

Design of a Fixed Wire-Actuated Tadpole Robot



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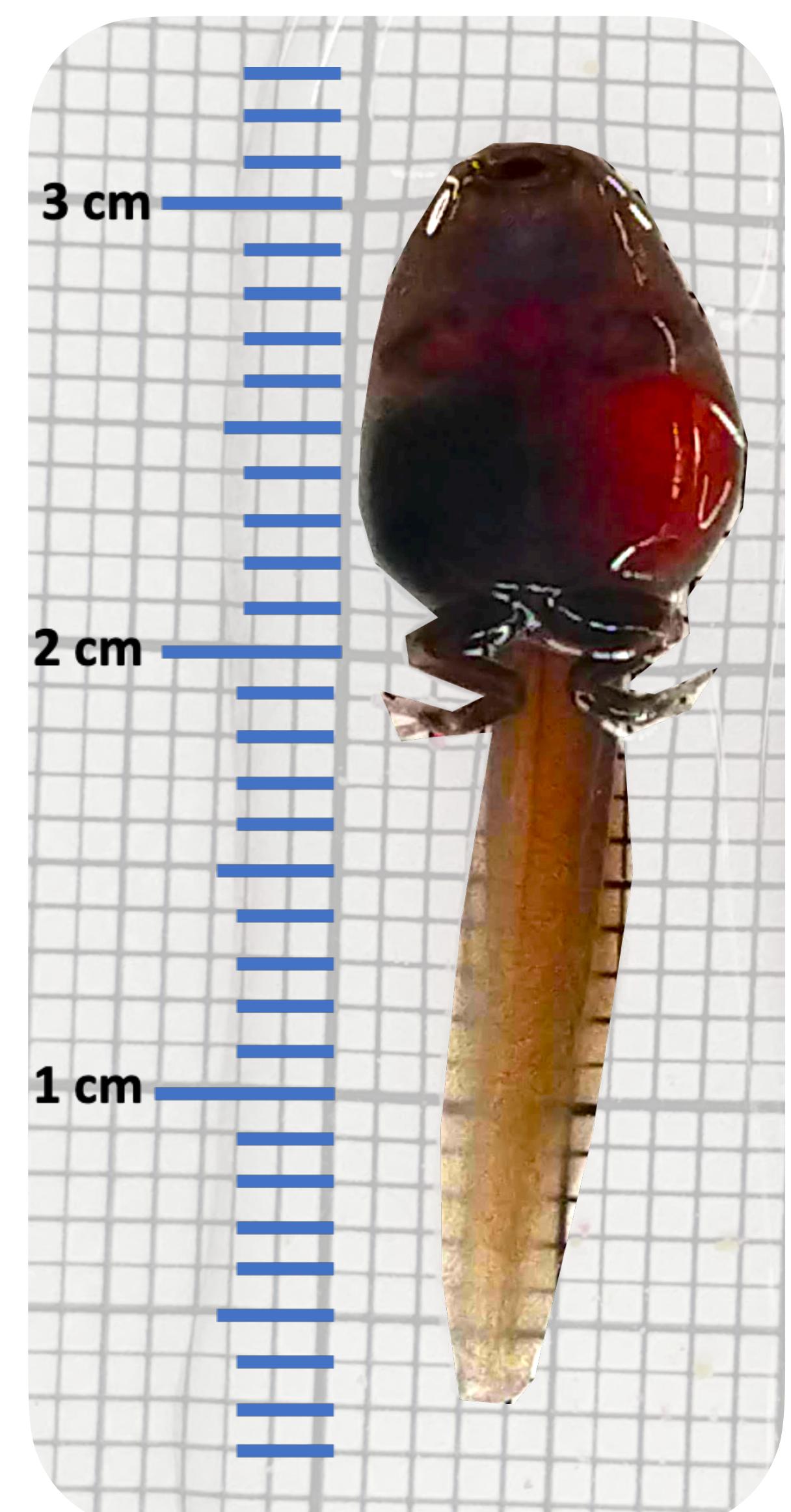
Introduction

The Ranitomeya imitator, the **mimic poison frog**, is the first confirmed monogamous species of frog and takes care of their tadpole babies. Biologists are exploring the ways frog moms communicate with their mates and offspring. A current hypothesis is that the **tadpoles' behavior – wiggling** in water at certain **frequencies** – is what triggers the frog mom to feed it.



