FSM Pt. 2 Assignment

In this assignment, you are required to implement the following algorithm to find the Greatest Common Divisor (GCD) of two numbers:

```
while (1) {
  while (!start);
  while (A != B) {
    if (A > B) {
      A = A - B;
    }
    else {  // A < B
      B = B - A;
    }
  }
  res = A; // or res = B because the should be equal
}
```

You are required to use the FSMD structure we discussed in the session, meaning you should use control signals as outputs from the FSM and as inputs to the datapath.

Deliverables

- FSM representation of the algorithm, with meaningful state names and output control signals to the datapath.
  If you intend to optimize the resulting FSM, show it before and after the optimization.
- Sketch of the datapath module and how the control signals affect it.
- RTL implementation of the controller, datapath, and the top module that combines them (gcd_controller.v, gcd_datapath.v, and gcd_top.v). Don't limit yourself to these modules, create as many sub-modules as you see fit.
- Simple testbench that checks the results for at least 2 sets of inputs.

Helping questions

- Do the slides cover all the needed algorithm-to-FSM transformations?
- Regarding the datapath, what sort of operations do I need? How many do I need to execute in a single state?