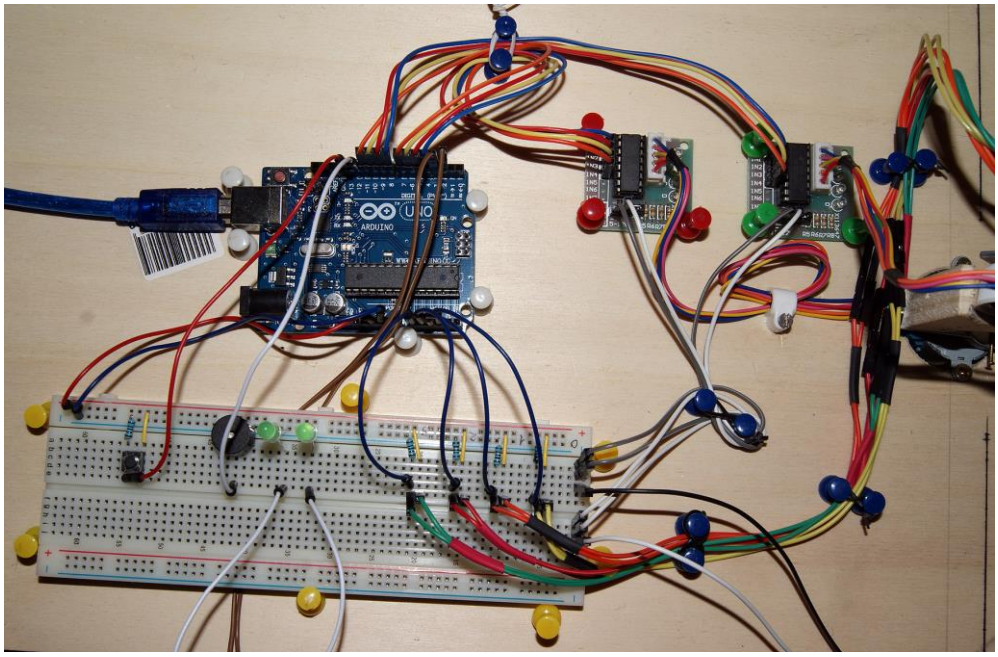
Arduino project "Light-tracking turret" – Additional information

Circuit and comments:
See http://www.cesarebrizio.it/Arduino/Light_Tracking_Turret.html

For those (if any) interested in replicating and improving my project, here I'll provide some more details on the mechanical part of the project.
Everything can be understood from the pictures provided at the web page cited above, so here I'll specify just some relevant details about raw materials and manufacturing of the turret.

The base is a **plywood board**: I happened to have one of about the right size, so I didn't even need to cut it to size (anyway, 20 cm x 40 cm should be ok);
With a few exceptions, I fixed all the main elements (breadboard, Arduino, cables…) to the plank by simple plastic "map pins". The fit is quite loose, but sufficient to keep the relative position of the components.



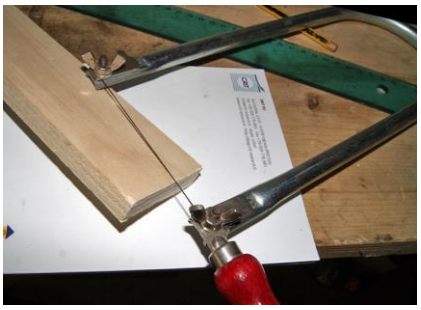
One of the first thing that I decided is that **the stepper to provide horizontal rotation should be embedded in the plank**: this required the use of an hole saws with a diameter slightly above that of the stepper. Caution should be applied, as long as the lateral fixing holes of the stepper exceed only very slightly its diameter: so, the hole should be as tight as possible around the stepper.

