Outline

• Introduction to Convolutional Encoders
• Circuit Diagrams
• State Diagrams
• Trellis Diagrams
Block Codes — Review

• Encoder for an \((n, k)\) block code \(\mathcal{C}\):

\[ u[1], u[2], \ldots \rightarrow \text{Encoder} \rightarrow x[1], x[2], \ldots \]

• Here \(u[1], u[2], \ldots\) is a sequence of \(k\)-dimensional information blocks of length \(k\), and \(x[1], x[2], \ldots\) is the corresponding sequence of \(n\)-dimensional code blocks where

\[ x[i] = u[i]G, \]

\(G\) being a \(k \times n\) generator matrix for \(\mathcal{C}\).
An \((n, k, m)\) Convolutional Encoder

- (There is an \(m\)-dimensional memory register inside.)
- \(m = 0\) corresponds to a block code.
- Conclusion? A block code is a special case of a convolutional code.
Example 1: A (2, 1, 2) Convolutional Encoder

- (2, 1) block codes are trivial.
From Circuit Diagram to State Diagram
From State Diagram to Trellis Diagram
The Truncated Trellis

- This is a $(14, 5)$ block code!

- Or rather, a nonsystematic encoder for a $(14, 5)$ block code.
A convolutional code is a special kind of block code!