Advanced Mechatronics Engineering

MCTR903

Assignment 1

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**Problem1 Solution**

Part 1:

A) Mealy Machine

States:

* : First floor
* : Second floor
* : Third floor.

Inputs:

* : Go to the 1st floor
* : Go to the 2nd floor
* : Go to the 3rd floor

Outputs:

* : Go up one floor
* : Go up two floors
* : Go down one floor
* : Go down one floor
* : Do nothing

State Diagram:

/

/

“2nd floor”

“1st floor”

/

/

/

/

/

/

“3rd floor”

/

State transition table:

|  |  |  |  |
| --- | --- | --- | --- |
| Input  State |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

B) Moore Machine

States:

* : First floor
* : Second floor
* : Third floor
* : 1st to 2nd
* : 2nd to 1st
* : 1st to 3rd
* : 3rd to 1st
* : 2nd to 3rd
* : 3rd to 2nd.

Inputs:

* : Go to the 1st floor
* : Go to the 2nd floor
* : Go to the 3rd floor

Outputs:

* : Go up one floor
* : Go up two floors
* : Go down one floor
* : Go down one floor
* : Do nothing

State Diagram:

1st to 2nd

“3rd floor”

“1st floor”

3rd to 1st

2nd to 1st

3rd to 2nd

1st to 2nd

2nd to 3rd

“2nd floor”

State transition table:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Input State/output | |  |  |  |
| /s |  |  |  |  |
| /s |  |  |  |  |
| /s |  |  |  |  |
| / |  |  |  |  |
| / |  |  |  |  |
| / |  |  |  |  |
| / |  |  |  |  |
| / |  |  |  |  |
| / |  |  |  |  |

Simplified solution

States:

* : First floor
* : Second floor
* : Third floor
* : Going up one floor
* : Going down one floor
* : Going up two floors
* : Going down two floors

Inputs:

* : Go to the 1st floor
* : Go to the 2nd floor
* : Go to the 3rd floor

Outputs:

* : Go up one floor
* : Go up two floors
* : Go down one floor
* : Go down one floor
* : Do nothing

State Diagram:

“up one floor”

“1st floor”

“2nd floor”

“down one floor”

“2nd floor”

“down two floor”

“up two floor”

“3rd floor”

“2nd floor”

“1st floor”

State transition table:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Input  State/output | |  |  |  |
| /s |  |  |  |  |
| /s |  |  |  |  |
| /s |  |  |  |  |
| / |  |  |  |  |
| / |  |  |  |  |
| / |  |  |  |  |
| / |  |  |  |  |