As long as the stepper is much thicker than the plank and it should be mounted flush with the upper surface of the board, with the shaft sticking up, you'll need to put **spacers under the board** (in my case, I just cut two pieces from the very same board, so that their width was ideal), sufficienly thik to ensure that, when the whole turret assembly is put on a table, the stepper embedded in the plywood board clears the table.
Before mounting the stepper in the board, you'll need to prepare a **chamfer for the set of wires entering the stepper**, that obviously wouldn't fit in a perfectly cylindrical hole.

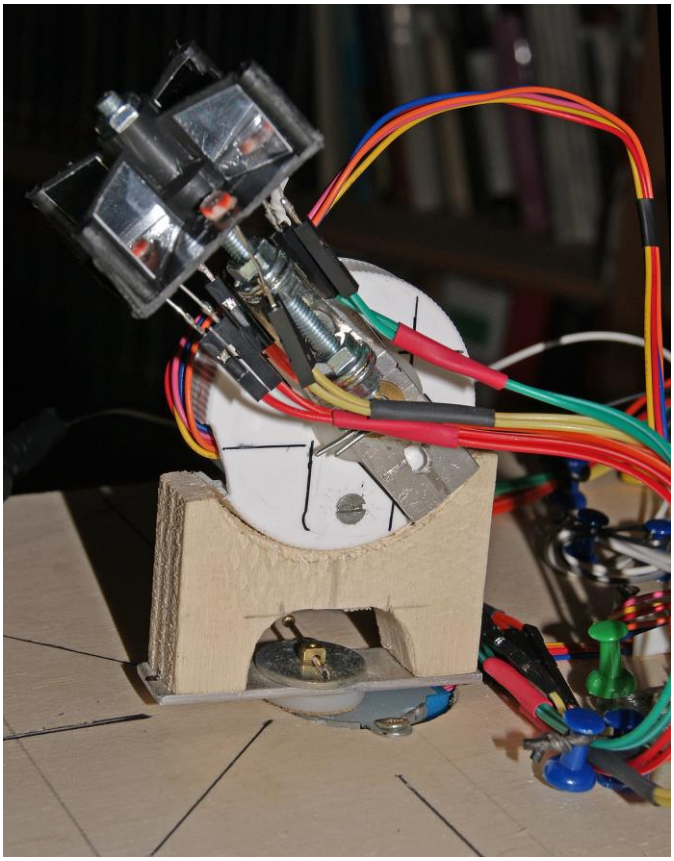
The main mechanical challenge was finding a way to join the shaft with a rotating arm. In my case I used **aluminium strip 15 mm wide**, the same thickness of the plywood I had at hand.
To ensure that the aluminium rotating arm would fit to the shaft (the approximate size of the joint being 5mmx3mm), I started by **drilling two 2,5mm holes in contact**, side by side, along the midline of the aluminium strip, and then by careful pressure of the drill bit I joined the two holes in an elliptical shape, that was filed to the proper shape and size by **a very small file**.

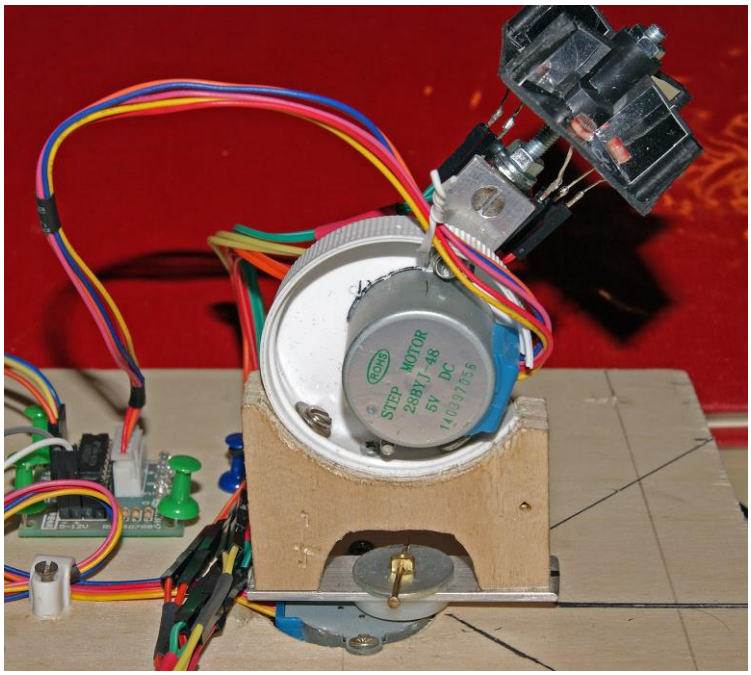
The aluminium arm needs to be kept in place on the shaft, so I very carefully **drilled a 2mm hole through the shaft**, to pass a cotter pin that would keep the arm in place. During the drilling phase, the engine was placed shaft-down, and the shaft was tightened at the edge of a small vice, so that I could drill horizontally.