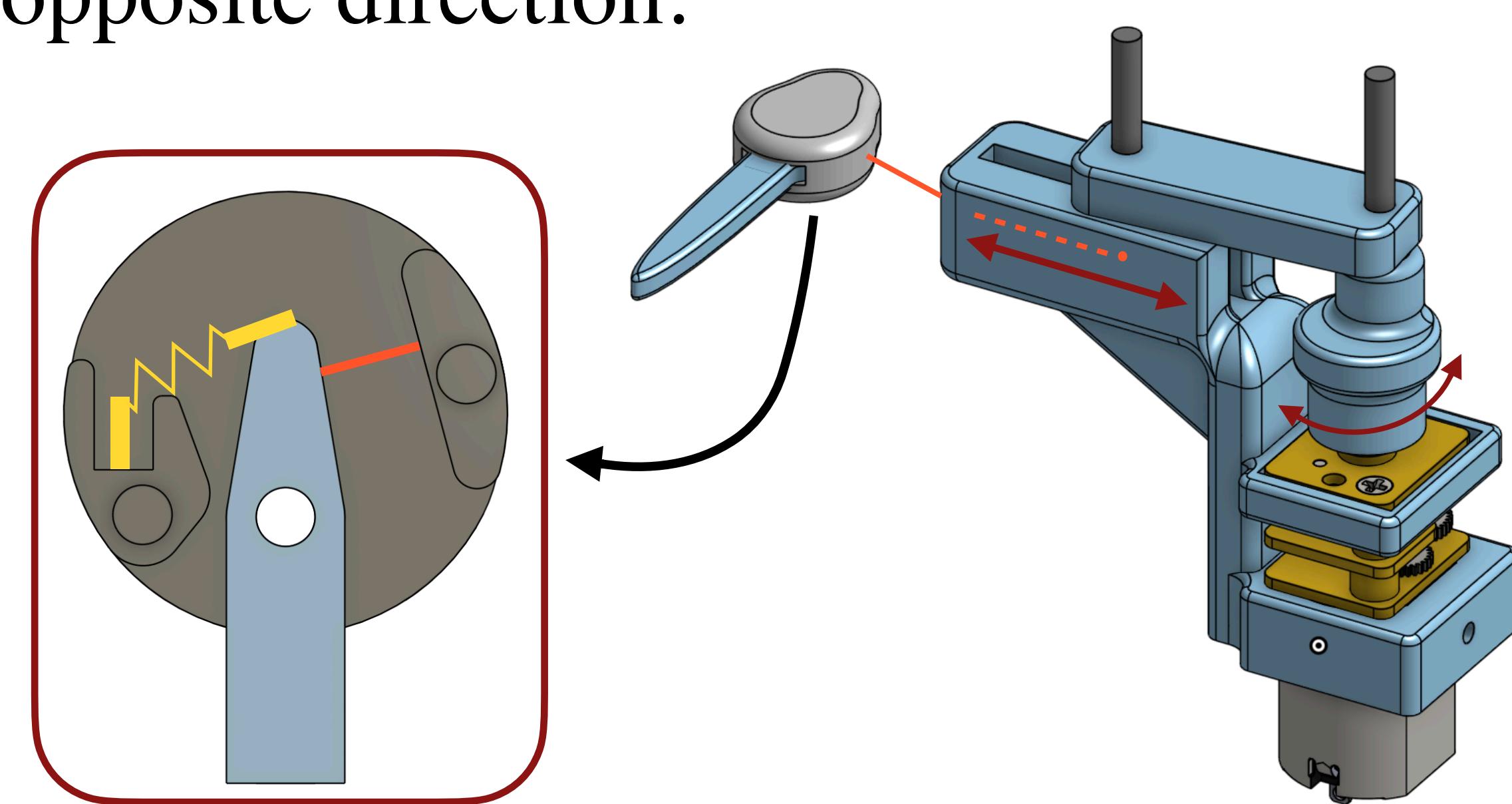
Requirements

To test the hypothesis, the design requirements for designing a robot tadpole include making it to look as similar as possible to the actual tadpole in **shape, size, color**, and **texture**, while also being able to move its tail at a **frequency of ~40 hz**.



Mechanical Design

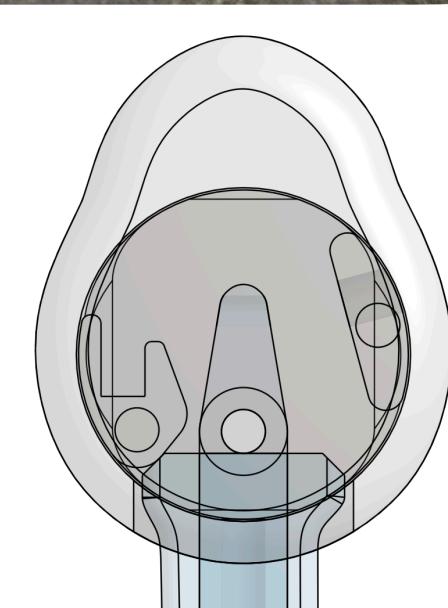
To achieve the **small-sized** design, we offloaded the actuator and connected it to the mechanism within the tadpole head with plastic tubing. A **crank and slider** system pulls a string and when released a rubber band pulls the tail back in the opposite direction.



