Quiz 5 - Autorate and Detection

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1. What does MCS stand for?
   MCS stands for "Modulation and Coding Scheme." MCS defines how many useful bits can be transmitted per Resource Element (RE). MCS defines two aspects: code rate and modulation. It is adjusted to keep the error probability lower than the error probability threshold.

2. What does the "order" of a modulation scheme mean?
   It represents the number of different symbols that can be transmitted using the scheme.

3. What are the pros and cons of a high-order modulation scheme?
   pros
   - Increased data rate since it can transmit more bits per symbol.
   - Reduced transmission time.
   cons
   - More vulnerable to noise and interference. Higher error rate.
   - Higher complexity.

4. The statement "A high-order modulation scheme can always produce a higher throughput." is true or false? Give your reason.
   False. Although higher-order modulation can increase data rate by transmitting more bits per symbol, the error rate might also be higher. The resulting throughput depends on the quality of channel. If the quality is bad, frequent retransmission may lead to even lower throughput.

5. Why do we need a rate adaption algorithm?
   Since the condition of communication channel changes over time while transmitting data, we need a rate adaption algorithm to adapt to the current condition. The algorithm aims to maximize throughput and robustness of data transmission.

6. The goal of a rate adaption algorithm is trying to maximize which performance metric?
   overall throughput

7. What could be the challenges of a rate-adaption algorithm? (just guess)
   - How to let the transmitter know the current condition of the channel?
   - How to calculate and find the best transmission method?

8. "Packet detection" is the function of capturing the start of a packet. Do you think "packet detection" is hard when the SNR is high or low? Why?
   Packet detection is harder when SNR is low. Low SNR means that noise strength is close to signal strength, making it easy to mistake noise as packets.

9. What is the preamble of a WiFi frame? Why do we need a preamble for packet detection?
   A preamble is a sequence of 0 and 1 bits at the beginning of the frame. Preambles are needed to synchronize receiver clock with transmitter clock. It can also enable receiver to detect the starting of a packet and decode the transmitted data.