PRODUCT DESIGN – 2

Toy Design

Prof. Vijay Bapat

IDC School of Design
अभिकल्प विद्यालय
IIT Bombay

Ashuj Chawda | 216130009

Acknowledgement

First of all, I would like to thank my Professor Mr. Vijay Bapat for guiding and motivating through the entire module. I came to learn more about animals and their associated limb/body movements that define them. I also learnt how we can incorporate various mechanisms to achieve these motions into some of the chosen animals for our toy project. I gave me a broader perspective and confidence to build things.

I would like to thank Alka ma'am for letting us use various tools and machines at the PoC Lab at IDC School of Design. Further I would also like to thank Rohit and Deepak sir for guiding though various tools at the PoC and Wood Lab.

I would like to thank my batchmate Prateek Pagore and others from the Mobility and Vehicle discipline for helping me with the mechanism where I found difficulty.

A sincere gratitude towards my classmates whose hard-work and perseverance brought more out of me. A further word of gratitude towards my B.Des. juniors who helped me with the laser cutting machine when Rohit sir was not around.

Contents

1. INTRODUCTION

Toys are fun material objects for children's playing experience. For children aged from 15 till 24 months, a toy ignites their cognitive powers and stimulates imagination. It also directs their behavior and interaction towards their parents, peers and environment.

1.1. Opportunity

As a product designer with the given role to design a toy, it is an exciting and fun learning experience to draw inspiration from the nature and make a simple and active working contraption that makes use of various mechanisms from the world of physics.

The following constraints are to be followed:

a. It should be a simple push/pull toy made out of wood or related material.
b. Other materials are to be used in minimal quantity only when there is a requirement.
c. The toy should be inspired from nature that incorporates an associated motion.
d. Toy should be easy and safe to operate.
e. It should be able to withstand wear and tear for at least an year.
f. The operating environment needs to be the interior of house or children’s play area and on a smooth surface.
g. The kids should be able to operate it while they are standing, walking or sitting.

1.2. Brief

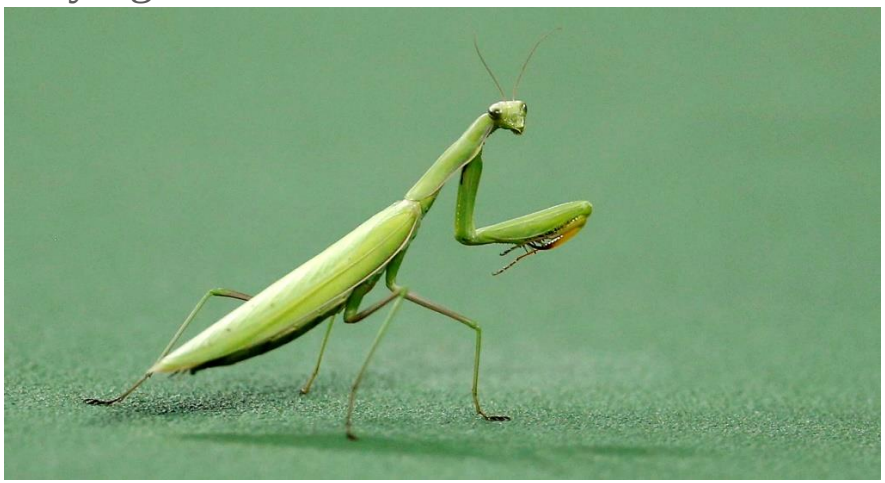
The goal is to design and develop a simple push/pull toy for children aged around 15-24 months that is inspired from nature and replicates a specific associated motion of that selected inspiration in the form of various kinetic mechanisms related to physics; made from wood and/related material.