Tadpole Body

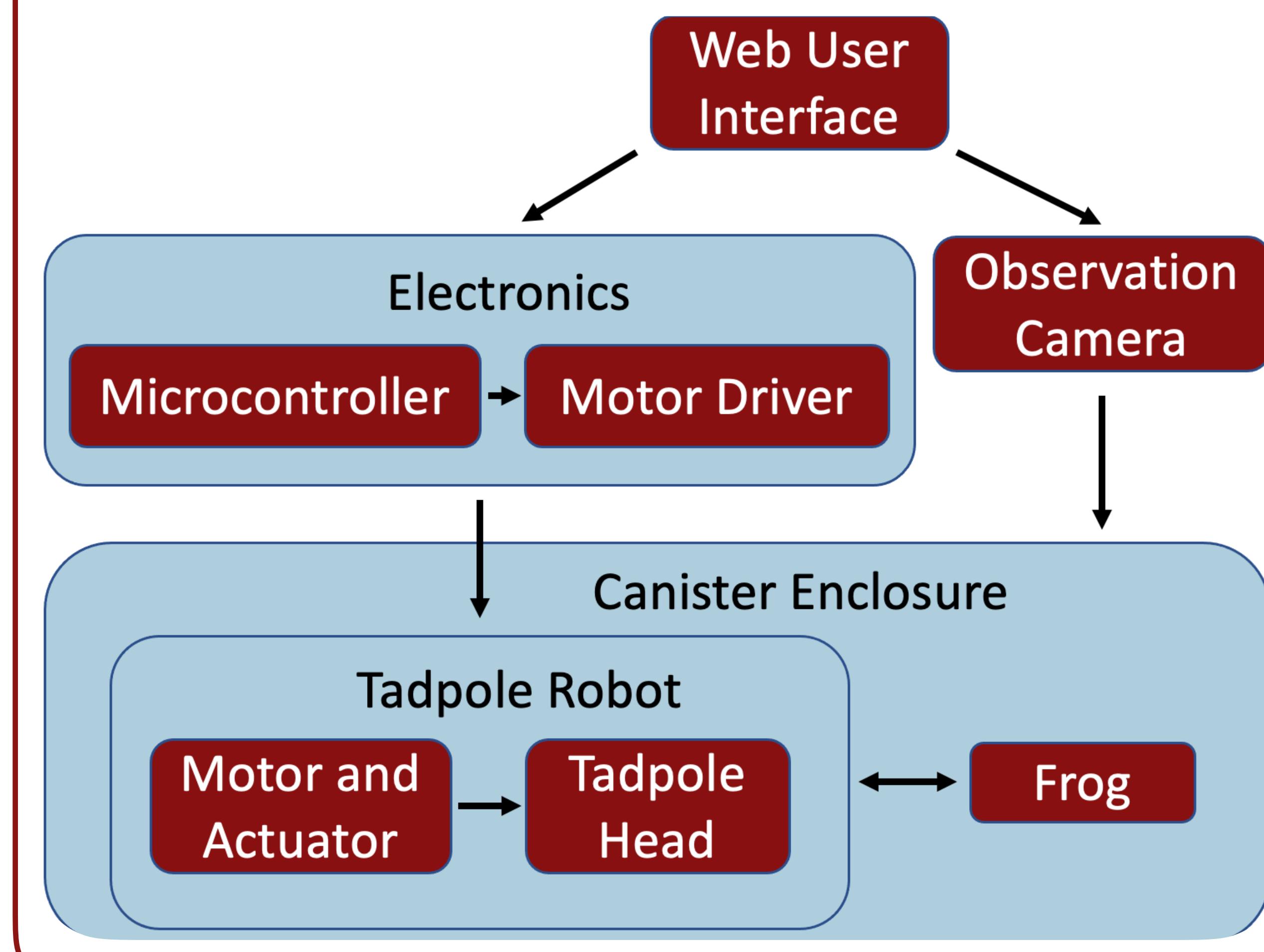


The design of the head was made to fit around the internal mechanism while remaining within a 1 cm diameter.



The exterior body, including both the head and tail, is made of silicone cast to the tadpole's shape with a 3D printed mold. This addresses the texture and shape constraints while giving the tail the ability to move more freely.

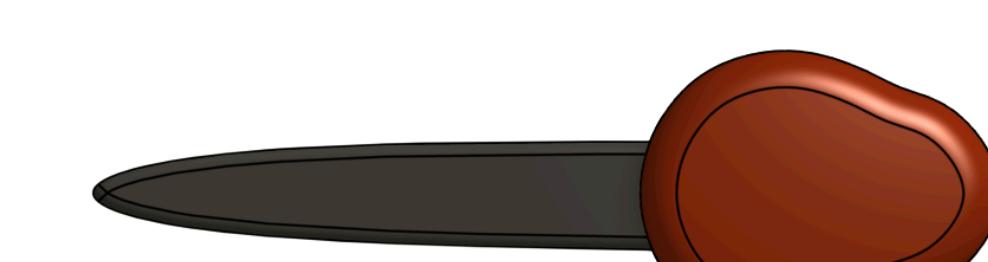
System



Conclusions

We present a **life-size prototype** for a new robot concept intended for **biological experimentation**. Future steps include:

- (1) Color correction to the silicon for appearance.
- (2) Initial biological tests in the mimic poison frog environment.
- (3) Replacing the current tubing with a more flexible tether that supports locomotion.



Acknowledgements

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