Part2: Simulink and MATLAB code

Mealy machine MATLAB function



Moore machine MATLAB function



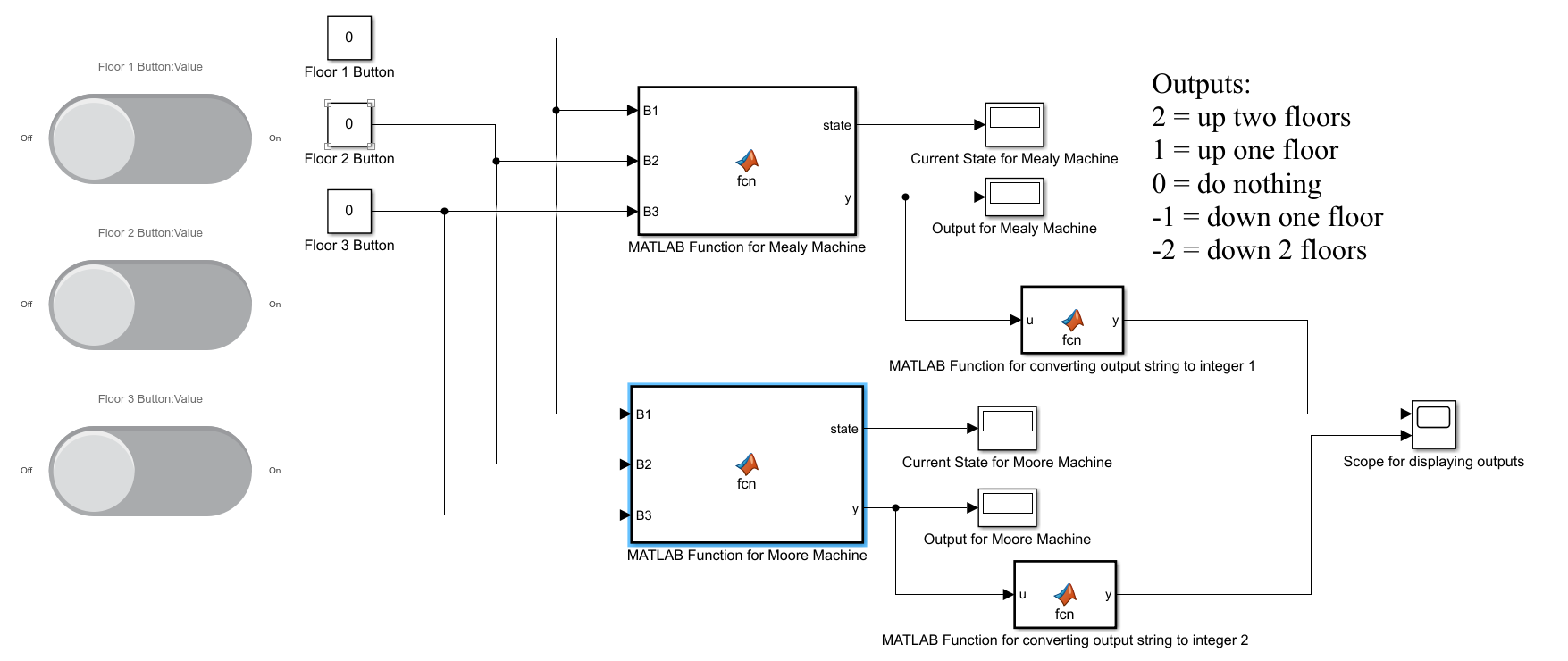


Modified Moore machine MATLAB function

