CPE 133 Final Lab Proposal

Robotic Arm
with IR input and Servo Output V2

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1 Project Description

This project proposes the development of a robotic arm with a three-degrees-of-freedom (3DOF)[1] movement capability, enabling it to maneuver in three-dimensional space. The core of this system is its ability to receive inputs through an infrared (IR) transmitter, making it responsive to remote commands. The IR signals will be routed into an FSM capable of sequence detection to discern and interpret the various signals it receives. This ensures that each command is distinctly recognized, allowing for a seamless flow from remote input to mechanical action.

[1] This refers to the number of rotational axes the robot will have, in this case, 3 axes

Upon detecting an input, the IR receiver[2] decodes the signal to determine the intended operation. The decoded instructions are then used to manipulate the robotic arm, with servos that actuate movement. These servos will be controlled via PWM signals generated by a decoder/pulse-width modulation (PWM) module, which adjusts the clock timings to control the servos with high precision. The integration of these items will be completely done in the FPGA on the board.

[2] Commands will be sent to the receiver via an IR remote control

2 High Level Black Box Diagram

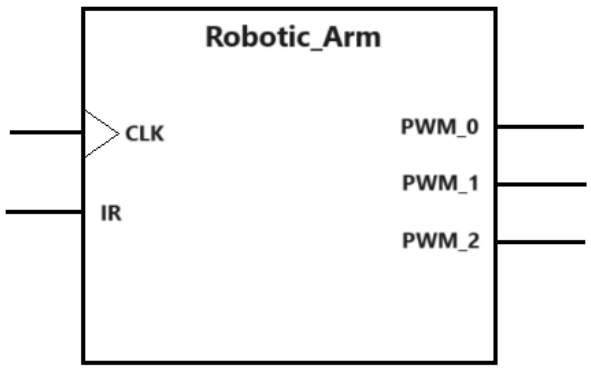

Figure 1: High-Level Block Diagram

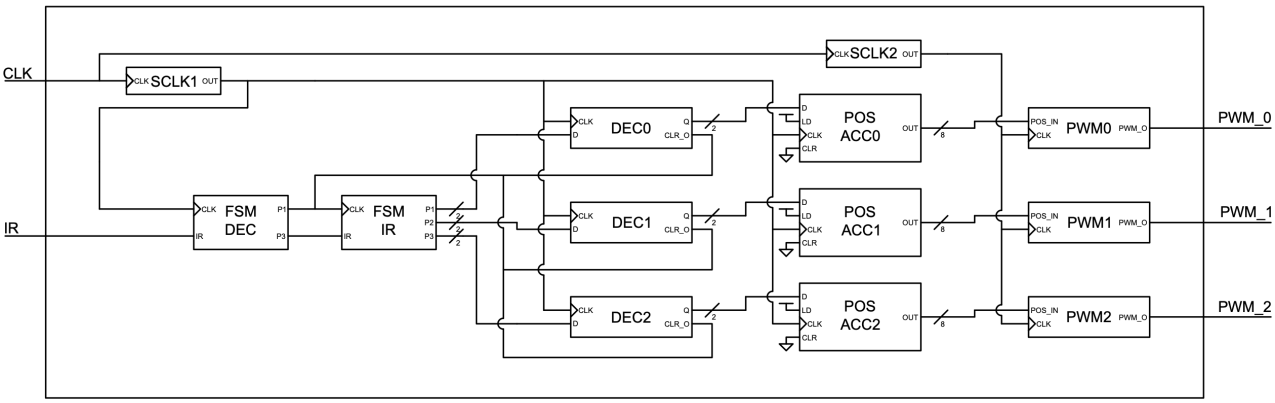

Figure 2: Low-Level Block Diagram

3 Low Level Diagram

As noted in the diagram the FSM is implemented in the IR Decoder module. Multiple accumulators are used to slow down the command rate as well as store the current location of the robotic arm. The new module criteria are met by the decoder module that sends signals to the accumulators as well as the decoders that send the PWM signal out. There will be multiple modules used including new ones that will have to be developed.