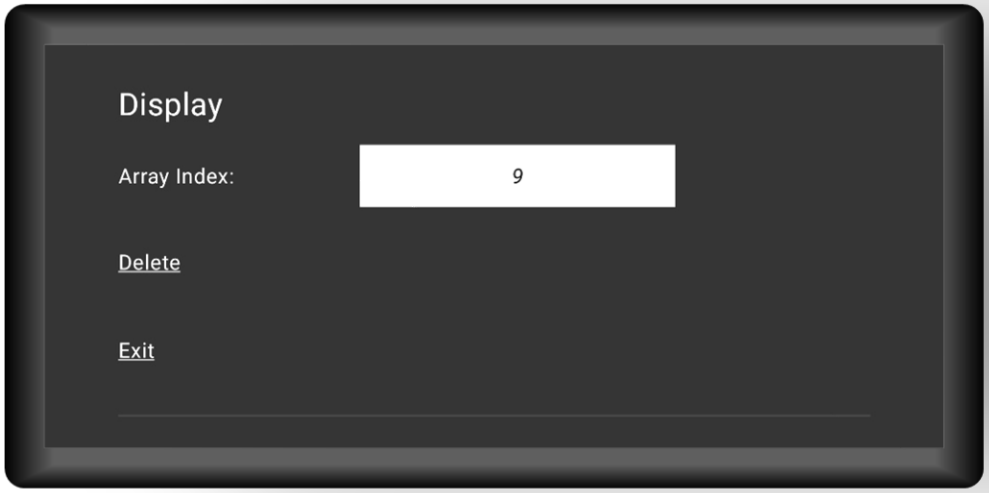

Figure 11. Menu Options for the Numerical Display

Custom Label

The custom label displays editable text. The text is limited to 25 characters. It is useful for labeling other interface items or leaving comments for later. The custom label can be moved by dragging it while in “edit” mode. It resizes automatically. The menu can be accessed by double-clicking the custom label while in “edit” mode.

Menu Options:

- Text — This is the text that is displayed.
- Delete — This deletes the custom label.
- Exit — This closes the menu.

Figure 12. Menu Options for the Custom Label