This is not precision mechanics at all: **to keep the rotating arm tight and with almost no play, I needed a set of washers of different sizes both under and above the aluminium strip**. At the end, instead of a cotter pin, I used a nail for the horizontal arm. Obviously, the washers' internal diameter has to be slightly above the diameter of the shaft, with as little tolerance as possible.
The lower part of the plywood turret was cut with a jigsaw in a shape that could allow easy fixing and removal from the horizontal stepper.

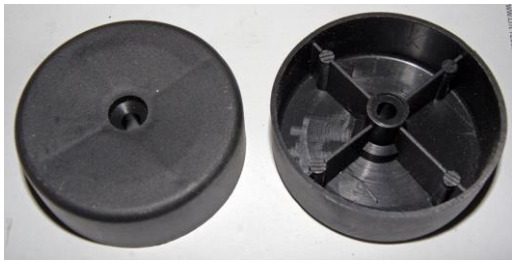


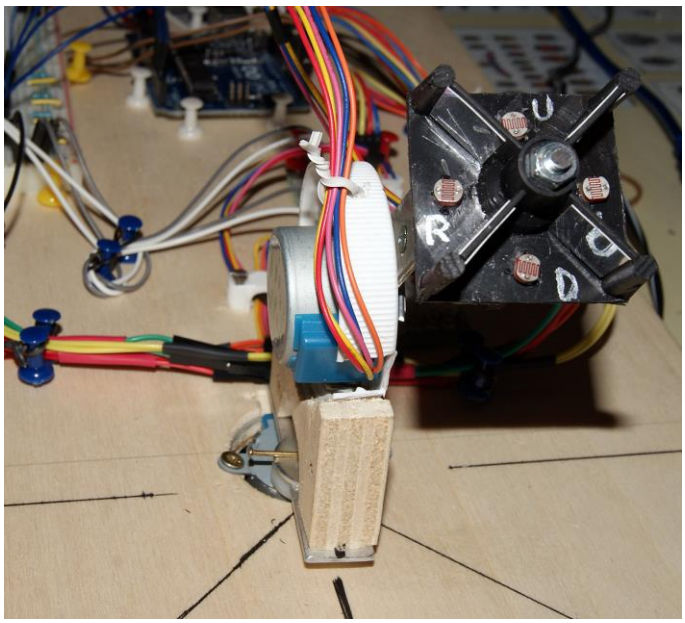
The upper part of the plywood turret was conceived to replicate in the vertical what I previously did in the horizontal plane: **also the vertical stepper should be flush with the turret, with just the shaft protruding on one side**. The easiest way I found is to use a plastic lid, fix the stepper to the plastic lid, and fix the lid to the turret (again using an hole saw to cut the upper profile of the turret so that it fits tightly the lid). The sensor is fixed to the vertical arm by **a small piece of threaded bar**, fixed coaxially to the vertical arm as can be seen in the pictures.





The “sensor head” bearing the 4 photoresistors was obtained **from a plastic furniture feed pad** that happened to be internally divided in four sectors. To increase directionality, **small patches of adhesive mirror coated paper were sticked to each side of each photoresistor**.





Cesare Brizio, 28 September 2014