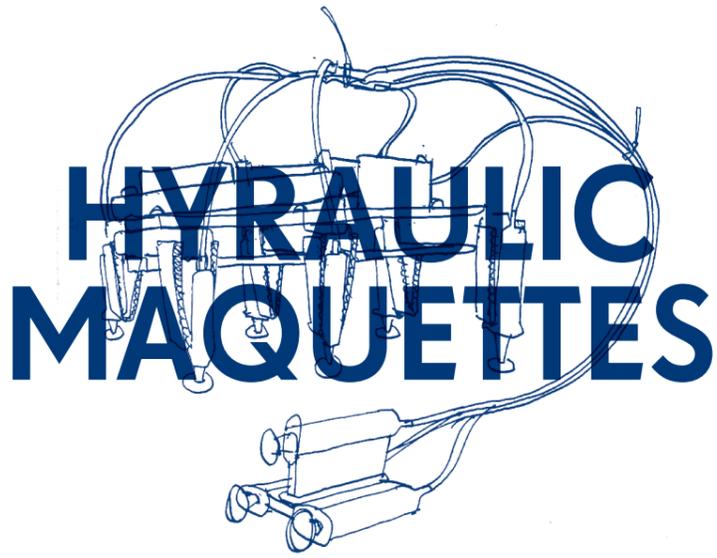


MAKERS MANUAL #18

James Capper

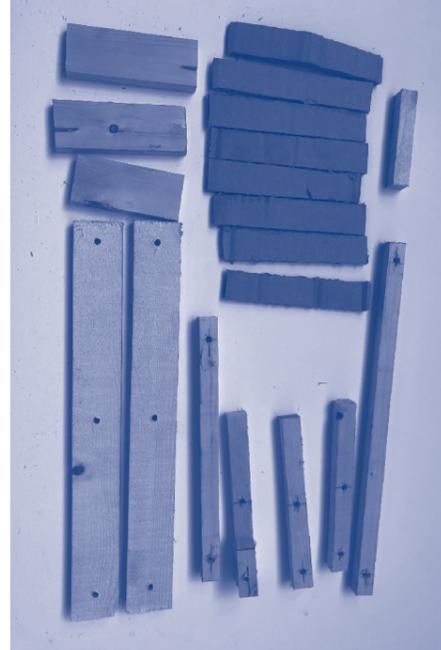


LIST OF THINGS

- 2x Lengths of wood
- 1x Strip of card
- 6x M5 x 50 bolts
- 30x M5 washer
- 6x M5 nylon lock nuts
- 2 meters 3mm tube
- 4x 20ml syringe
- 6x 5 ml syringe
- 4x 3mm tube Y junctions

TOOLS

- 1x Glue gun
- 4x Glue sticks
- 1x Battery drill
- 1x 5mm drill bit
- 8mm spanner



BIO OF THE DESIGNER

My sculptures deal with the pathways and journeys in the evolution of life on this planet and the increasing interest in modern forms of engineering and technologies that are informed by nature. My work explores hydraulic mobile and static structures. Many of my sculptures are developed for a purpose, to take me on a journey away from London and out to the mountains of Switzerland, the Pacific coast of Mexico or the arid lands of the Australian outback. These sculptures sometimes act as vehicles to take me on journeys and other times are evolving experiments that adapt to their surroundings.

FURTHER READING

- Human and Machine Locomotion, Edited by A. Morecki / K.J. Waldron
- Machines that Walk, the Adaptive Suspension Vehicle, Shin-Min Song / Kenneth J. Waldron

INTRODUCTION

This small mobile sculpture is influenced by the locomotion of a six legged insect, this form of locomotion is called the 'Alternating Tripod Gait.' The gait allows the insect to always have three points of contact to the ground when walking on six legs, this gives the insect a great amount of stability. An insect's nervous system is far simpler than other animal species, making it an ideal case study for mobile engineering. By making a simple parallelogram mechanism with the linear movement application of hydraulic cylinders it is relatively straightforward to demonstrate the walking motion of insects such as honey bees, ladybugs, woodlice and stick insects. This table top sized mobile sculpture once made will give you further ideas of adaptation to improve its walking and climbing abilities. It's important to start this study from somewhere - this is the simplest place I can think of!