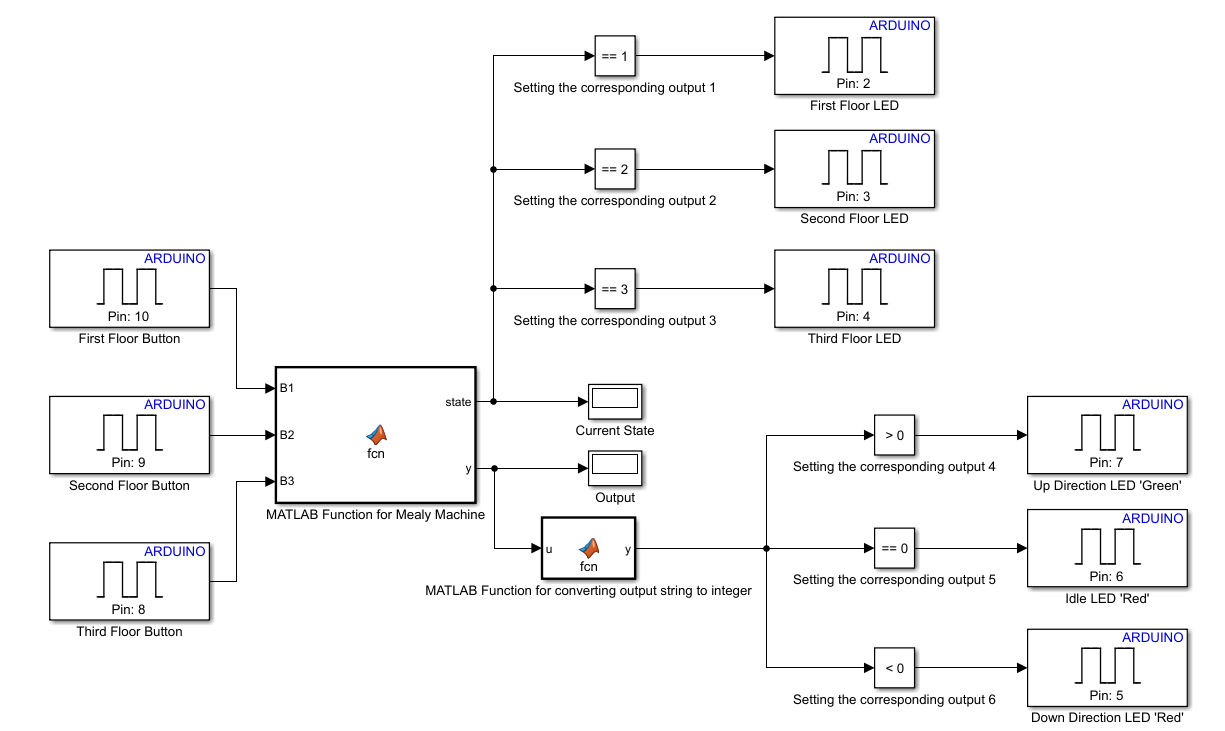




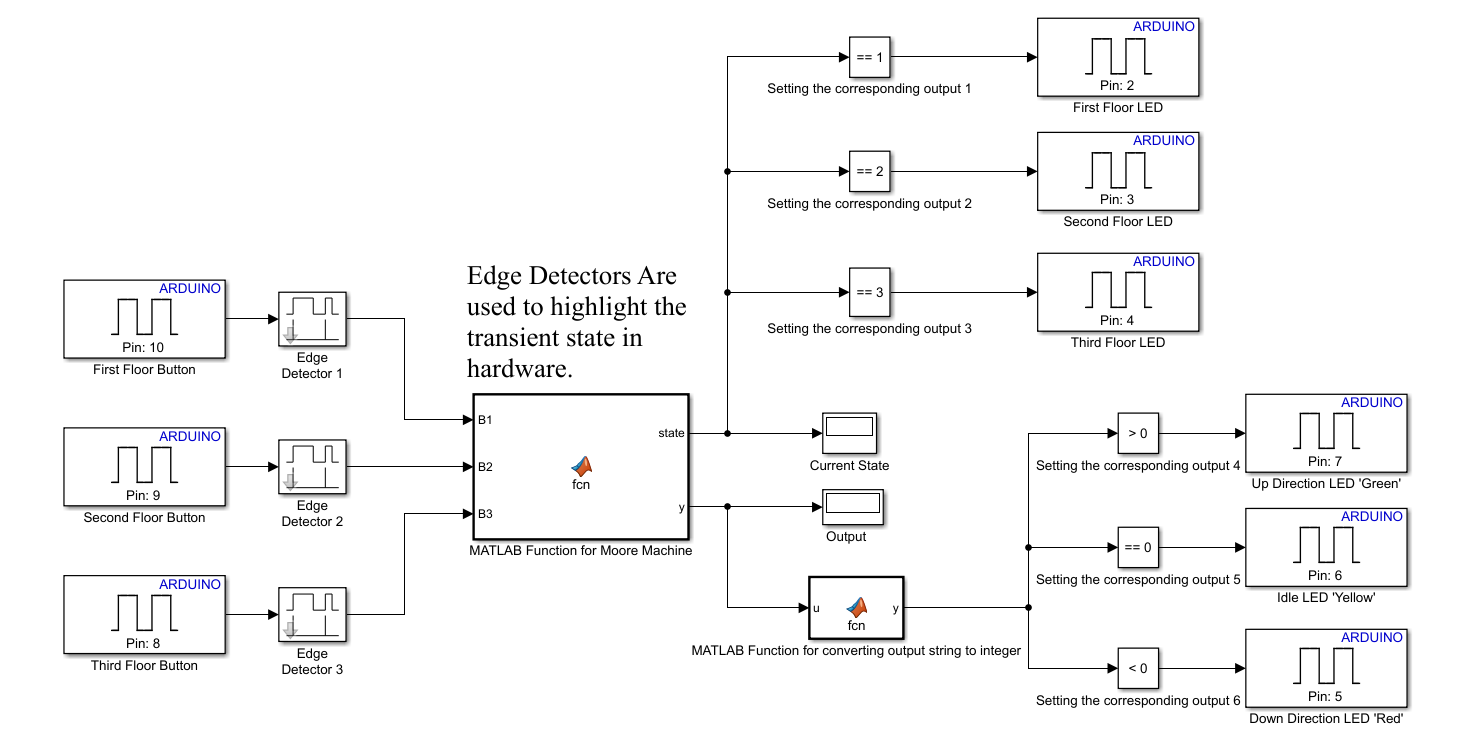
Simulink model for Mealy and Moore machines with switches and a scope



