More Simple Arrays—Another Way to Initialize Variables
(Project 3 – part 2)
In this tutorial you will:

- Learn how to edit a project
- Learn another way to initialize variables
- Create multiple variables in order to accomplish a challenge!
- Learn more about rotating the satellite to face different directions

Remember: Attitude describes the direction the satellite is facing.
More on Assigning Values to Variables

- There is more than one way to assign a value to a variable in the graphical editor.

- So far you have assigned the values of an array individually, as shown on the right.

- Next we will show you how to assign the values of the array when the variable is declared.

- **But first** we will show you how to edit a project so you can see that the two methods give the same results.
Open your Project

- Open the project you just created when learning about arrays. (“Project 3”)

- If the project is not already open
  - Select Open Project from the IDE Menu
  - Click on “Project 3” and then “Select” to open the project

- You should see the project shown here.
• To remove a **group** of blocks from your loop:
  • Click on the **topmost** block in the group
  • Drag the group of blocks out of the loop.
Edit your Project, cont.

- To remove a **single** block from a group of blocks:
  - Peel blocks off from the bottom
  - Save this block for later
- To delete a **group** of blocks:
  - Click on the **topmost** block in the group
  - Drag them into trash (watch for trash can lid to open)
Edit your Project, cont.

• Now you can drag the remaining “setAttitudeTarget” block back into the loop

• Your program should look like this:
Initializing Arrays

- Go to the Init page
- When you created the array “attitude [3]” you entered:
  - “float”
  - “attitude”
  - “3”
- This time **initialize the array here** by typing in the values of the array into the initial value spaces
  - For the satellite to point in the positive x direction- type: -1,0,0
    - The first value sets [0]
    - The second value sets [1]
    - The third value sets [2]

<table>
<thead>
<tr>
<th>To point the satellite in the following directions:</th>
</tr>
</thead>
<tbody>
<tr>
<td>+/- x direction</td>
</tr>
<tr>
<td>------------------------------------------</td>
</tr>
<tr>
<td>set: [0] =</td>
</tr>
<tr>
<td>set: [1] =</td>
</tr>
<tr>
<td>set: [2] =</td>
</tr>
</tbody>
</table>
• Compile, Simulate

• In the Simulation Settings pop-up box:
  - "Maximum Time":
    • Change from 90 seconds to 20 seconds
  - Click "Simulate" button

• View simulation
  • The SPHERE will rotate just as it did before when you set the values individually within the program

• Return to the Graphical Editor page by closing the simulation window (top menu bar)
Look at your code

• Here is your program with the array values initialized on the init page

```c
1  void init() {
2    attitude[0] = -1;
3    attitude[1] = 0;
4    attitude[2] = 0;
5  }
```

• Compare to your program with the array values defined separately

```c
1  void loop() {
2    api.setAttitudeTarget(attitude);
3  }
```
• Next go to the Init page and delete the array attitude[3] by dragging it to trash

• On the next few slides you will create and name arrays for specific pointing directions
  • For example:
    you will initialize one array with the name:
    \texttt{pointposx} (to \texttt{point} in the \texttt{positive} \texttt{x} direction)
    and initialize another array with the name
    \texttt{pointnegy} (to \texttt{point} in the \texttt{negative} \texttt{y} direction)
  • This will make it easy for you to recognize and use your arrays
• First declare two separate arrays that point the SPHERE in +/-x direction
• For the +x direction create “pointposx” which will be initialized to: point in the positive x direction:
  • Select purple array initialization block
    • Type: select “float”
    • Name: “pointposx”
    • Length: 3 (=array size)
    • Set Initial value to: 1,0,0
• For the -x direction create “pointnegx” which will be initialized to: point in the negative x direction as follows:
  • Select purple array initialization block
    • Type: select “float”
    • Name: “pointnegx”
    • Length: 3
    • Set Initial value to: -1,0,0

To point the satellite in the following directions:

<table>
<thead>
<tr>
<th></th>
<th>+/- x direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>set: [0]</td>
<td>+/-1</td>
</tr>
<tr>
<td>set: [1]</td>
<td>0</td>
</tr>
<tr>
<td>set: [2]</td>
<td>0</td>
</tr>
</tbody>
</table>
• Use the table as a guide and declare 4 more variables which point in the
  • +/-y directions (pointposy, pointnegy)
  • +/-z directions (pointposz, pointnegz)

• Remember:
  • Select purple array initialization block
    • Type: select “float”
    • Name: enter name
    • Length: 3 (=array size)
    • Set Initial value (as shown in the table)

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<th>+/- x direction</th>
<th>+/- y direction</th>
<th>+/- z direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>set: [0] =</td>
<td>+/-1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>set: [1] =</td>
<td>0</td>
<td>+/-1</td>
<td>0</td>
</tr>
<tr>
<td>set: [2] =</td>
<td>0</td>
<td>0</td>
<td>+/-1</td>
</tr>
</tbody>
</table>

• The +y direction should be initialized to: 0,1,0

• Can you figure out the rest?
• Return to the **main** page
• Now in the “setAttitudeTarget” block you can choose the array which sends the satellite to any of the pointing directions
• Pick one and try it!
• Compile, simulate and view simulation.
  • Remember to use the zoom-in tool to look at the satellite
• Next you will use your new arrays to try to accomplish a challenge
• Click “Back to Project”
Preparation for the Challenge

- First you will need to change the initial attitude of the satellite in the simulation setting window.
- Select Simulate
  * “Maximum Time”:
    - Change from 90 seconds to 20 seconds
  *Initial Position and Attitude
    - For this challenge, SPH1 should start pointing in the negative x direction
    - Set SPH1 to (you may need to enter this each time!)
      - $\text{Attx} = -1$
      - $\text{Atty} = 0$
      - $\text{Attz} = 0$
The Challenge

- Use your new arrays and try to rotate the satellite so that you can see all the different sides shown below.
If you completed the Challenge, congratulations!

Here is another question for you:
- Suppose you wanted to rotate the satellite 180 degrees?
  - How would you do that?

- What if you wanted to rotate the satellite 90 degrees?
  - How would you do that?
• To rotate the satellite 180 degrees
  – Simply change the pointing direction from positive to negative or negative to positive
  – For example:
    • If the satellite starts pointing in the negative x direction
    • Then set the attitude target to pointposx

• To rotate the satellite 90 degrees
  – Change the pointing direction from the x axis to the y axis
  – For example:
    • If the satellite starts pointing in the negative x direction
    • Then set the attitude target to pointposy
• Congratulations!
  • You know how to edit a project by deleting blocks, and deleting arrays
  • You have learned another way to assign values to your arrays
  • You learned more about rotating the satellite to face different directions
  • Maybe you even solved the Challenge!

![Satellite Images]