2. METHODOLOGY

2.1. Inspiration

We are surrounded by nature that work and perform in very interesting, certain specific ways. Some have linear, some have curvy, some rotational, some spiral and some a mixture of these motions. These are some of the creatures that drew my attention and I have felt very inspired:

a. Praying mantis – limb motion

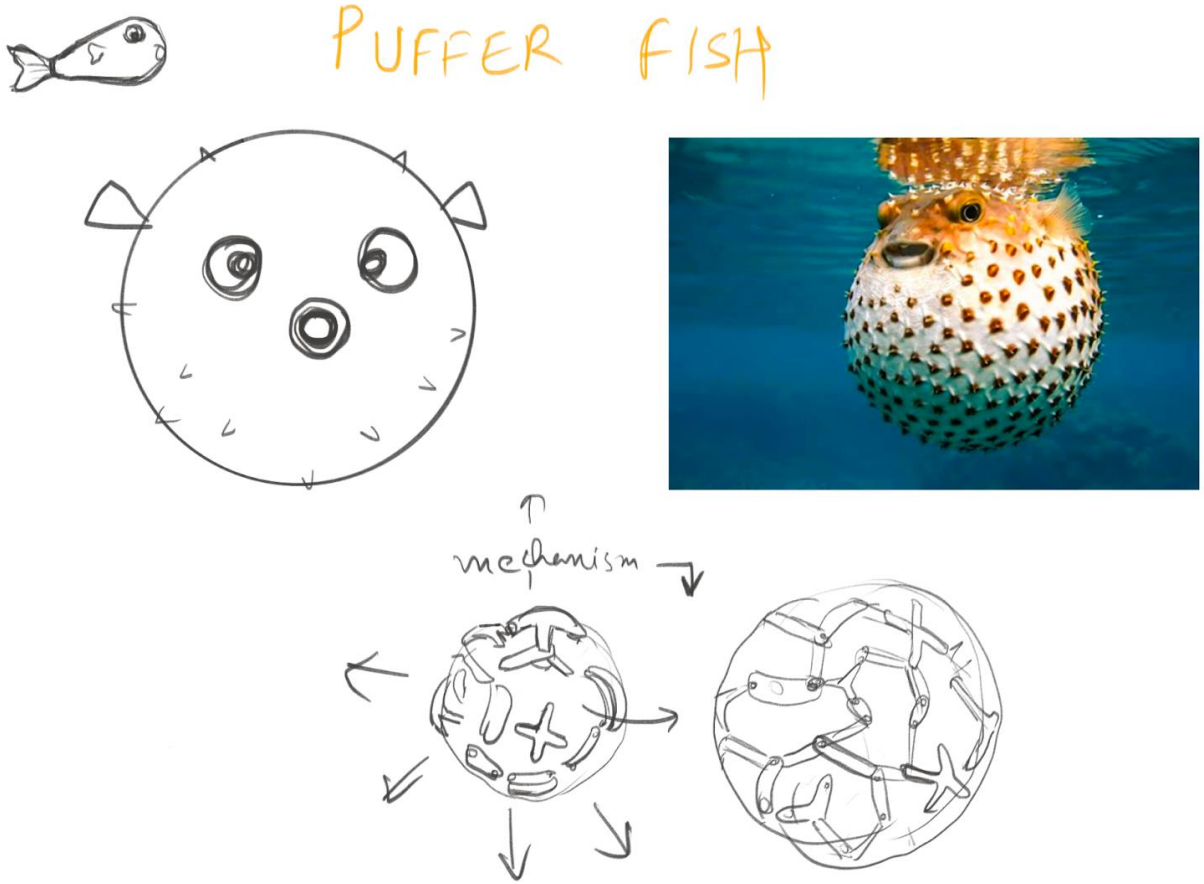


2.1.(a). Praying mantis

b. Crab – lateral limb motion

2.1.(b). Crab

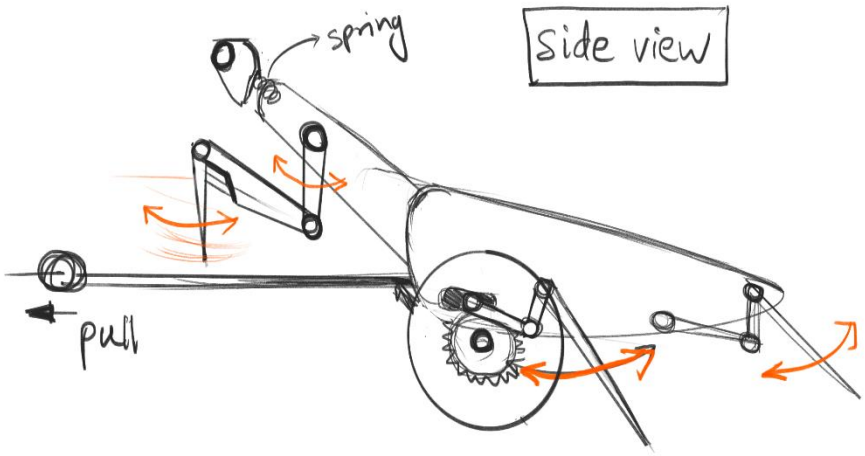
c. Puffer fish – swelling motion (defense mechanism)



2.1.(c). Puffer Fish

2.2. Ideation

Initially, I started working with praying mantis, I found the boxing motion of the front limbs and sideways motion of the rear limbs to be very interesting. With the use of