Code

The mapping of events to messages is called encoding. Messages are recorded in information storage units. The recorded message itself is an *event system*. Encoding is a transformation, based on the mutual and unambiguous correspondence between two event systems.

The tool of encoding is code. A code consists of a finite set of symbols (an alphabet) and coding rules (groups of symbols).

A *code-word* is an elementary message, which consists of a finite number of symbols. The code's syntax is the set of code symbols and the rules for forming code-words.

Encoding changes the information's form, but other information characteristics remain unchanged. There are fixed-length and variable-length codes.

Basic Types of Codes:

Fixed-length code	**Variable-length code**
Technical codes	Morse code
Communication Codes	Human languages
Computer codes	Technical languages

For a fixed (n) length binary code, the number of possible codewords is:

$$ N = 2^n $$

If we form codes from m different symbols, then the number of possible n-length codewords is:

$$ N = m^n $$

The fundamental problem of coding theory is the preservation, security, and maximization of the information content of transmitted messages.

Morse Code

Morse code is a method of encoding text characters into sequences of *dots* and *dashes* (or short and long signals) that can be transmitted over telecommunication lines or other mediums like light or sound. It was originally developed in the 1830s by **Samuel Morse** and **Alfred Vail** for use in telegraphy.

Key features:

- **Dot** (.): A short signal or sound.
- **Dash** (-): A longer signal or sound, typically three times the duration of a dot.
- **Spacing**:
  - Intra-character space: The space between dots and dashes within a single character (typically silent, as no signal).
  - Inter-character space: The space between characters (equivalent to three dots).
  - Inter-word space: The space between words (equivalent to seven dots).

Examples:

- **A**: .- (dot-dash)
- **B**: -... (dash-dot-dot-dot)
- **C**: -.-. (dash-dot-dash-dot)
- **SOS**: ... — ... (dot-dot-dot, dash-dash-dash, dot-dot-dot) - a universal distress signal.

Example message:

- **HELLO**: .... . .-.. .-.. - - - (dot-dot-dot-dot, dot, dot-dash-dot-dot, dot-dash-dot-dot, dash-dash-dash)