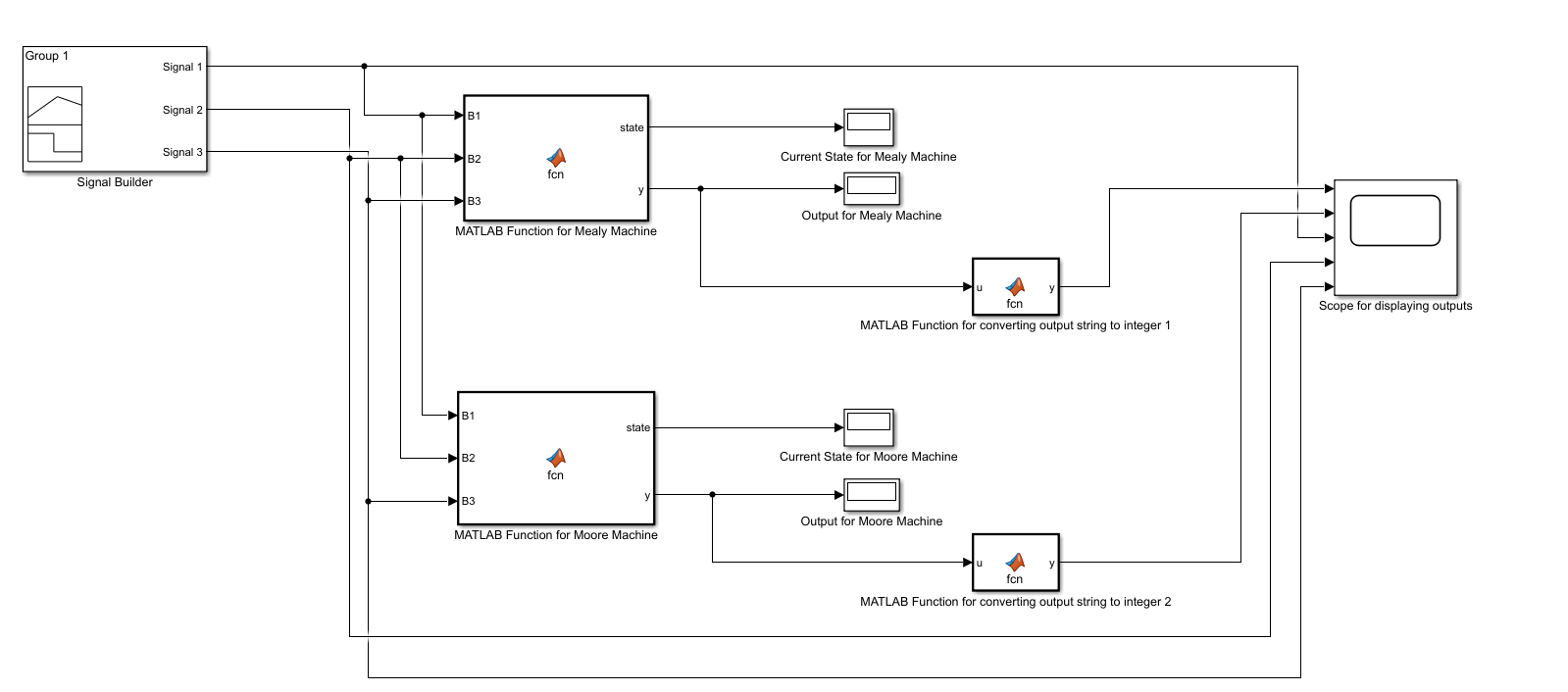
Simulink model of the Mealy machine for Arduino