cranks and linked parts, this motion can be achieved. But considering the thickness of the limbs and the quantity of linked parts was making it impossible for it to be produced for small children. So, I moved towards the next inspiration: Crab.

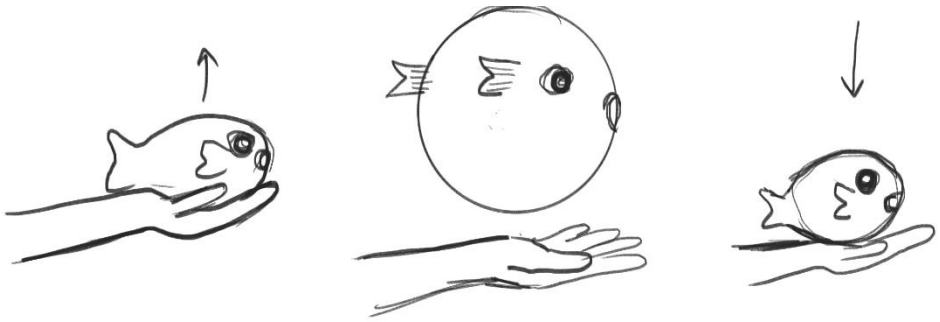


2.2.(a). Ideation for praying mantis

I loved the idea of a crab moving sideways and I really thought that with the use of some simple gears, cranks and few links, this could be possible.

2.2.(b). Crab ideation

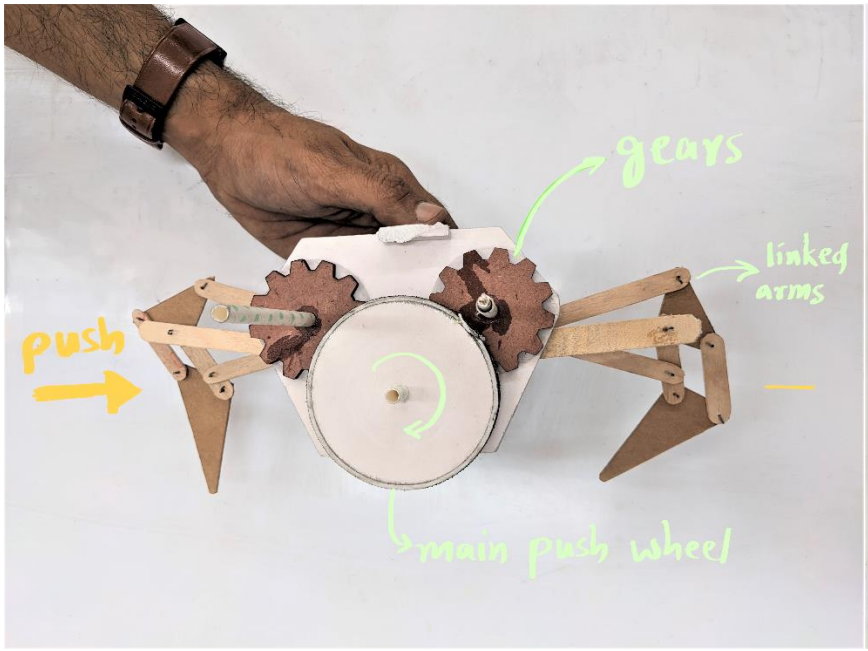
Lastly, I wanted to incorporate the concept of Hoberman's sphere into a Puffer fish. The idea being that as soon as the kid throws the toy into the air, it expands and when it about to land, it shrinks back to its original size.



