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:

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

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

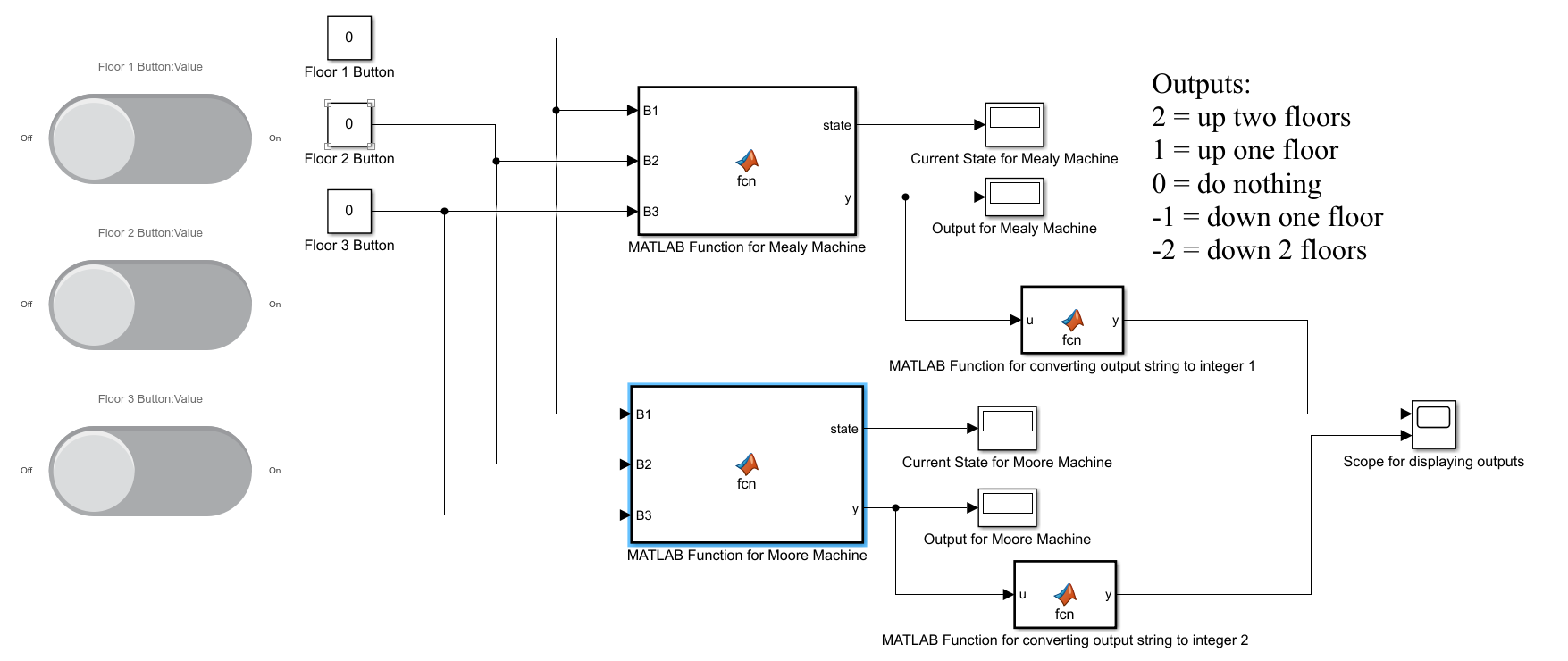
Mealy machine MATLAB function



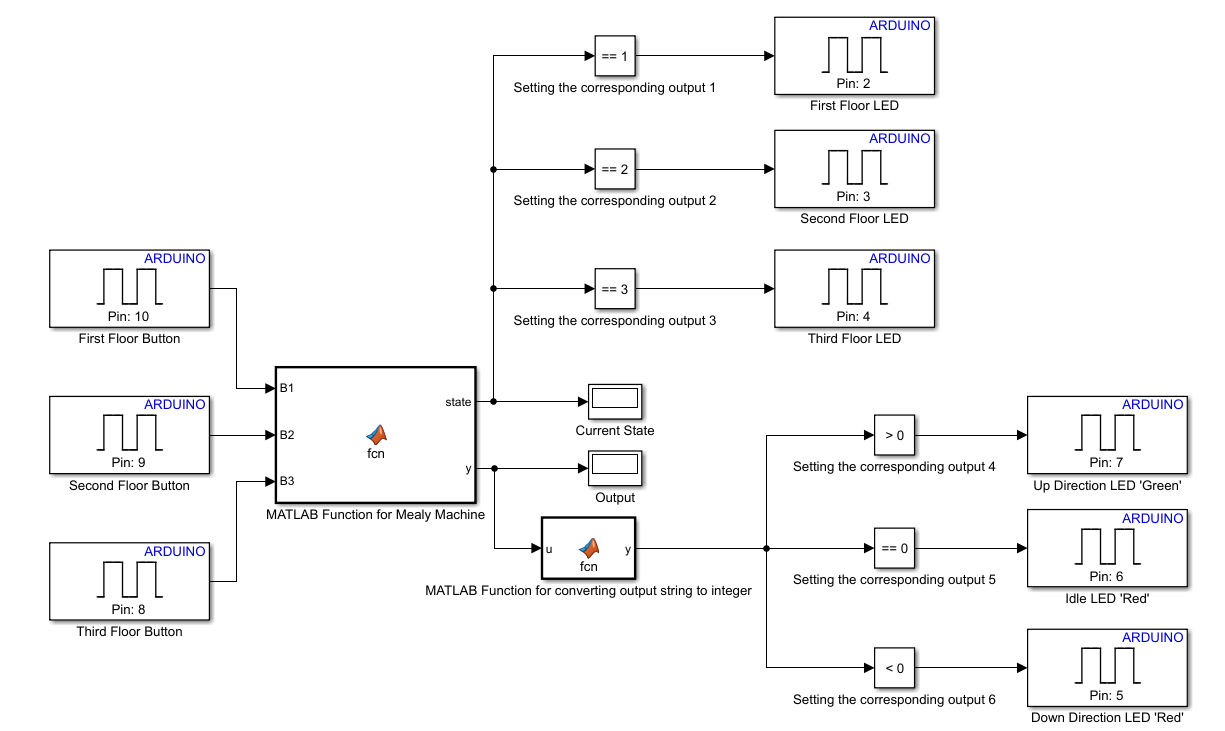
Moore machine MATLAB function



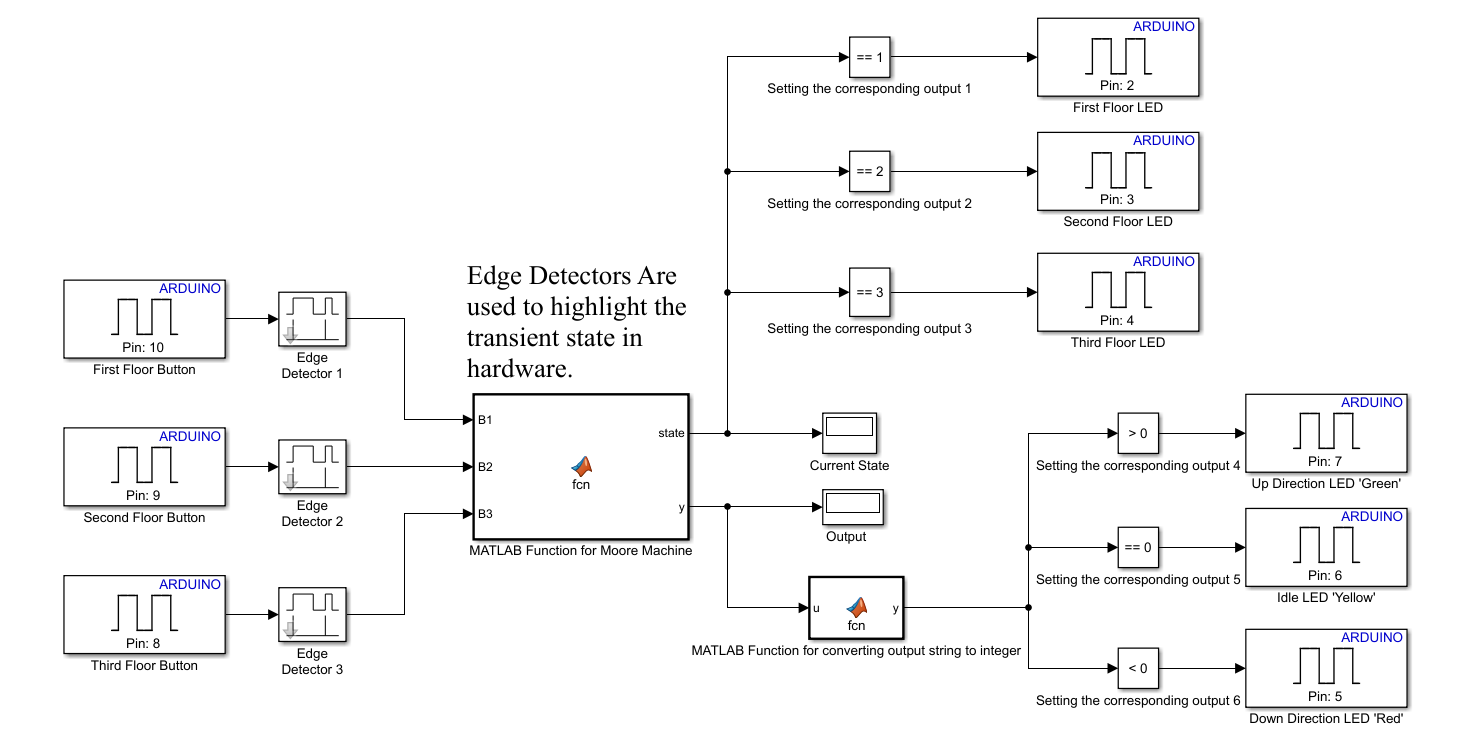
