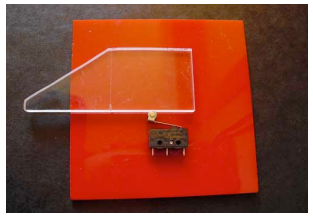
LASER RANGE – LASER PAINTBALL:
YOUR GUN AND AN INTERACTIVE TARGET

Welcome to my instructables.
It is about a shooting kit including a laser gun, offering the possibility to aim at objects in a far distance.
But how would you know if you hit or not?
For this purpose I created a photo-sensitive target, that will let you know when you hit the spot – it will simple „yell“ by the means of a buzzer. But the same target could be worn to your chest in a clean version of paintball.
Try it out – and don‘t forget to wear laser-glasses to protect your eyes… I hope you‘ll have some fun building and playing. :-)

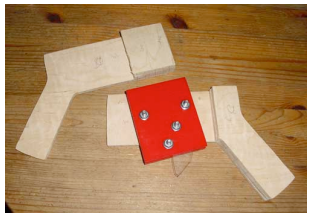
created by Jeremiasz Hauck



I started with the trigger. It is made of plexi (easy to cut, but wood also works). The main element though is the micro-switch (the small roller moves in when the trigger lever is pulled).

This is the gun body, built from 4 layers of plywood (8mm). The reason was to easily be able to cut out the space for the trigger. Shape can be whatever you like, but keep an eye on the distance between trigger and handle to keep it comfortably in your hand.

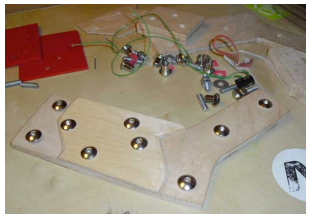
Showing the gun prepared to be sandpapered. The trigger-box shows 4 screws, one to serve as the lever, the others to keep the distance (one blocks the trigger movement towards the front, one to fix an elastic band or spring to bring the trigger back to its original position after shooting)



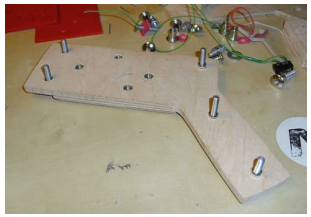
The two center plywood layers have been cut to make space for the trigger-box (the trigger-box needs to be as thick as these two layers of plywood).
Therefore we have a separate nose and a handle part.

Glue the center pieces together to allow for a better handling (when you need to make the holes).

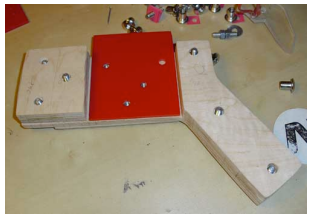
To connect the 4 layers I used furniture connectors, that have nice heads on both sides. The screw part only has 6mm, while the heads need a hole with a width of 9mm. Here the holes are already made.



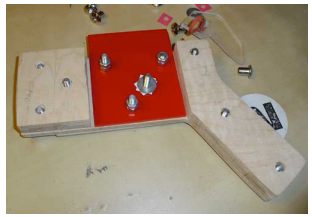
I added another layer of 4mm plywood in the trigger area. Just to make sure the heads wouldn't go too deep into the plexi. Serves also as a nice decorative element. Equal placement of the heads helps to keep the tension on the plywood low.



Two screws in the nose, three in the handle.

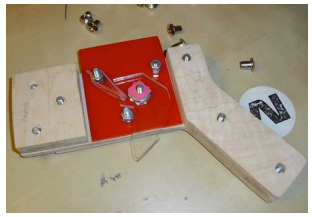


Inserting the trigger-box…

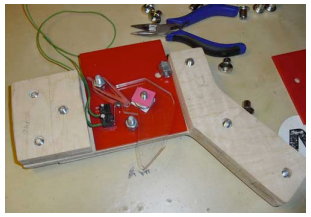


Here you can see the interior of the trigger-box…

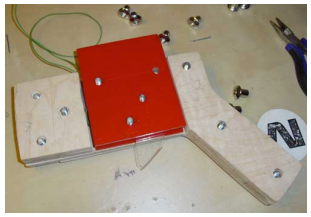
created by Jeremiasz Hauck



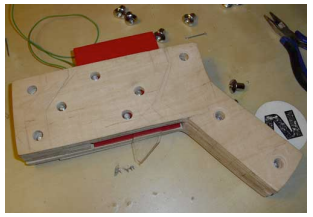
…and it‘s mechanism. Little pieces of paper serve as soft washers to keep the trigger exactly centered and fixed.



