

Self-synchronizing code

Self-synchronizing code is a special kind of [line code](#) that is easy to *synchronize* (having two computers "stay in time with" each other when "communicating"). Code like this happens in [telecommunications](#).

Information on computers is made from [binary](#) bits - 0's and 1's (OFFs and ONs). This means that when a computer is being "communicated to", it must "listen" for bits at the correct speed by staying *synchronized*, or else there will be a misunderstanding. A computer needs to notice misunderstandings immediately, so that wrong things don't happen.

Confusion can happen when two signals combine or misalign, so it's helpful for different "words" in a code to be *unique* from each other.

Example

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- Imagine a language with the only "letters" being **0** and **1**, and no spaces or other symbols.
- This language only has "words" with exactly two letters.
 - This means that computers "reading" this language would start "reading" the "sentence" at the first two letters, then the next two letters, and so on.
- Two computers, Alice and Bob, have to say the sentence 1100001100 to each other, and it needs to be understood as **1100001100**.
 - Alice says the sentence to Bob correctly.
 - Bob's "sentence" gets **de-synchronized** on its way to Alice, and the first "letter" gets chopped off. This turns the "sentence" into 100001100.

Code A: self-synchronizing

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Imagine the language only has the words **00** and **11**.

- Alice's sentence 1100001100 is heard by Bob as "11, 00, 00, 11, 00", meaning **1100001100**.
- When Bob's sentence 100001100 is heard by Alice as "10, 00, 01, 10, 0", Alice knows there's been a misunderstanding at the very beginning, because "10" is not a word in its "language" code.

Code B is self-synchronizing, because its "words" are very different from each other, and *hard to confuse with each other*.

Code B: not self-synchronizing

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Imagine the language has the words 00, 11, and 10.

- Alice's sentence 1100001100 is heard by Bob as "11, 00, 00, 11, 00", meaning 1100001100.
- When Bob's sentence 100001100 is heard by Alice as "10, 00, 01, 10, 0", it doesn't realize there's been a misunderstanding until it hears the third "word" "01". By that time, it's already heard 1000.

Code B is *not* self-synchronizing, because its "words" are too similar to each other, and *easy to confuse with each other*.

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