Simulink model for Mealy and Moore machines with switches and a scope



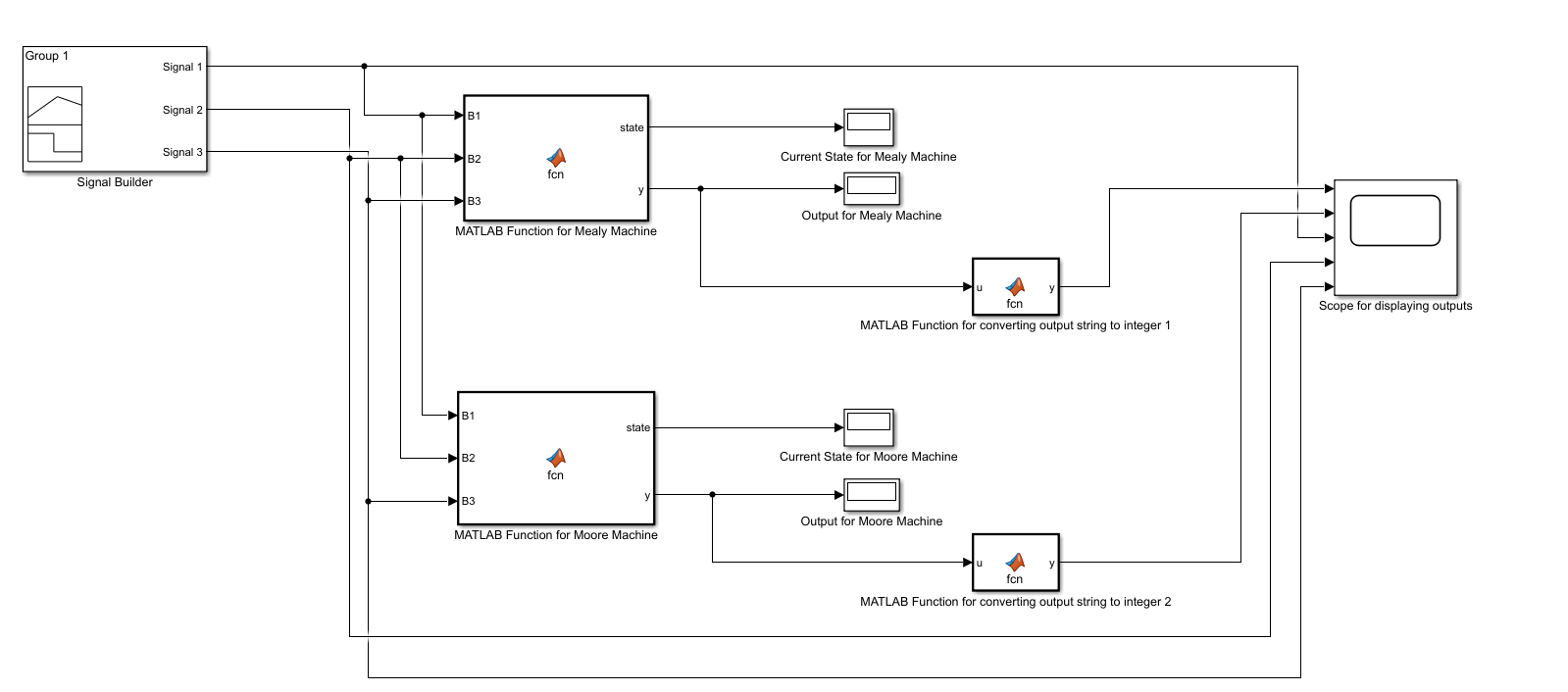
Simulink model of the Mealy machine for Arduino



