channel-model-indep. min distance decoder

⑥ Taking into account when we have non-uniform prior distribution.

Example: Suppose now that each codeword is not equally probable

$$P(\vec{V}=\vec{v}) \propto (q)^{\#\text{ of 1s}} (1-q)^{\#\text{ of 0s}}$$

Q: How to use the VA to find the MAP decoder?

Ans: Our goal is to find

$$\arg\max_{\bar{p}} \left(\prod_{t=1}^{T} P_{\overline{y[t]}|\overline{p[t]}}\left(\overline{y_{obs}[t]} \,\middle|\, \overline{p[t]}\right) \right) \cdot q^{\#\text{ of 1s}} (1-q)^{\#\text{ of 0s}}$$

$$\equiv \arg\max_{\bar{p}} \prod_{t=1}^{T} \left(P_{\overline{y[t]}|\overline{p[t]}}\left(\overline{y_{obs}[t]} \,\middle|\, \overline{p[t]}\right) q^{\#\text{ of 1s in } \overline{p[t]}} (1-q)^{\#\text{ of 0s in } \overline{p[t]}} \right)$$

$$\equiv \arg\max_{\bar{p}} \prod_{t=1}^{T} f_t'\left(\overline{p[t]}\right) \quad ※$$

The only change is thus to initialize the $f_t(\circ)$ function in a different way

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* The VA is an efficient <u>codeword-based</u> ML decoder.

Q: Can we also design an efficient <u>bit-based</u> ML decoder?