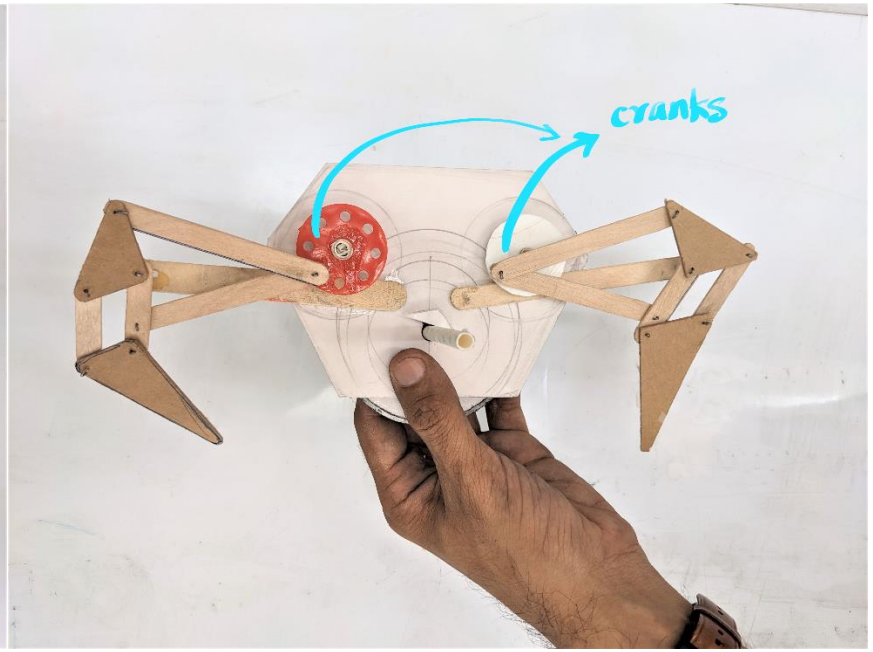
2.2.(c). Ideas for Puffer fish

2.3. Mock-ups

After much thought and consideration, I decided to work on the idea of Crab moving laterally. My friends and classmates also found the motion interesting and practical.



2.3.(a). Crab mock-up internal



2.3.(b). Crab mock-up external

The above mockup uses ‘sunboard’ for the chassis, laser-cut 4 mm MDF boards for gears, cardboard as linked arms and ice-cream sticks as links and cranks. The linkages are made out of bent and cut 1 mm wire. The parts make use of gears, cranks and links to perform the