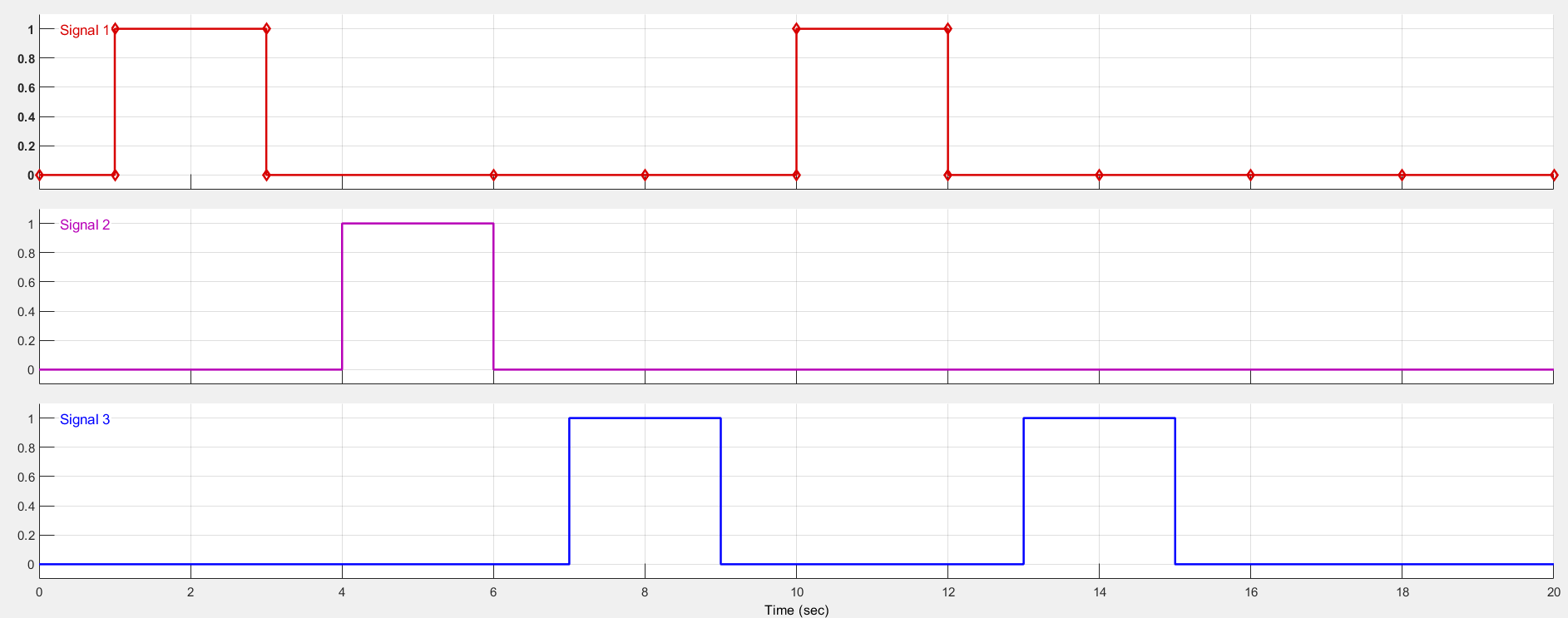
Simulink model of the Moore machine for Arduino



