**Sensor selection**

For the design of our prototype, you can use different types of proximity sensors.  
The most common are the position switches, capacitive sensors, inductive and photoelectric, infrared and ultrasonic sensors.

Here are the main features of each type of sensors and compares to justify the choice of the final sensor.

**Position switches:**

Position switches or limit switches, are a type of sensors that act when it detects direct contact. Normally placed at the end of the route of a machine and are activated when they perceive contact. Such sensors are invalid for our project because we do not want contact.

**Capacitive sensors:**

Capacitive sensors are suitable for the detection of metallic and non-metallic objects of all types. Even highly transparent glasses or liquids are easy to detect with a capacitive sensor. Only the dielectric conductivity of the target material is relevant. The greater the dielectric constant of a material, the higher the possible switching distances or the more reliable detection.

The disadvantage of this type of sensor is the scope, because depending on the diameter of the sensor, can reach up to 60 mm. Another drawback is that depends on the mass to be detected, if you want to perform a detection of any type of object this sensor does not work, since it depends on the constant electric.

There are other drawbacks, but we have basically ruled out this option for the little measurable length.

**Inductive sensors:**

Inductive sensors are a special kind of sensors used to detect ferrous materials. They are of great use in industry, both for positioning applications to detect the presence or absence of metallic objects in a particular context. We have also ruled out such sensors because they are not what we want for our application. Especially because there is different type of materials in the trash, not only metal.

**Photoelectric sensors:**  
A photoelectric sensor or photocell is an electronic device that responds to the change in light intensity. These sensors require an emitter that generates light component and a receiver component that receives the light generated by the issuer.

Again we discarded this type of sensors because inside the garbage containers, the light is low and therefore the measures would not be accurate. Also they are not used for long distances.

**Infrared sensors:**

Infrared sensors operate by emitting a signal of infrared light, not perceptible by the human eye, which is reflected in the material, and according to the time it takes to get the reflected signal, can measure the distance. This type of sensor is very useful for short distances, but not for long distances as we need for our prototype.

**Ultrasonic sensors:**

Ultrasonic sensors are proximity sensors working free of mechanical friction and detect objects at distances up to 8m. The sensor emits ultrasonic pulses, then they reflect an object, the sensor receives the echo produced and converted into electrical signals, which are produced in the apparatus of valuation. These sensors work only in the air, and can detect objects with different shapes, surfaces and different materials. The materials can be solid, liquid or dusty, however they must be sound baffles. The sensors measure the time course of the echo, that means the time between the transmitted pulse and echo pulse is evaluated.