One for the birds

SIMPLE ELECTRONICS ARE USED TO CREATE FUN EFFECTS THAT GET SOME BIRDS ALL A TWITTER

By Enrico Miglino
Photographs: Enrico Miglino

Birds is the project we will be creating this issue. It is built with simple electronics to create a nice effect. To build the project I have followed two separate workflows: building of the birds' cage, and the animatronics of the birds themselves, including electronics with micro:bit.

The inside of the cage includes the laser-cut moving parts (see the article on page 66).

The cage resembles a traditional chicken cage with a cardboard base made by painting a recycled box black. The base of the cage also contains the electronics and the moving engines. The support structure of the cage is built with 2×3cm wooden splines joined on the top side by two M2 threaded bars to give robustness to the entire structure. Around the cage, I have fixed chicken wire that gives good visibility to the interior and a touch of realism.

All servo controllers are used

No soldering is required for the electronic assembly which is based on the BBC micro:bit board and All-in-one motor and servo controller by Kitronik (kitronik.co.uk). As already mentioned in the previous installment of this column (The Shed Issue 83, March/April) the board can manage up to
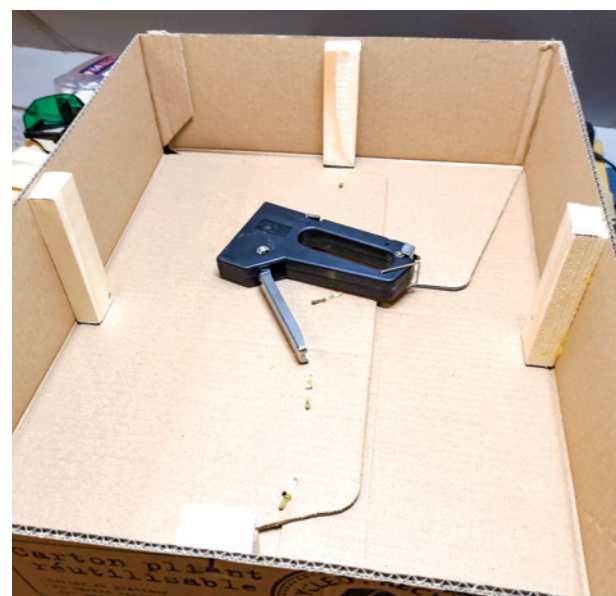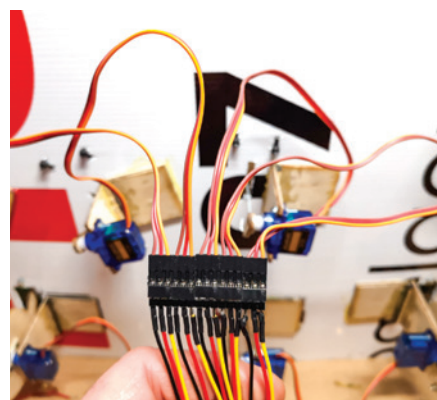