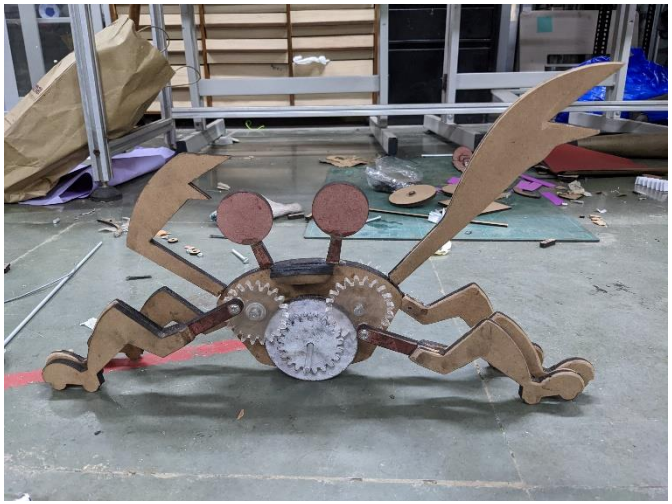
crawling motion. There are three gears, one attached to a main wheel and the other two adjacent to the main wheel gear to translate the rotatory motion (image 2.3.a). The translated rotary motion is converted to linear motion through the use of cranks on the back side of both the gears, as shown on the image 2.3.b. These linked cranks to the limbs perform the desired motion.

2.4. Prototypes

I used laser-cut 4 mm MDF boards to make the prototype. Upon reaching the stage where I needed to connect the links, I found out that the links and gears became very tight. There was no desired smoothness in the motion.

2.4.(a). Prototype -1

I decided to change a few things for good: the number of mechanisms from gears, cranks and links to only gears and cranks. I also needed to make the gears out of laser-cut 7 mm acrylic sheets for smoother rotatory translatory motion.

