Chapter 1

A transistor is basically a miniature relay with 3 poles, which has different nomenclature depending on the type of transistor:

- Bipolar transistor (base/collector/emitter): Collector-emitter current controlled by base *current*
- MOSFET (gate/source/drain): Source-drain current controlled by gate *voltage*

Basically, the concept is the same either way, where one terminal is used to control the current flow between the other two terminals.

They are inherently amplifiers than can essentially be used as switches, and when we connect the outputs of transistors into the inputs of other transistors… well, that's when we start getting into things like logic gates.

Many semiconductor sensors are made by exploiting the sensitivity of transistors to temperature, light, magnetic fields, stress, and other physical variables.

Transducers convert energy from one domain into another, and a sensor provides a useful output based on a specified measurand. In most applications, a sensor is a basic element of a transducer. They seem to be used synonymously.

The reliability of integrated sensors is inherently better than a separate sensor and control circuit because there are fewer internal connections. They have also been catered to a specific application, so the designed has essentially 'traded-off' unnecessary performance characteristics in favor of desirable ones – in other words, they have created a black box that can be integrated into some other control system more easily, as a simplified device.

Sensor fusion can create a more robust output for applications – example given auto-orientation in smartphones - where an accelerometer output is compared to an accelerometer plus gyroscope output:

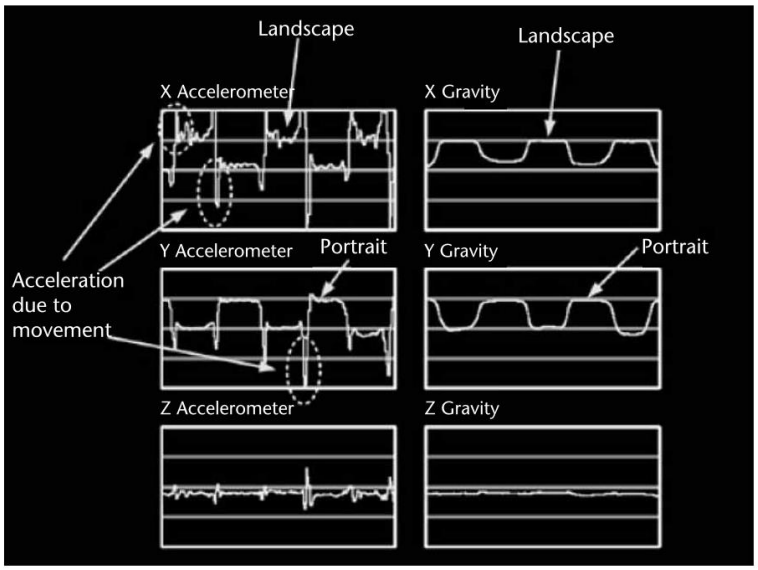

Figure 1.11 The output of an accelerometer only verses accelerometer plus gyroscope. (Courtesy of InvenSense [12].)