Left and right: Some phases of building of the cage structure. The cardboard box base will include the mechanical components and the wiring. The cover of the box, made from recycled white plastic sheet, is also the base of the birds and tweeters
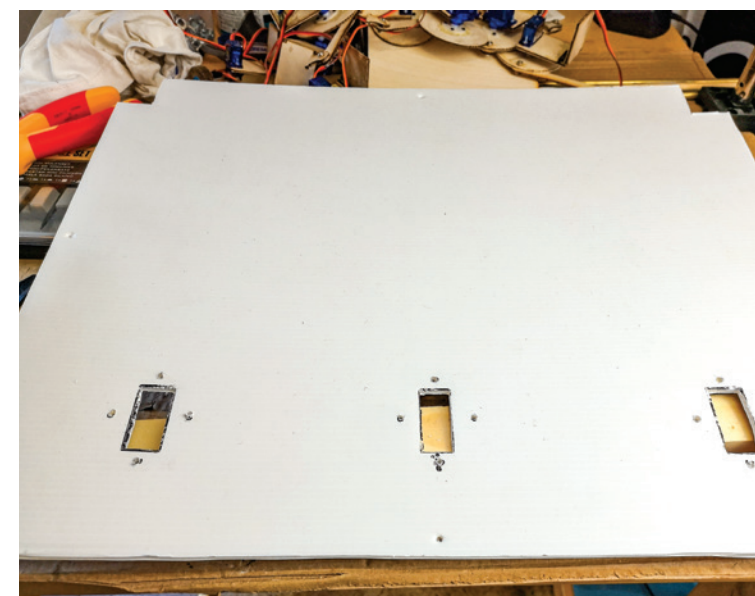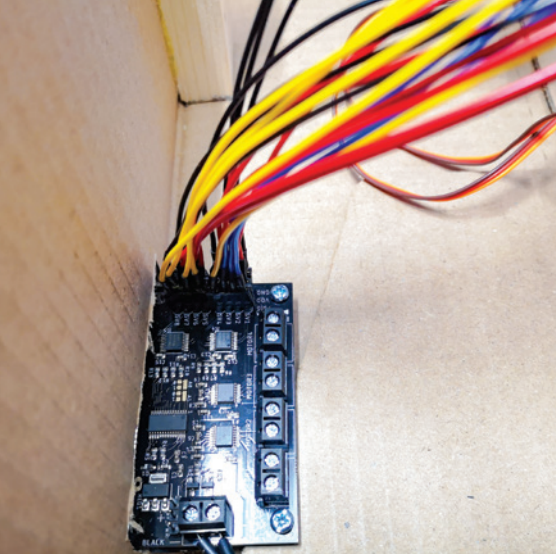
Thanks to the Kitronik's all-in-one robotic board the electronic assembly does not require circuits or soldering. Here I have used a set of custom wires to connect the board to the eight servos used to animate the birds, but a set of breadboard connectors would also work.

Note that I have fixed the controller board half inside the base box, while the micro:bit side of the board is outside of the box. This solution makes it easy to keep the micro:bit visible and the system can also be programmed when the cage assembly is complete

Rob Ives interview

Rob Ives with one of his paper creations

Enrico: Hello Rob. I love your projects and your site. I think I will use some of your inspiring paper projects and hack them for one of my projects. I am doing a cage with tweeting birds and the sound is generated by an automated version of your twitterer design.

Rob: Sounds good.

Enrico: Please can you tell me something about yourself? Is it passion or something related to your job that makes your designs so special? Please tell us how you started the project site (https://www.robives.com/).

Rob: I've been making paper models for quite a while now. I registered the site www.flying-pig.co.uk in 1997 while I was still a teacher. I started when I was invited to write a book by Tarquin publications that was called Paper Locksmith; unfortunately, it is no longer in print but you can sometimes find copies on Amazon. The publication was fairly successful and I wrote the book Paper Automata for the same editor.

I had produced six models for them but they only used four so I thought I would have a go myself with the other two. From there I started selling printed kits to shops and online via the Flying Pig site.

In 2000 I left teaching and this is now my full-time job. Most of my work now is on www.robives.com which is my official site.

Enrico: Sounds like a very interesting adventure and you started in 1997 — over 20 years ago. I am curious to know what approach you follow when creating a design from the real world subject to its mechanics. I see there are a lot of sophisticated solutions in your models.

Rob: I often work from the start of an interesting mechanism, either one I have thought up myself or one I have seen. I then try to imagine how it could be used in automata.

Alternatively, I start with a movement and try to work out the mechanism that could make it work. For example, I am currently working on a model turtle that has a head that pops out when you squeeze it.

In this model, I had an idea for the mech but it turned out the original idea wasn't very good; I'm currently working on an improved mechanism for this model. It's always interesting to work on these sorts of projects because of problem-solving.

I've also been branching out into the laser-cut card which is a very interesting technology.

Enrico: My other question was about the use of some alternative similar materials, like cardboard or 3D-printed stuff.

Rob: I've done some work with laser-cut wood providing the mechanisms for another artist.

The use of laser-cut paper looks promising because I can use that with publishers and they can provide pre-cut kits.

Enrico: Where do you live, Rob?

Rob: I live in Cumbria, in the North of England, in a small village called Broughton Moor.

Enrico: Thank you for your time, Rob! It was nice to speak to you.

eight servos and four DC motors. For this project, I have used all the servo controllers available.

The laser cut parts can be done manually without difficulty with a couple of cutters, scissors, and plywood saw but this part of the project was made easier and took less time by using a home laser cutter instead.