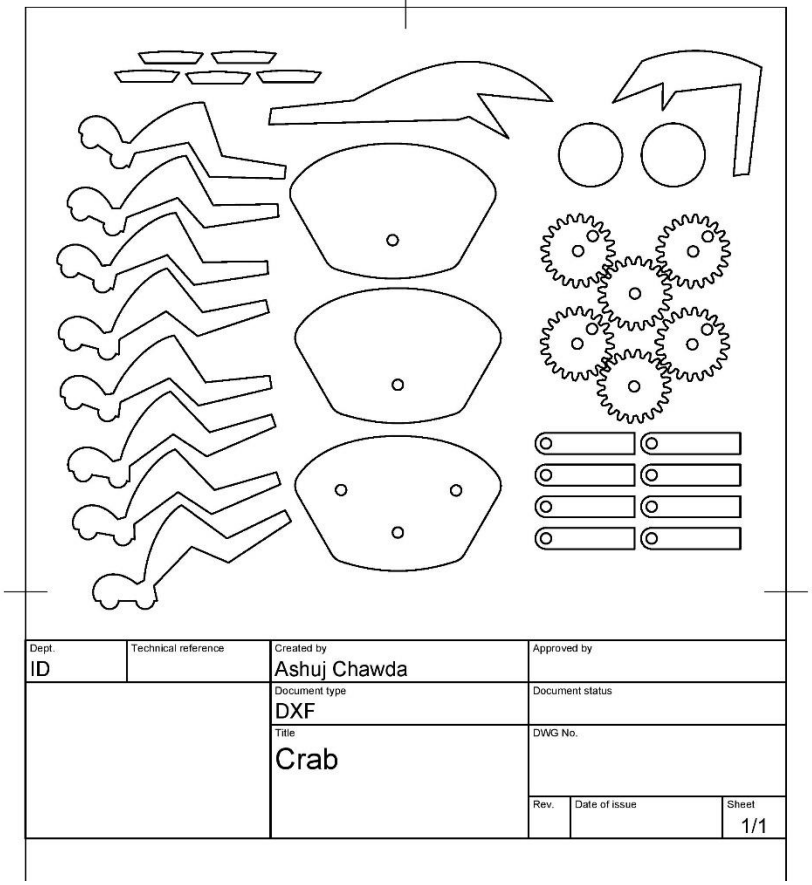


2.4.(b). Prototype -2

2.5. Final Concept

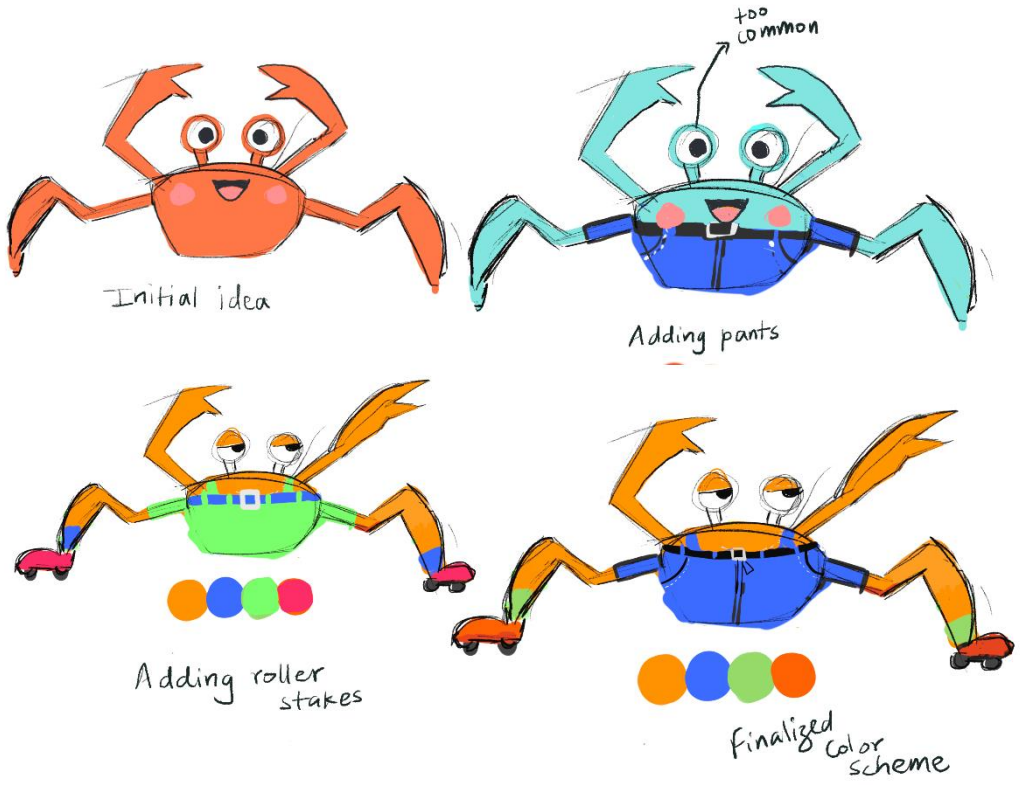
a. Parts for laser cutting:

Parts were finalized for laser cutting in the DXF format and cut into shapes with varying thicknesses. Then the parts were assembled using 5 mm aluminum rods and 5 mm bolts held together with industrial grade glue.



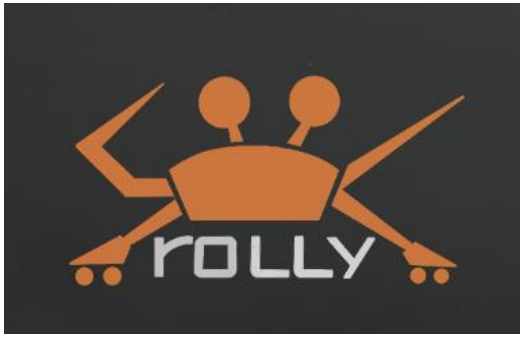
2.5.(a). Drawing for laser cutting

b. Color scheming: After trying out various colors and patterns that would suit the little children, the following colors were finalized. I loved the concept of a crab sliding and crawling on roller skates.



2.5.(b). Color schemes

c. Logo design:



2.5.(c). Logo

3. TOY MODEL – ROLLY THE CRAB