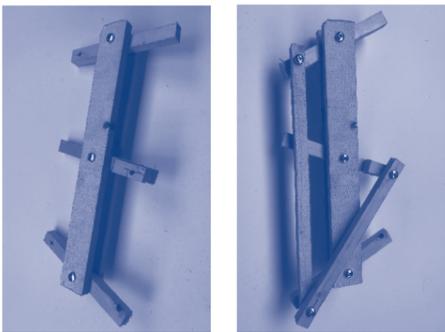
STEP 1

Cutting / drilling list

- (8x) cardboard strips cut 25mm x 140mm
- (2x) wood 35mm x 10mm x 300mm with 5mm holes set 20mm in from each end and one hole in the center
- (2x) wood 35mm x 10mm x 100mm
- (1x) wood 35mm x 10mm x 80mm
- (1x) wood 15mm x 15mm x 210mm with 5mm holes set 20mm in from each end
- (1x) 15mm x 15mm x 300mm length of wood 5mm holes set in the ends by 20mm x2
- (x3) wood 15mm x 15mm x 140mm with 5mm holes set 20mm in from each end and one hole in the center
- (1x) wood 15mm x 15mm x 80mm
- (1x) wood 15mm x 15mm x 40mm

STEP 2

Sandwich the (x3) 15mm x 15mm x 140mm lengths between the (2x) 35mm x 10mm x 300mm lengths of wood, use the M5 x 50 bolts with the M5 washers as spacers, do not tighten the M5 lock nuts too tight allow for the wood to have a smooth articulation of movement when you move all the legs from side to side.



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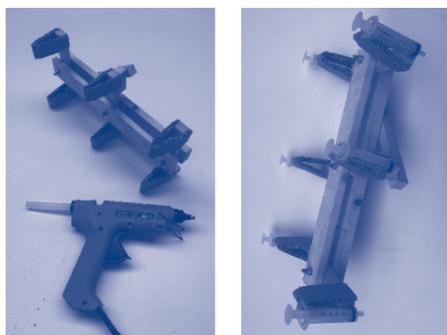
STEP 3

Glue and attach the 15mm x 15mm x 40mm length of wood to the center leg, use the existing hole in the wood as a guide to drill through once the glue is dry. Attach the 15mm x 15mm x 300mm length and 15mm x 15mm x 210mm length of wood using the M5

x 50 bolts with the M5 washers as spacers, do not tighten the M5 lock nuts too tight allow for the wood to have a smooth articulation of movement when you move all the legs from side to side. You can now see how the parallelogram mechanism works!

STEP 4

Fold six of the cardboard strips in half and glue them to the end of the legs



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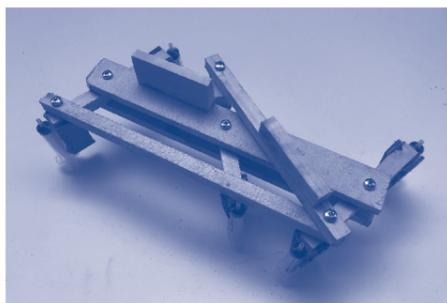
STEP 5

Glue the six 5ml syringes to the end of the legs and cardboard supports

STEP 6
Check that everything is glued well, make sure the parallelogram mechanism still works, you may have to clean some glue away from the pivot points!

STEP 7

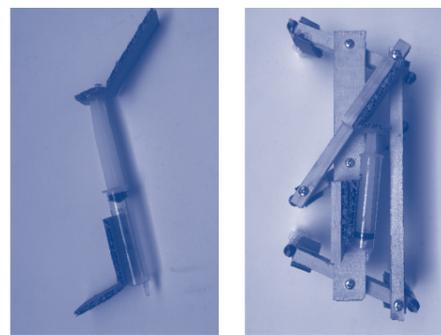
Retract the parallelogram mechanism back and glue the 35mm x 10mm x 80mm



length of wood to the main chassis rails, glue the 15mm x 15mm x 80mm length of wood to the upper section of the 15mm x 15mm x 210mm length of wood, that forms the parallelogram linkage.

STEP 8

With the glue gun attach two pieces of card to the 20ml syringe, to make the hinge linkages



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STEP 9

Glue the 20ml syringe hinge linkages to the chassis and parallelogram linkage

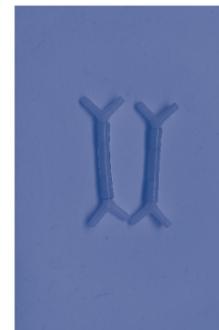
STEP 10

Glue the 2x 35mm x 10mm x 100mm lengths of wood in a T shape and then glue the 20ml syringes to the sides, this makes you a controller!



STEP 11

Join the Y junctions together with a short length of hose



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STEP 12

Attach the hoses to the three opposite 5ml leg syringes, then attach the hoses to the Y junctions

STEP 13

Connect the hoses to the other three 5ml leg syringes, then attach the hoses to the Y junctions

STEP 14

Connect all the hoses to the controller, now you should be ready to walk! It will take some practice, but you'll get the idea and hopefully a load more ideas on how your sculpture can evolve!

