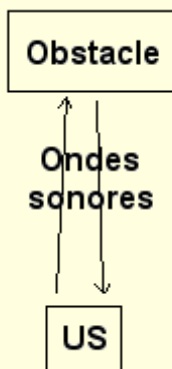# Ultrasonic / Infrared sensor comparison

The principle

Ultrasonic rangefinders work by **measuring the return time** of an inaudible sound wave emitted by the sensor. The speed of sound in the air being approximately stable, we deduce the distance of the obstacle.

The SHARP sensor works by **measuring the angle of reflection** of a modulated IR emission, thanks to an array of receivers.
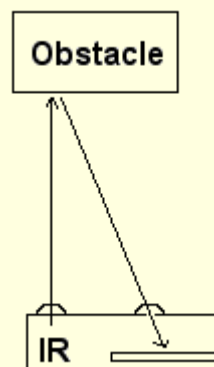
The scope

A few meters in general for ultrasonic systems, even if in theory there is no limit. There is also usually a minimum distance.

The range is from **5 to 80cm**.

Directionality

Ultrasounds are **very evasive**. This can be a **big advantage** (detection of close obstacles on a large ring) or a **big disadvantage** (detection of the walls of a corridor and not the bottom of the corridor).

The directivity is **much better** (5° cone). To do better, you have to switch to much more expensive laser rangefinders!

Precision

The accuracy of ultrasound depends on the **precise measurement of the travel time of the sound wave**. The latter can also vary according to the conditions of temperature, pressure ...

The accuracy of the sensor **depends on the distance.** Excellent at 10 cm, it regresses more and more until 80cm.

The size

Ultrasonic transducers can be quite small. But the cards performing the telemetry like take up space.

The size is **very small**. Nothing else is needed.

Consumption

100 mA in standby and up to several Transmitter **amperes**

Only **25 mA**.

The price

Several tens of €uro. (You need the control module and a transducer)	From 15 € approximately

The link with a microcontroller

	There are in fact 2 different versions: Either the sensor has an **analog output**. Either the sensor has **a kind of serial link**, very easy to code on a microcontroller.

Acquisition frequency and speed

	The sensor in analog version returns a measurement every **40ms**.

Sensitivity to interference and other sensors

As mentioned above, ultrasonic sensors are sensitive to temperature and pressure. But there is more serious: They are also **sensitive to other devices using the same frequencies**, such as ultrasonic tele-lenses, or simply **other robots**!	These IR sensors have a modulation that **normally makes** them **independent of ambient lighting**.

Who uses them?

Professional" robots make **extensive use of ultrasonic sensors**. But it is still very complicated to model an environment completely according to their return, especially because of the too large emission cones.	Toy Manufacturers Pob Technology

Conclusion

Obviously, both systems have their advantages and disadvantages, and if distance is information you are interested in, you will have to choose between the two.
That said, I would distinguish 5 cases:

- IR sensors will be the easiest thing to use!
- You need to **measure a distant distance**, and only ultrasound will do. But beware of the wide emission cone!
- You really want to make sure **that nothing comes close to your robot**, and in this case a ring of ultrasonic sensors will cover better than IR.
- You have **a small robot**, with little space, not much autonomy. Here obviously, the IR will be more suitable.