The moving components are of two types — the birds, moved by five micro servos; and the twitters, moved by continuous servos which are very similar to a geared DC motor. The birds' motion is simple, through a 2mm thick wire transmission. Using software delay and different starting positions the five birds all move in quite different ways.
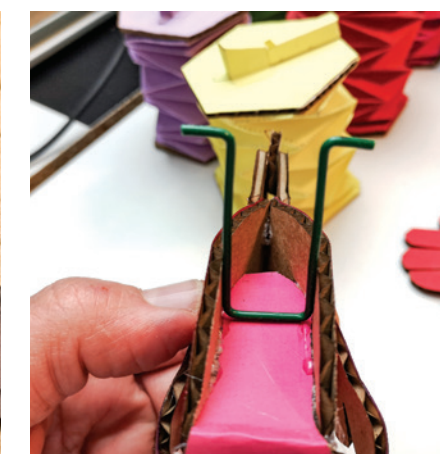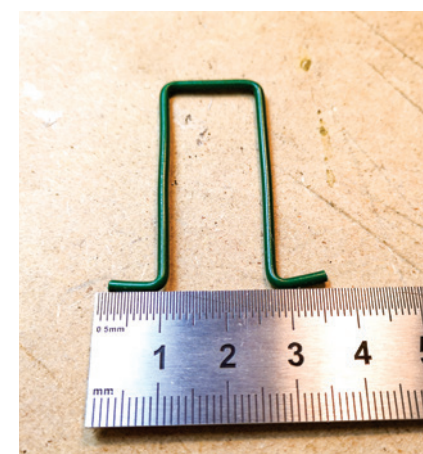
The inspiration

This project was inspired by Rob Ives, a genial maker from the UK who creates ingenious paper mechanisms.

I had been searching for some time for a way to reproduce that "coo coo" sound used in wall mount clocks, made very popular during the '60s and '70s. ▶

"*This project was inspired by Rob Ives, a genial maker from the UK who creates ingenious paper mechanisms*"

Right: After the components have been cut, and the birds assembled, I added the legs made from 2mm-thick metallic wire.

Under the backside of every bird, I hot-glued the plywood support used by the servo to move the body

