tts

Make a chair-o-plane

Crumble blog 4

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Follow this step-by-step guide on how to make a chair-o-plane.

Associated resources:
Crumble lesson plan
Crumble PowerPoint - chair-o-plane
Crumble blog 1 – set up the controller
Crumble workbook 4 – chair-o-plane

You will need:

Parts included in class kit

- 1 Crumble controller unit (see Crumble blog 1)
- 1 sheet of corrugated plastic 16.5 cm x 16.5 cm
- 1 sheet of corrugated plastic 12.5 cm x 12.5 cm
- Offcuts of corrugated plastic
- 1 piece wooden rod 15 cm long
- 2 crocodile leads
- 1 motor
- 1 motor mount
- 1 wooden pulley
- 6 card discs
- 1 cardboard craft roll
- 3 rubber bands about 8.5 cm long
- Coloured gems
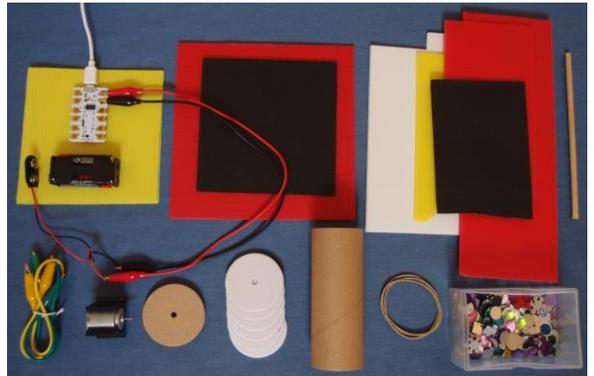
Other parts, tools and consumables

- Ruler
- Pencil
- Pair of compasses
- Protractor
- Large scissors
- Pencil sharpener
- Low melt glue gun & glue sticks
- Transparent sticky tape
- Computer (see Crumble blog 1)
- Optional: 6 lightweight passengers e.g. plastic figures or bugs

Step 1

Use the compasses to mark out circles on the sheets of corrugated plastic. Cut these out with the large scissors. Use the ruler and pencil to mark a line across the middle of the large plastic circle (the 'top circle'), then use the protractor to measure angles of 60° from this line. Mark lines at 60° with the ruler.
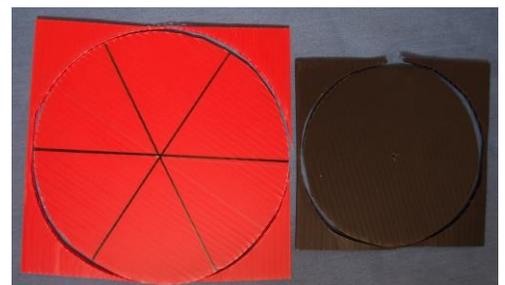
Top circle   Base circle

Step 2

If there is any card in the central holes of the card discs then remove it. Turn the small corrugated plastic circle (the 'base circle') over and glue a card disc to the middle. Glue two more card discs on to make a stack – make sure they are concentric, and be careful not to get glue in the central holes. Use the pencil sharpener to partially sharpen one end of the wooden rod as shown until it slides easily into the discs. Don't make the end pointed, as it must rest on the base circle, not pierce it. Glue the cardboard craft roll onto the top card disc.

Step 3

Take another card disc and use the nose of the scissors to enlarge the hole in the middle until the wooden rod rotates easily in it. To do this, push the nose of the scissors into the hole and rotate the scissors to make a smooth round hole. Glue this card disc to the top of the cardboard craft roll.

Step 4

Use the pencil and ruler to mark the wooden rod 13 cm from the sharpened end. Sharpen the blunt end of the rod very slightly to make it easier to fit the pulley and discs. Push on the pulley until it just covers the pencil mark. If the pulley is a loose fit on the rod then glue it firmly in place. Glue two more card discs to the top of the pulley (first enlarge the central hole very slightly so they can just be pushed on – they should also be a tight fit).

Step 5

Carefully slide the rod down through the cardboard craft roll until the end rests on the base circle. You will need to hold it very straight and feel around for when the end of the rod drops down through the holes in the card discs. Check there is a gap of about 3-5 mm between the bottom of the pulley and the card disc on top of the craft roll. Spin the rod with your fingers to check it rotates easily, then take it out.
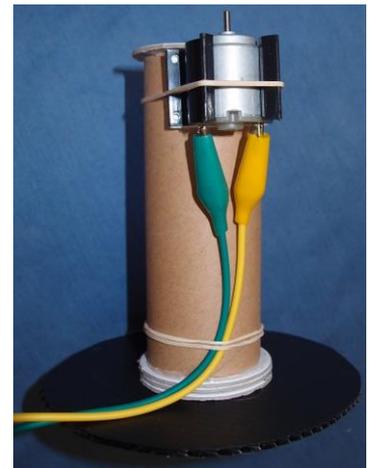

Step 6

Remove the plastic film from the bottom of the motor mount and glue it firmly onto the cardboard craft roll in the position shown (i.e. just below the top disc). Stretch one of the rubber bands over the motor mount and craft roll to help keep the motor mount in position. Clip two crocodile leads onto the motor contacts, and use a second rubber band (you will have to double this one over) to hold the wires close to the bottom of the craft roll and stop them getting caught in the chairs as they rotate.

