This ULU

The *ULU.52 – Motion sensor* can be used to detect the presence of a living object (human or animal) in a room. It uses a passive infrared (PIR) sensor.

Used parts

The following standard parts are used:
1x casing 50 x 25 x 25mm;
1x 2mm signal connector;
1x black O-ring 9 x 5 x 2mm;
1x power connector;
1x 3mm round LED ;
1x resistor to dim the LED;
1x LED holder;
1x micro (G6K-2F-Y-5VDC) relay;
1x fly back diode (1N4148);
1x Arduino Nano;

The following extra parts are used:
1x passive IR sensor;
1x M3 countersunk bolt;
1x 10x30x1mm aluminum strip.

Construction

The standard ULU specifications are applicable as specified in the datasheet *ULU.00 – Common specifications*.

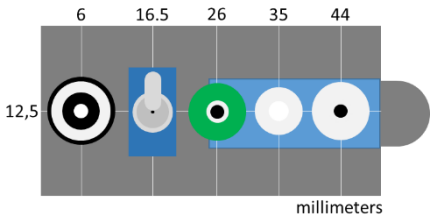

Figure 1 – Drill guide

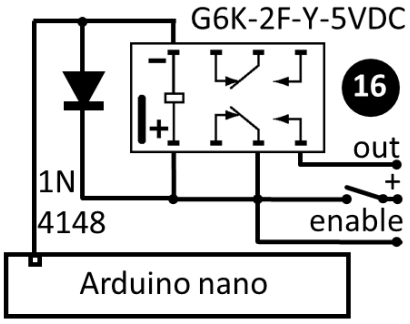

Figure 2 – Used arduino interfaces

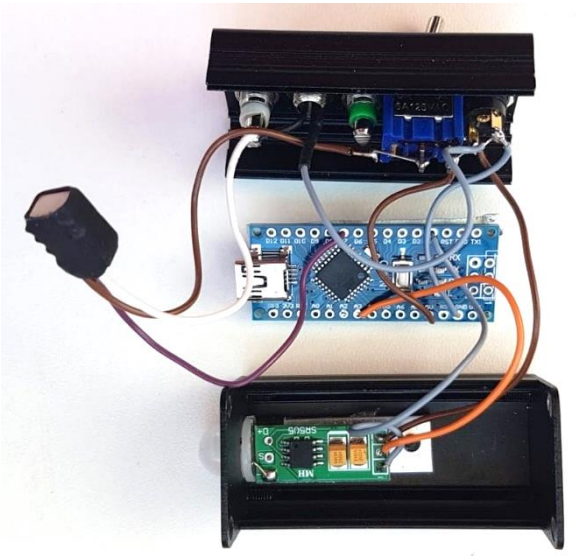

Figure 3 – ULU inside

Figure 4 – Finished ULU

First, the pin header needs to be desoldered from the used sensor (Figure 6). The easiest way is to cut both components to pieces and desolder the pins one by one. Then a chirurgical clamp is clamped on one of the pins to draw it downwards and this part can be desoldered with a common soldering iron. After that, a desoldering cleaning rod or a small PCB drill will open the hole

Then in the bottom of the enclosure a 3mm hole is drilled and countersunk to fit a M3 countersink bolt. Be sure to drill this hole not too close to the end, otherwise the sensor will not fit. Also ensure that the hole is drilled at the correct end of the enclosure, otherwise the top part of the enclosure will not fit. The bolt is used to attach a 5mm female/male standoff to the casing. Glue is used to glue the PCB on the aluminum strip. A 3mm hole is drilled in the strip and a nut is used to attach the strip to the enclosure. For the PIR-sensor another hole (10mm) is drilled in one of the cover plates.

Since this sensor does not provide a useful digital signal, an Arduino must be used for the attachment of a relay. The positive pole of this relay is activated by the enabling switch and socket, the negative pole by the Arduino when the sensor detects a human or animal. Both the sensor and relay need to be connected to the 5V DC power. The relay is insulated with shrink fit tube and the Arduino Nano with duct tape.

	Port	Con.	Rest.	Func.	Interface	Signal
1.	D7	☐		O	16	Relay
2.	D13		O	L		Heartbeat
3.	A7			I	0	Sensor
4.	+5V	⊙	I	I	0	+5V
5.	GND	⊙	I	I	0	GND

Input, **O**utput, **L**ed, **S**PI, **T**oggle switch, **R**otary switch

Figure 5 – Pinout Arduino Nano

Figure 6 – Used passive IR sensor

Usage

This sensor can be used as an animal or human detection sensor. It detects the infrared radiation that is emitted by a living body. After the sensor is triggered, it will stay on for approximately 20 seconds before switching to off again.

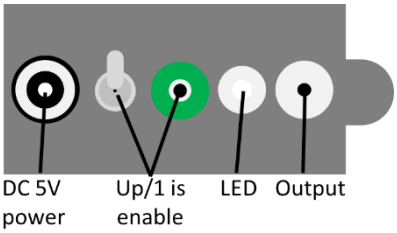

Figure 7 – Controls and connectors

Arduino Nano program

```
/* ULU.52 Motion sensor - program */
/* CC BY-NC-SA Jeroen Brinkman */

#define THRES 25
#define SENSOR A3
#define RELAY 7
#define HEART 13

void setup() {
   Serial.begin(9600);
   pinMode(RELAY, OUTPUT);
   pinMode(HEART, OUTPUT);
   /* Every ULU with an Arduino introduces itself. This one is ashamed for the simplicity, so stays quiet*/
};

void loop(){
   digitalWrite(HEART, (millis() / 1000) % 2); //1s heartbeat for the onboard led
   Serial.println(analogRead(SENSOR));         // debug sensor value
   digitalWrite(RELAY, (analogRead(SENSOR) > THRES) ? LOW : HIGH);
}
```