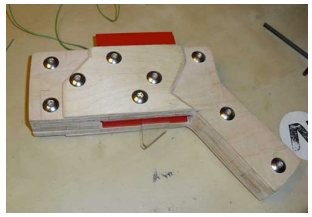
One can see the switch in relation to the screws: the trigger lever, the rubber band, and the bottom screw to block the forward pull of the elastic band.



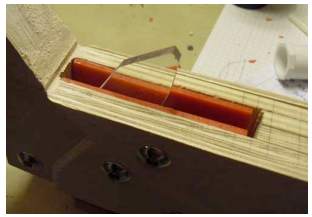
The trigger-box closed for the first time… though the cables were already fixed to the switch, I didn‘t glue the switch in yet to allow for a later fitting (if necessary).



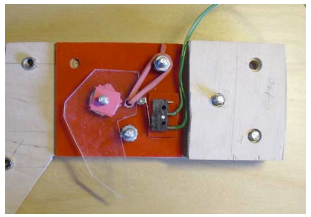
Closing the body of the gun…



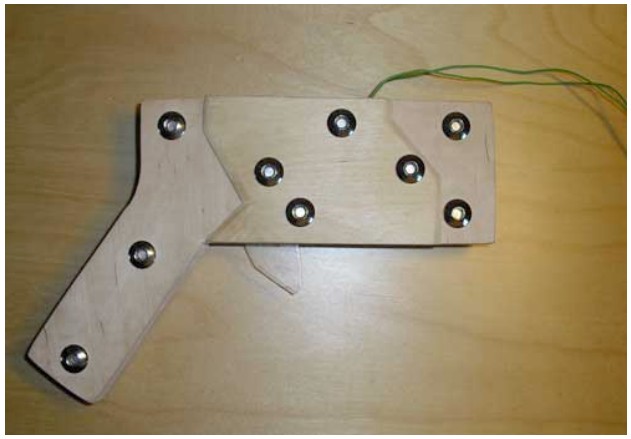
And done! I had the idea of fixing the barrel to the overlapping plexi, so I left it for the time being.



A view of the trigger from below. One could still close the hole with another plywood, but I like it that way.



Another view of the trigger, this time the plexi‘s been cut, and the switch glued for good!



The ready gun-body,

created by Jeremiasz Hauck

There‘s not enough space for the technical gadgets I wanted to add in the wooden body of the gun. And to make a trouble-free exchange of circuit and battery possible, I decided to put those in extensions to the left and the right of the barrel.

These are actually urine cups – be careful when drilling them, they break easily. Here they are sprayed already from the inside to hide their contents. You can see that I‘m using a PVC water tube to connect the containers to the barrel (also a PVC tube).

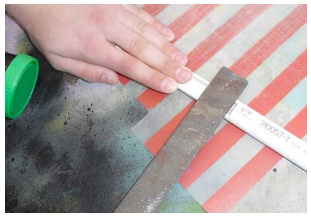
The container is trapped between two ends of piping, glued together. That will stabilize the bottom of the containers, and allow the cables to pass through (two containers broke while drilling them – very brittle plastic!).

The two containers fixed to a T junction… and nicely colored. In the right one there‘s plenty of space for the battery, just unscrew the lid. In the left I will still later add a circuit that will make my laser pulsate while the trigger is kept.

The 1/2 inch water tube that will serve as the barrel to my laser-gun.

This is the actual laser pointer. I‘m leaving the tail (battery container) away and connect the plus and minus contact of the laser-tip to regular cables.

To make sure that the cables are secured and properly insulated, I filled the gap with hot glue. This laser-tip will find it‘s place in the PVC tube.

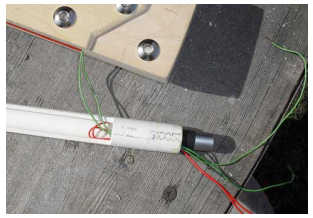


Preparing the barrel PVC tube: in the front we need the whole tube to allow for the laser-tip, while the rest has to sit on the gun – therefore I cut the tube along it‘s length. Mark both sides of the tube to get an equal cut with the saw, then sandpaper.

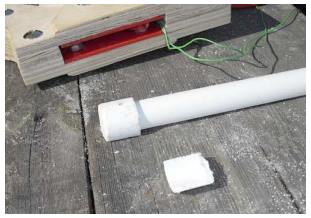
The tube‘s almost ready, still too long in the back and the front. To get a nice equal cut around the PVC tube, this time I used a pipe-cutter (took much longer than a saw).