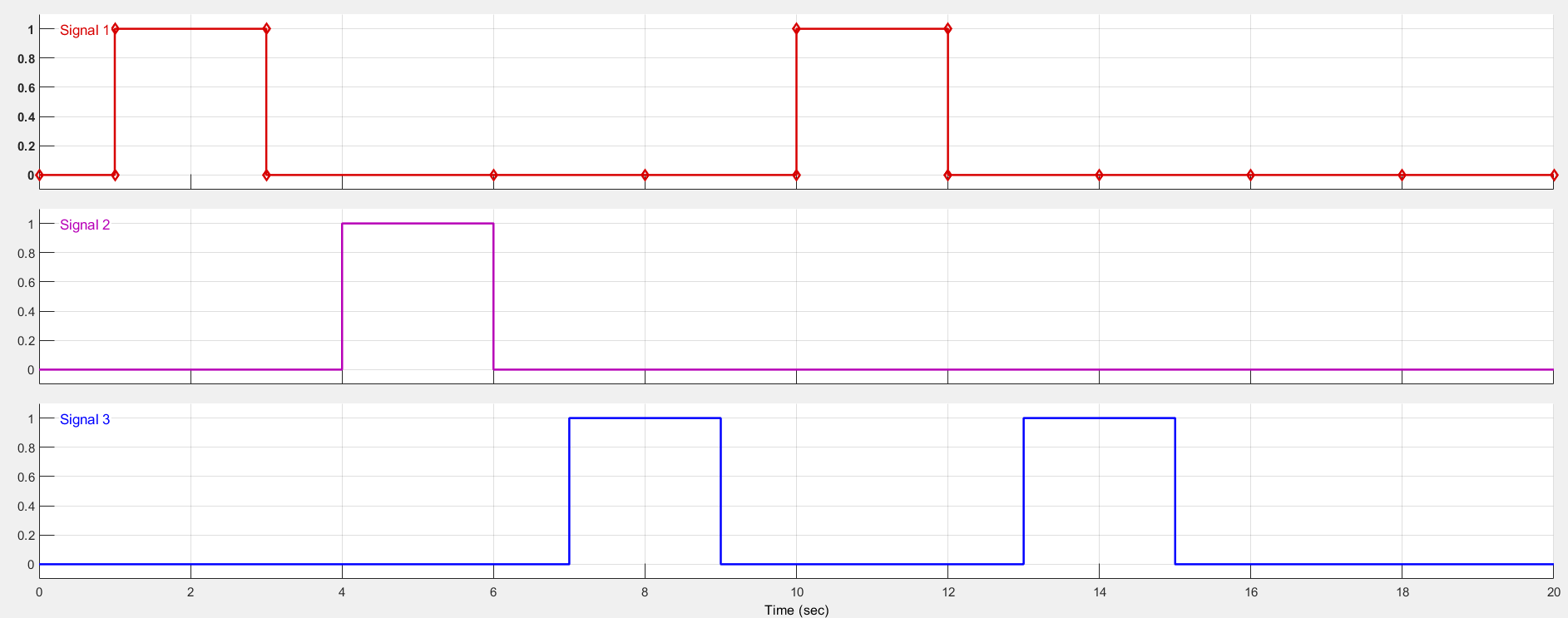
Simulink model of the Moore machine for Arduino



