

Digital Circuit

- Why Digital Circuit?
 - Digital signals (0 and 1) are very easy to handle with electronic circuits

only 2 states needed:

Switch **ON** or **OFF**,

Circuit **CLOSED** or **OPEN**,

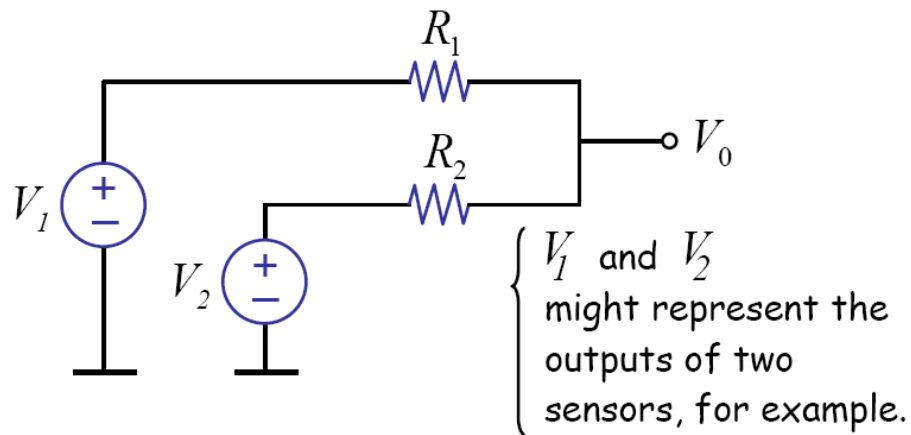
Current **FLOWING** or **NOT**,

Voltage **HIGH** or **LOW**

Low error: accurate measurement of voltage in analog circuit vs. 0 (0-2V) and 1 (2.6 to 5 V).

Why Digital

Analog signal processing



$$\frac{V_0 - V_1}{R_1} + \frac{V_0 - V_2}{R_2} = 0$$

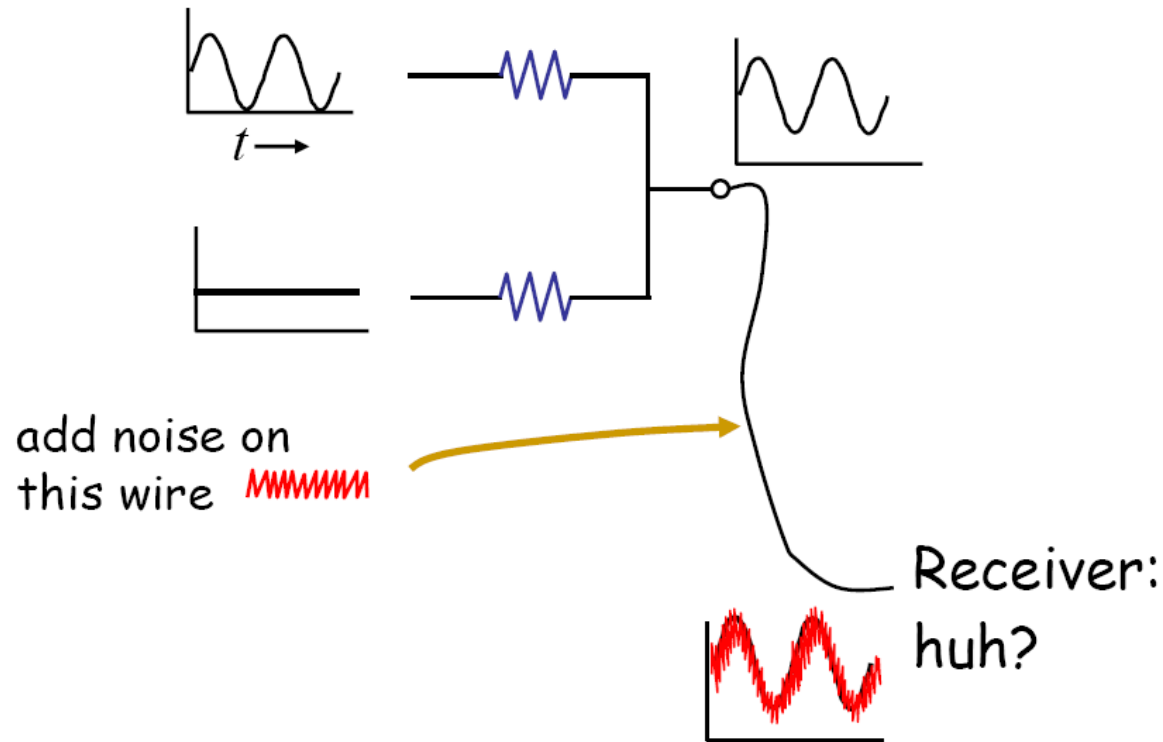
$$V_0 = \frac{R_2}{R_1 + R_2} V_1 + \frac{R_1}{R_1 + R_2} V_2$$

if $R_1 = R_2$

$$V_0 = \frac{V_1 + V_2}{2}$$

This is an "adder" circuit

Noise Problem

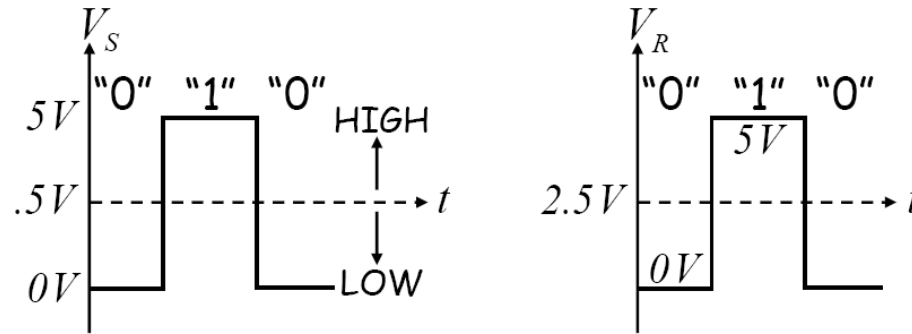
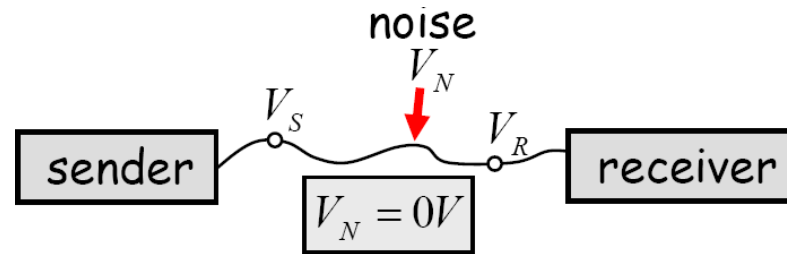


Noise hampers our ability to distinguish between small differences in values
— e.g. between 3.1V and 3.2V.

Value discretization

- Any numbers, letters, and symbols can be represented using multiple binary digits and coding, much like using multiple decimal digits to represent numbers greater than 9.
- E.G.: binary 101 \rightarrow 5

Digital System



With noise

