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18-441 Project 1 (Exploring the Wi-Fi PHY) Design Doc

a. Decoder design: For the decoder for level 2 for my WIFI receiver system, I implemented a hard Viterbi decoder. To do this, I had to demodulate the complex-valued symbols to binary values. Then, I calculated the branch metrics for the different transitions to different states in the convolution system by calculating the hamming distance between a pair of encoded bits and coded bits in the convolution system and saved these values in a 2d-array for access later. In the second part of the decoder system, I created a 2d-array to store the minimum path to each node at each state in the convolution system, so I stored each node's minimum path to the beginning of system by mapping a node to its minimum distance (that was set as infinity at the beginning), the previous node that connected to the current node and the type of transition that was used to connect the two nodes. Using Dijkistra's algorithm, I calculated the minimum distance to the beginning of the system for each node at each state and updated the previous nodes and transitions along the way. At the end, I used the stored transitions to find the input bits for the decoded sequence of bits.

b. Inferring the length of the packet: After preamble detection, I used the following mathematical expression to infer the length of the packet without the extra zero bits added at the end:
num_of_added_zeros = 2*nfft-(length*8)%(2*nfft)
message_bit_size = (length*8) + num_of_added_zeros

   where length is integer value for the size of the message, num_of_added_zeros is the number of zeros that were initially added to the message bits to make its size a multiple of 128, nfft = 64 and message_bit_size is the length of the packet.