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Cours N° 1 d'Anglais Technique

THE PHASE-LOCKED LOOP (PLL)

Master1 ESE -Partie 1-

' Electronique des Systèmes Embarqués '

The PLL is a very interesting and useful building block, available from several manufactures as a single integrated circuit.

A PLL contains a phase detector amplifier, and voltage controlled oscillator (VCO) and represent a blend of digital and analog techniques all in one package.

A few of its applications are tone decoding, demodulation of AM and FM signal, frequency multiplication, frequency synthesis, phase synchronization of signals from various sources (e.g. a magnetic tape), and regulation of "clean" signals.

There has traditionally been some to use PLLs, partly because of the complexity of discrete PLL circuits and partly because of a feeling that they cannot be counted on to work reliably with inexpensive and easy to use. PLLs are widely available. The first barrier to their acceptance is rapidly vanishing And with proper design and conservative application, the PLL is as reliable as a circuit element as an operational amplifier (Op-Amp) or a flip-flop.

The figure 1 below shows the classic PLL configuration.

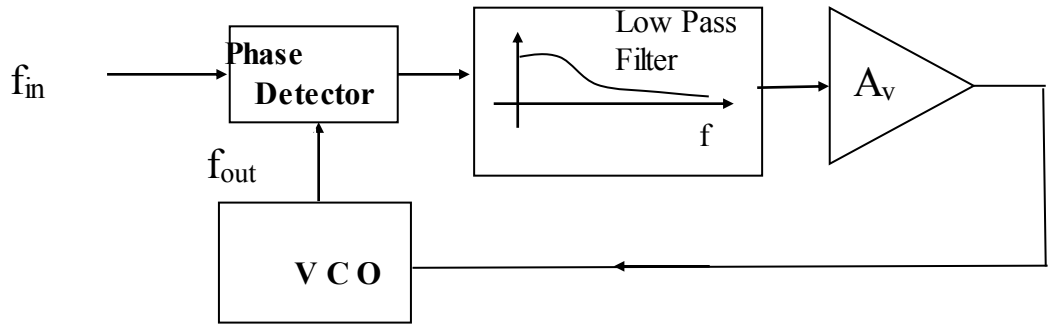

Figure 1 : The Phase-Locked Loop Principle

The phase detector is a device that compares the input and output frequencies (f_{in} and f_{out}), generating an output that is a measure of their phase difference (if, for example, they differ in frequency, it gives a periodic output at the difference frequency). if f_{in} is not equal to f_{out}, the phase-error signal, after being filtered (low-pass filter) and amplified, causes the VCO frequency to deviate in the direction of f_{in}. If the conditions are right, the VCO will qui quickly "lock" to f_{in}, and there exists a fixed phase relationship with the input signal.

At that point, the filtered output phase detector is a dc signal, and the control input to the VCO is a measure at the input frequency, with obvious applications to tone decoding (used in digital transmission over telephone lines) and FM detection. The VCO output is a locally generated frequency equal to fin, thus providing a clean replica of f_{in}, which may it all be noisy. Since the VCO output can be a triangle wave, sine wave, or whatever, this provides a nice method of generating a sine wave, for example, locked to a train of input pulses.

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