Part3: Using switches or signal builders to change the input

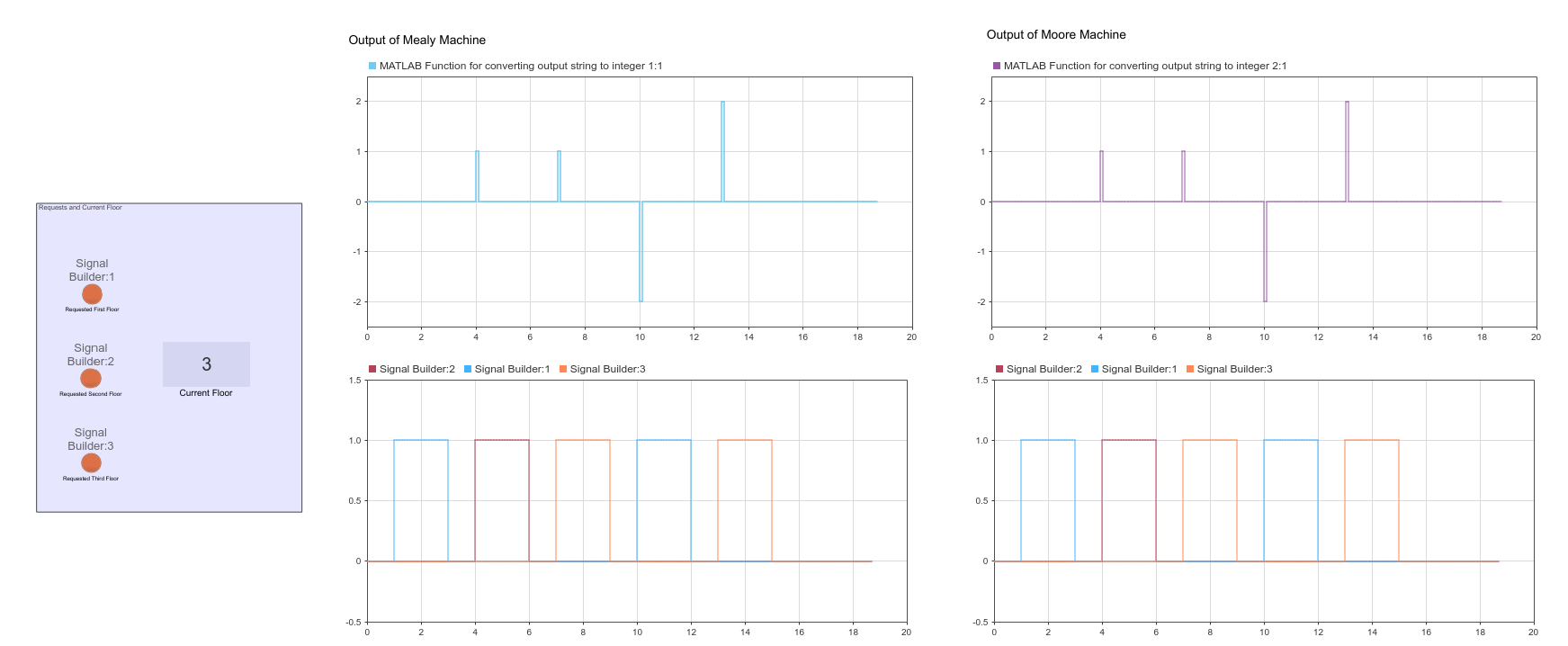


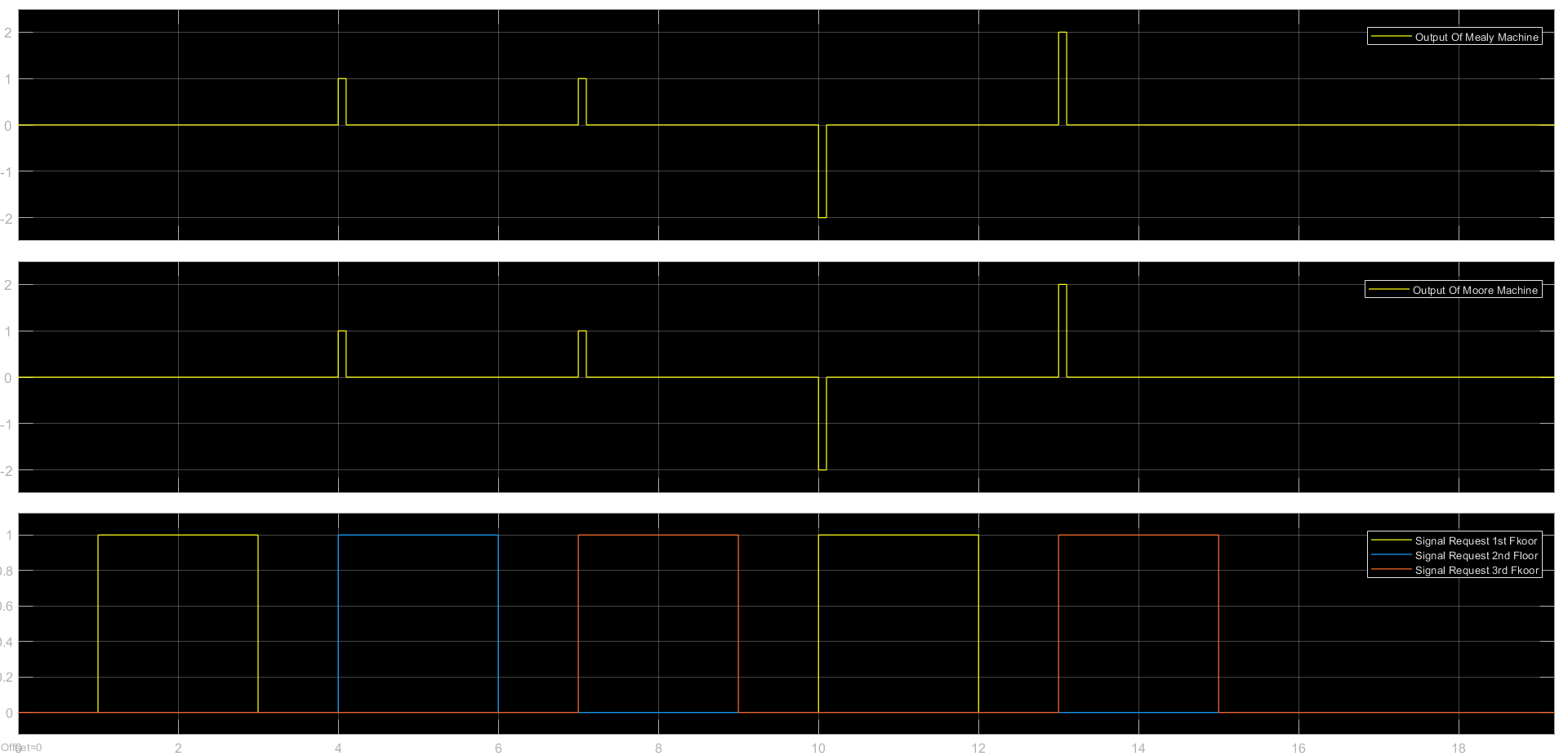
Signals used in the signal builder



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

states and the outputs.





Part 5: Comparison between the Mealy and Moore machines.

Part 6: Uploading the code on Arduino UNO

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