The open barrel tube with the front keeper of the laser-tip. Notice that this closed section is quite shorter than the laser to be accommodated. That‘s because the laser-tip has to still go all the way through the T-junction.

created by Jeremiasz Hauck



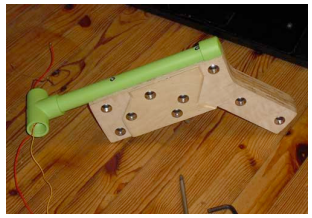
The laser-tip fit tightly into the PVC tube, and sticking out. Two cables that come from the trigger (here green) and two that go to the laser (red).



An end-cup to the pipe, also cut horizontally to suit the already flattened pipe. In front the off-cut piece.

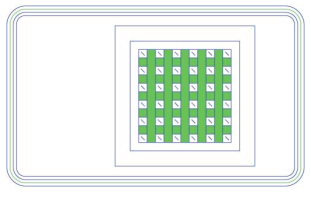
I made a hole through the T-junction. Be careful to hit the right spot when drilling! Because of the cables around the laser, the tip was slightly moved to the left. If it ain't straight, your laser will aim somewhere else.

Holes added to the barrel to screw it on to the gun body. Now I just need to paint the pieces.



The wooden body and the plastic barrel. See the cables go to their respective sides. If you don't plan to add anything more, just connect the ends on the right side (left: red from + of the laser to battery, green (any) from the trigger to the - of the battery).

This is the simple and ordinary lunch box, which serves as the container for our future interactive target.



One centimeter away from the bottom of that box (which will be our top) we need to place a plywood to fix the phototransistors and the technology to make them work. Measuring is tricky because of the round corners – use another box and copy the square for placing equally the transistors.

Here I placed a printout of my „helper" on a 8mm plywood, drilling holes using a 1mm thin drill bit. Make sure to go straight down – this small drill is balanced, so that one can let gravity lead the way.

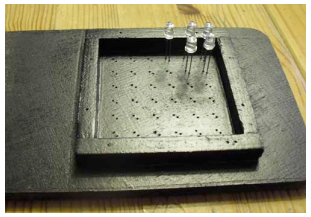
72 holes later, the first job is done.

Now you can re-use this printout, cut away the center square to mark where the 1cm spacer (and protector for the phototransistors) will be glued to. Use a dimensional lumber to get an equal result.

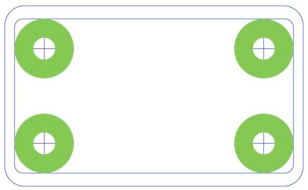
Mirko Hauck 17. April 2011 16:43

created by Jeremiasz Hauck

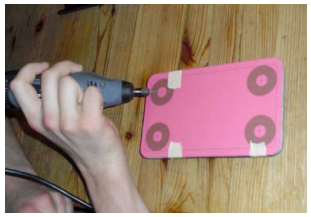
The 1cm² lumber I cut into two outside and two inside pieces. I drilled them too, to support the glueing with pin nails (without heads). Just to avoid the thin wood the crack. Later cut off enough of these pins, so they wont show on the other side when driven down.



The ready frame, the 72 holes visible, this side already nicely colored (to increase the sensitivity of the transistors).
The transistors have endings, that have unequal length, plus being the shorter. I fixed them with Super Glue, making sure they are all aligned /adjusted in the same direction.



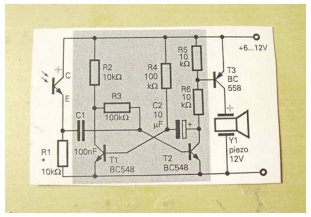
My next helper is to get holes through the lunch box that really align on both sides. I start with my 1mm drill bit and then go for the bigger. Always use a wood as a resistance, or your brittle plastic will break. And work from both sides of the box.



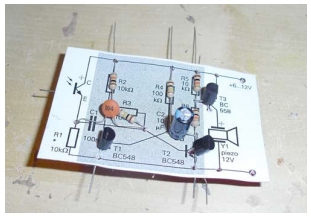
Here I drill the inside plywood with the same helper. Even though I had worked carefully, the holes on the three levels (box top, inside, box out) had slightly moved. Still it didn‘t create any problem.

To measure and mark the window for our transistor field I had to fix the plywood already tight to the „front“ of our lunch-box. The furniture screws are the same I used for the gun, but since the distance was bigger (4,5 cm) I had to cut the screw from a 6mm external thread cylinder.

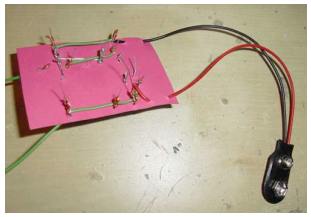
So we got the ready box with open window, screw holes going through three levels of material. Transistors not fixed yet.



Let‘s have a look at the technical gimmick that makes the box work. I like to work with a copy of the circuit printed and glued on a cartoon. Then punch the elements through the surface at the place needed and connect them in the back.