Below: The tweeters are moved by a continuous rotation servo, similar to a DC geared motor, translating the rotation to a linear bi-directional movement to push and pull the paper tweeters. The moving paper part is kept in place by gluing it to the perspex support.
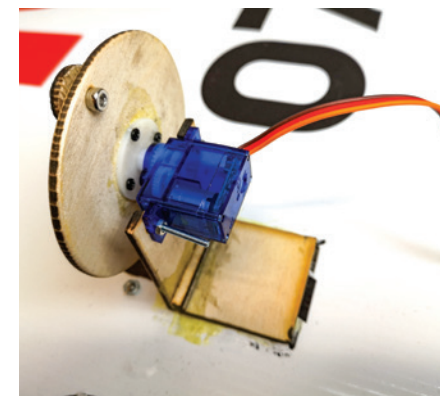
Below: The moving mechanism is of two types — birds are moved by micro servos to which the lever has been extended and connected to the bird plywood support through a transmission wire
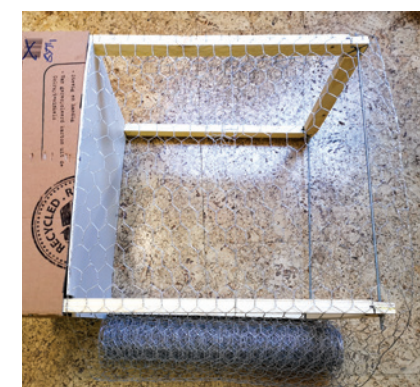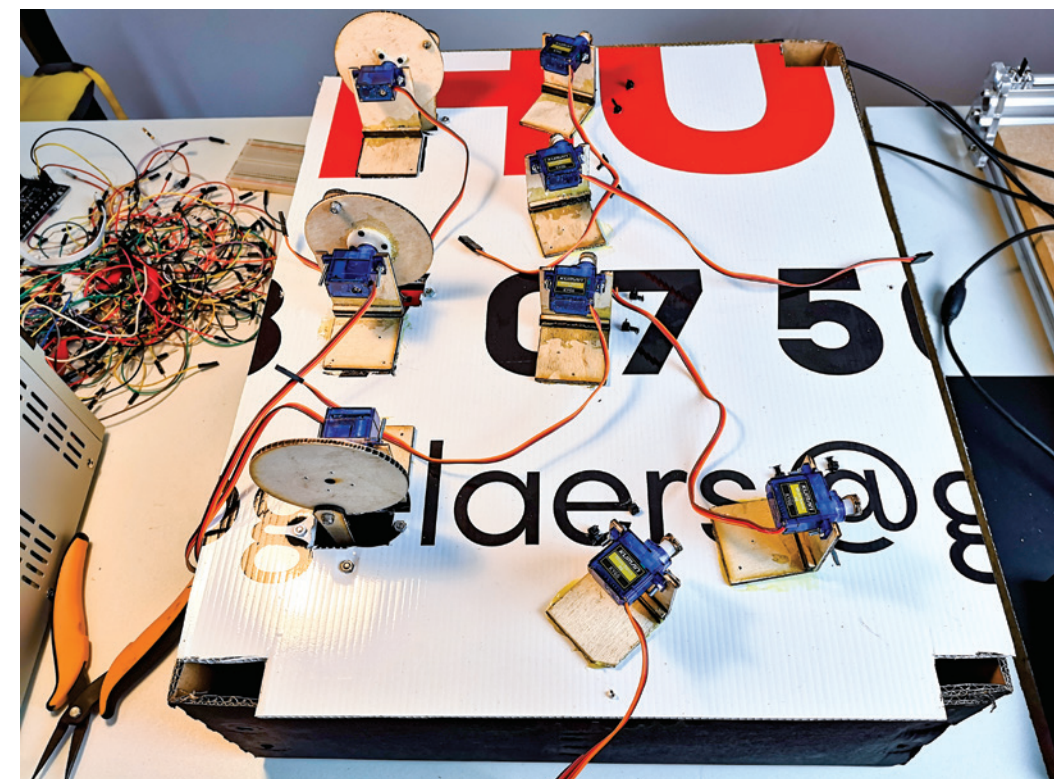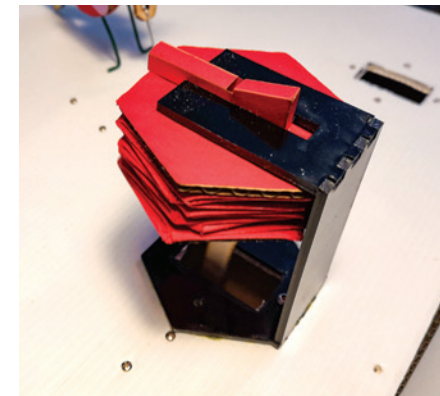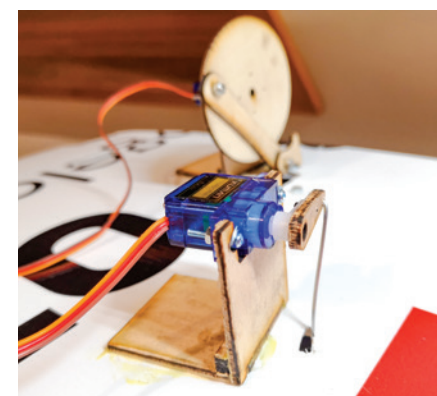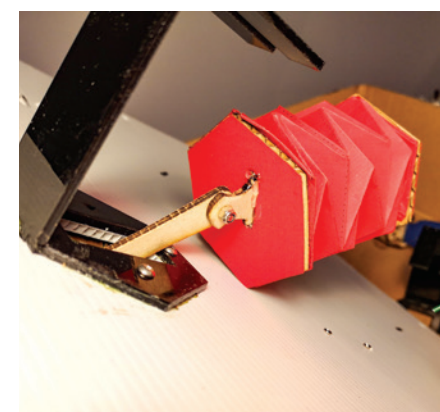
Top: A view of the bottom side of the cage plane with the servos and mechanisms in place
Above and top right: Details of the last phase of the cage assembly
Right: The finished project with the birds' cage hung up and running

▶ Finally, I saw his site (https://www.robives.com/) showcasing just what I was searching for, and it was easy to build from a single sheet of paper.

First I made one of his models and it worked, then I studied a way to hack the design (released under a free Creative Commons licence) and adapt it. I made a set of three different tweeters moved by the continuous servos with a rotating cam mechanism.

Designs, sketches, and the micro:bit software (JavaScript and Makeblock) are available on the dedicated GitHub repository: (https://alicemirror.github.io/birds/)