Step 7

Use the pencil to enlarge the hole in the centre of the top circle until it just pushes onto the rod. You can turn the circle over so that the pencil lines are facing downwards. Glue the circle onto the top of the two card discs. Slide the rod back through the craft roll.
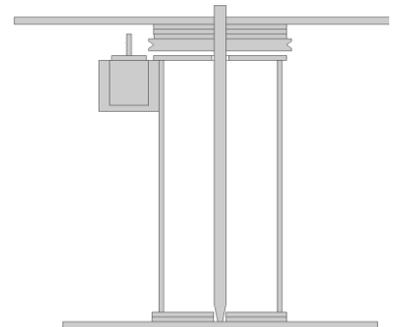
Step 8

To make chairs for the passengers, mark and cut 6 strips 1.5 cm x 20 cm from the corrugated plastic offcuts. If you don't have any passengers then you can make your own out of corrugated plastic and bend them into shape. Mark the middle of each strip and glue on the passengers. Bend the chairs around the passengers, then tape the tops of each chair together with the sticky tape. Tape each chair onto the outside of the top circle at the end of a pencil line, so that it hangs down vertically. If your passengers are different weights then try to position passengers of equal weight opposite one another to help balance the ride. Make sure your passengers are all facing the same way.
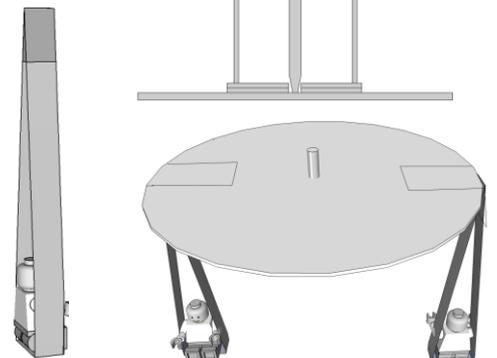
Step 9

Remove the completed chair unit from the craft roll, turn it upside down and lay the chairs out to the sides. Tape the underside of each chair to the bottom of the top circle, to reinforce the joint.
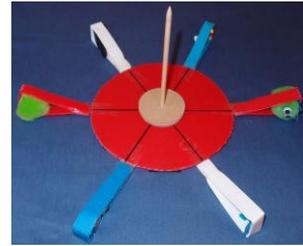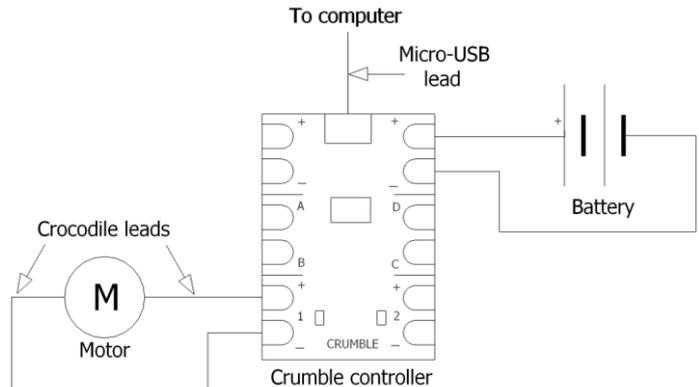

Step 10

Stretch the third rubber band over the pulley, keeping hold of the end. Turn the chair unit the right way up again and slide the rod back into the craft roll. Stretch the rubber band over the motor shaft as you push the rod back into the holes in the card discs. Slide the motor up in its mount until the rubber band sits at the bottom of the motor shaft as shown. The motor shaft should not be touching the top circle. Decorate the chair-o-plane by gluing on gems and shapes made from offcuts of corrugated plastic.
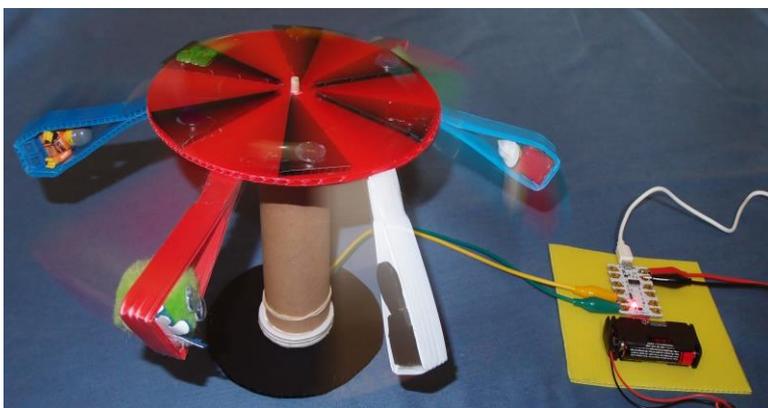

Step 12

Clip the two crocodile leads from the motor contacts to the Motor 1 terminals on the Crumble. Clip the snap battery connector onto the battery holder. Select the file 'Run motor' from the Crumble folder. Click on the green arrow to run your program, and check the chair-o-plane rotates. If the passengers are going backwards then swap the two crocodile clips attached to the motor contacts to make it go forwards.

Step 13

Program a ride for your passengers, for example going forwards and backwards at different speeds. An example is shown here. It is a good idea to program a short pause when changing between forwards and backwards, to avoid draining the battery too quickly.

Step 14

Unclip the snap battery connector from the battery holder when not in use so that you don't drain the battery.