1. We discussed combining outputs with shift and bitwise OR in section 2.2.1. Can we "add" (+) different outputs instead of performing bitwise OR operations (section 3 of code inside the main loop)? Why?

Yes, we can do it first by clear all bits to 0 in the outputRegister every time the AC calculate the result form the input signals(In the beginning of the while loop). If we did not clear the outputRegister, the carry bits from the addition operation can cause incorrect output results. Then when we have to combine the outputs by adding them with the shifted value. For example, if we want to add the fanspeed to output, we have to shift the value left 2 bits and add it to the outputRegister.

2. (Optional): How would you make sure that the hazardous system behavior is completely avoided?

Because we have a clear logic thought. Inside each each if-else statement we put the conditions the manual mentioned in the list which avoids the hazardous system behavior..

3. (Optional): Do a brief research (perhaps on the web) on Bang-bang (Hysteresis) controllers in relation to equations 4 and 5. Answer the following questions in a few words:

Bang-Bang or Hysteresis controller is an ON/OFF control action which is based on the setpoint. The setpoint is just simply a threshold where nothing happens. This type of controller prevents the device to turn ON and OFF so frequently when it meets the ON/OFF point.

4. (Optional): Which part of equations 4 and 5 represents "hysteresis" in our system? How much is the value of "hysteresis"?

In equation 4 and 5, hysteresis is 0.3 degrees. And the value of "hysteresis" is 0.3 degrees.

5. (Optional): Why do we need hysteresis in our system? What will happen if its value is zero?

When the value of the system meets the ON/OFF threshold. Without hysteresis, the device will be oscillated (switch ON and OFF frequently) which can harm the device. To prevent this to happen, an band called hysteresis is created between ON and OFF.