There are two capacitors, five resistors and three transistors to be fixed (consult the PDF added). Notice that the field of the photo-transistors, the buzzer and the R1 resistor are empty – they will be added later.



I connected the elements and soldered them according to the layout and fixed the cables to add a power source. On the opposite side cables go out to the 36 phototransistors.

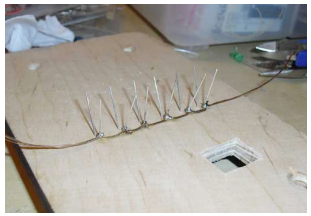
Back to the box: Since I decided to have a switch on the target I had to add another hole. And a piece of plexi to reinforce the hull. There are three diodes to show the status of the target, too. ON or HIT, they will blink.

created by Jeremiasz Hauck

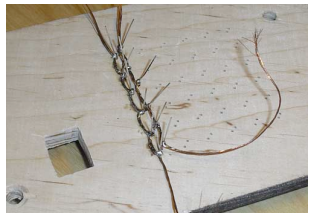
Now that all the crude holes are done I can start with the phototransistors, working line after line. Watch out for the orientation (plus-minus) of your transistors, and use Super Glue.

That‘s how the other side should look like, all short wires in one direction, the long ones in the other.

Now I can make a little loop around the same wires, without watching out too much if it‘s plus or minus.

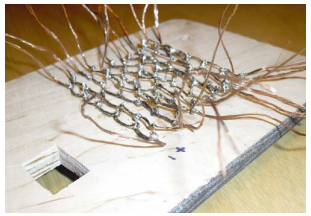


Then a small drop of solder on each connection – and done.



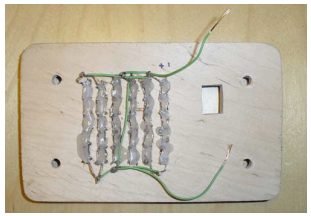
The other contact I made slightly higher so as to have a real distance between the two opposites, plus and minus.

Remember the system you started with – e.g. up minus, down plus. Then you can cut of the excess wire of the transistors, you‘ll have a less cluttered workspace. Here two lines are fixed already.



Proceed with the remaining four lines in the same way. It is important to leave enough wire at the sides of the transistors to later do further connections.

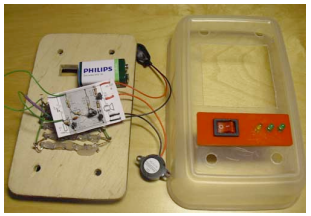
Finally done: to insulate the plus/ minus lines I used the Hot Glue again (like at the laser tip). It really adds to the stability, should something pull away at the cables. Notice that neighboring pluses and minus are grouped together.



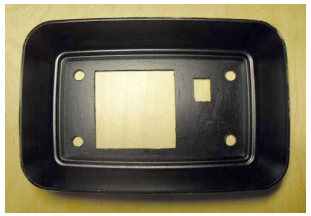
Connect all pluses into one wire, and the same with the minuses.

A unified field of transistors looks cool. Don‘t worry! It‘s more work explaining, than actually doing, once it‘s well prepared.

created by Jeremiasz Hauck



Connect the circuit to the phototransistors. There‘s a dedicated space on the plywood for the battery, and the buzzer has been fixed, too. The switch and diodes are not yet glued.

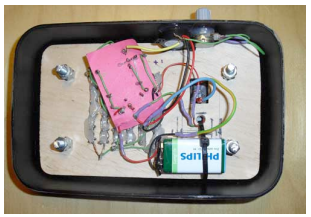


Because it‘s time to spray the inside of the lunch-box. Sandpaper it before, so the color won‘t come off so easily. From outside it‘s still a shiny surface.

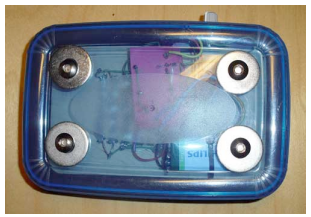
Now we can glue the switch field

Time to put the plywood into the box. You can see the potentiometer,(10kΩ) that I chose to put in lieu of the R1 resistor. So that the target won‘t buzz when there is strong daylight.

The buzzer still needed a little hole to stay audible when the box is closed. So, from the front, it‘s done.



A last view into the box, the buzzer is glued to the wall, the battery fastened to the plywood.



Then close the lid, and if you‘d want, you could put some suspenders between the box and the big washers. Then you could wear the box on your chest. Don‘t forget to put on protective glasses, the laser can hurt your eyes.

The ready project with : lasergun and interactive target…

Have Fun!!!

created by Jeremiasz Hauck