Part3: Using switches or signal builders to change the input

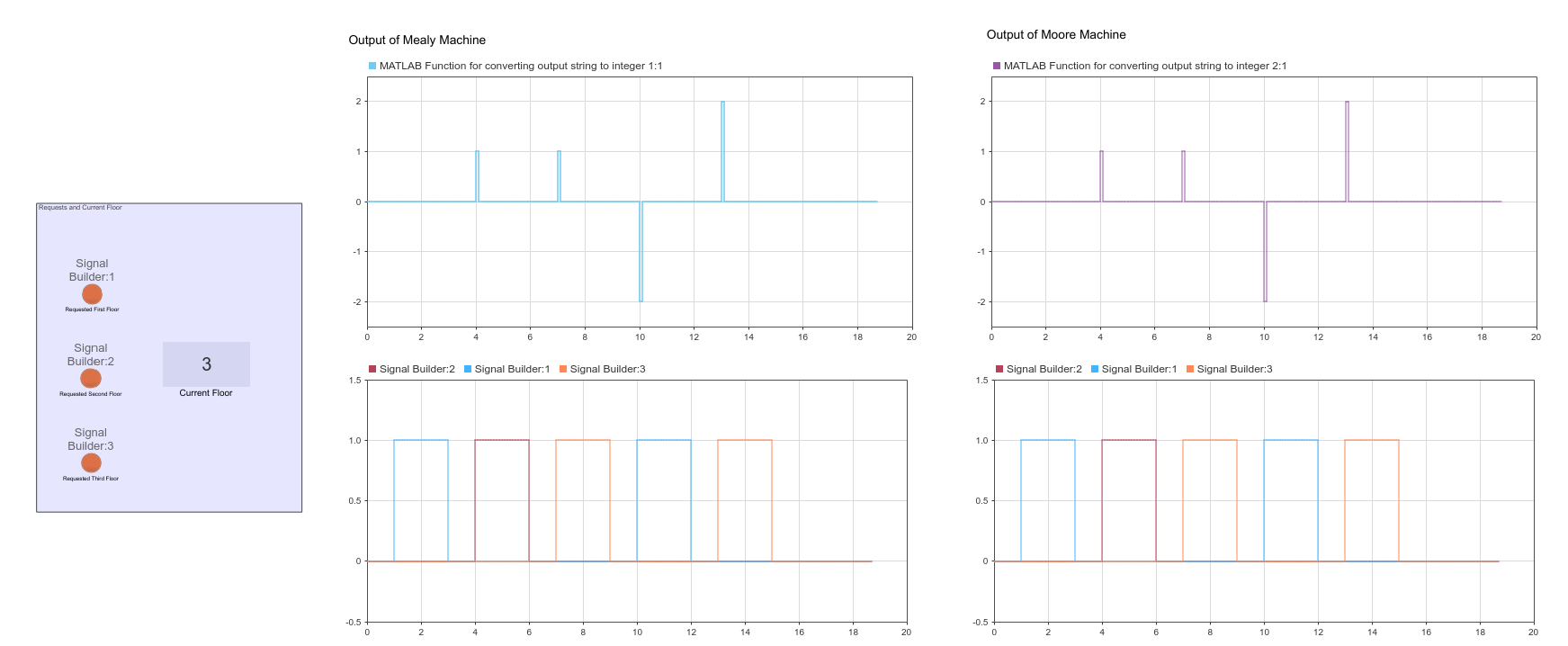


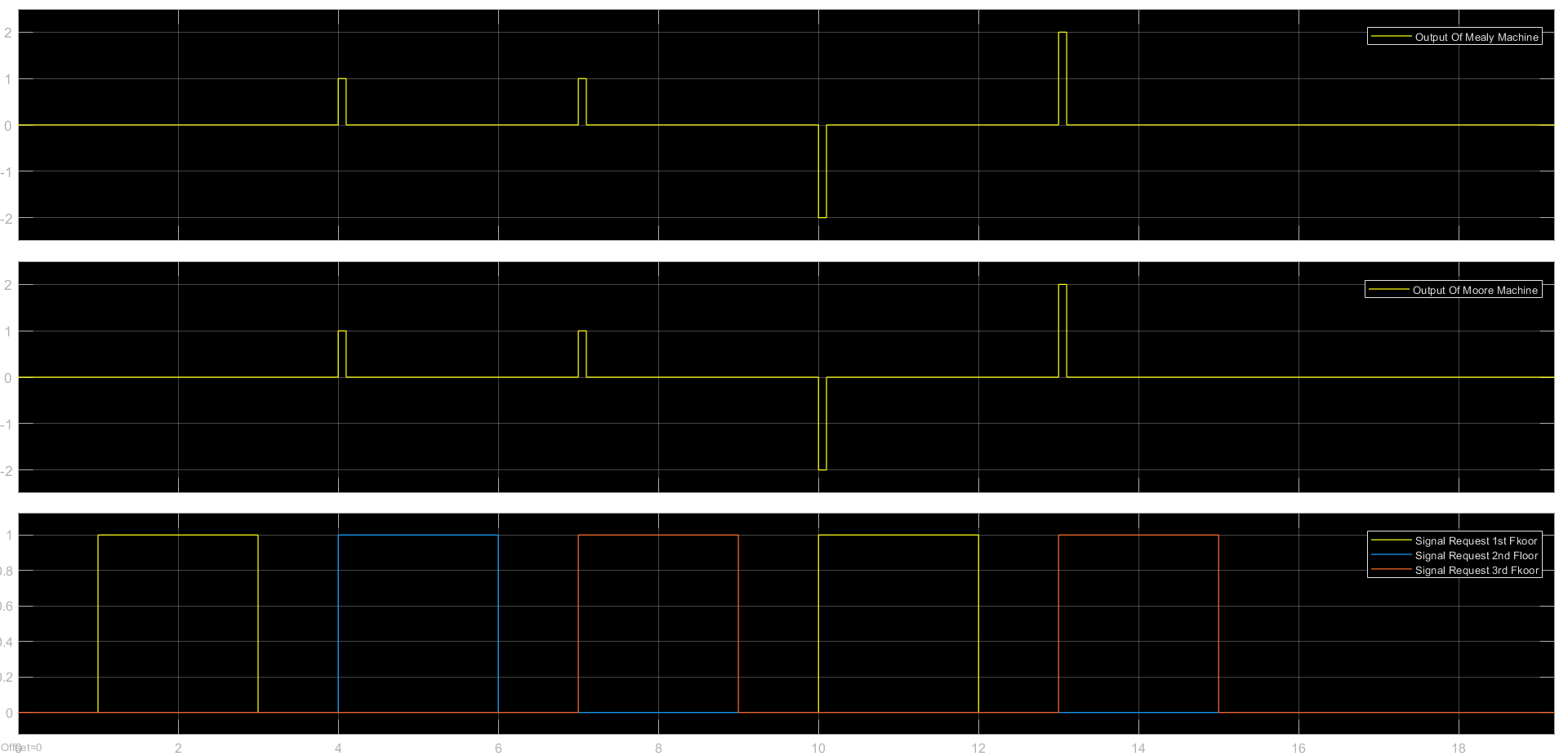
Signals used in the signal builder



Part 4: Plots showing triggering inputs and how this would change the

states and the outputs.

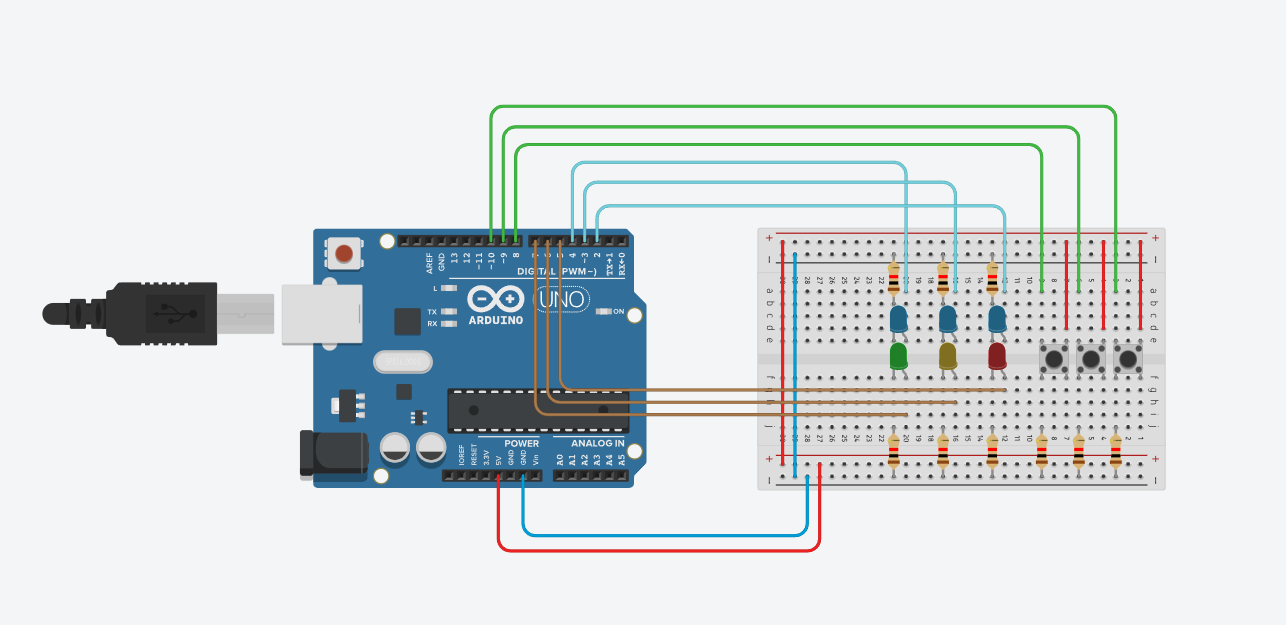




Part 5: Uploading the code on Arduino UNO

The code is uploaded using the Simulink support package for Arduino hardware.

Part 6. Arduino hardware and output.



The result of running the code on the hardware can be seen in the attached video.

Part7. Comparison between the Mealy and Moore machines.