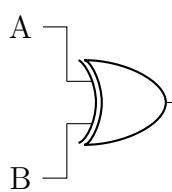


There can be a time delay before an error and a failure, or a failure may never even occur from an error. Same with going from faults to errors.

One example of liveware faults was pilots who required training after controls became digital.

- Permanent errors must be repaired
- Intermittent errors depend on the error: Do we fix the error or just modify the cases which cause the error?
- Transient errors cannot be easily fixed. They need to be tolerated.

Consider the circuit  $f = \overline{A + B}$



To test a fault, we need to set the faulty input to the complement and the other inputs to be non-dominating. So to test A-sa0, we need  $A = 1, B = 0$  and will get 1 if the fault isn't there, or 1 if the fault is. Likewise, to test A-sa1, we need  $A = 0, B = 0$  and will get 0 if the fault isn't there, and 1 if the fault is.

Note that:

- $\langle 0, 0 \rangle$  will detect A-sa1, B-sa1 and f-sa0.
- $\langle 0, 1 \rangle$  will detect B-sa0 and f-sa1.
- $\langle 1, 0 \rangle$  will detect A-sa0 and f-sa1.

So our test set is  $\{00, 01, 10\}$

Boolean difference example (circuit in slides):

To detect y-sa0, find values such that  $y \frac{df}{dy} = 1$ :

$$y(f(y=0) \oplus f(y=1)) = 1 \implies y(z \oplus x) = 1 \implies \bar{x}yz + xy\bar{z} = 1$$

Therefore, 011 and 110 can detect the fault.