PROJECT

Shape*ShiftV3.0*

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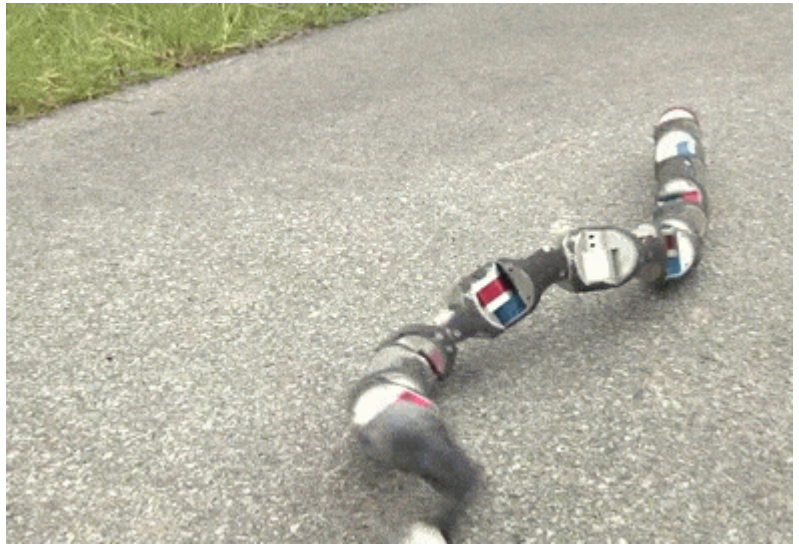
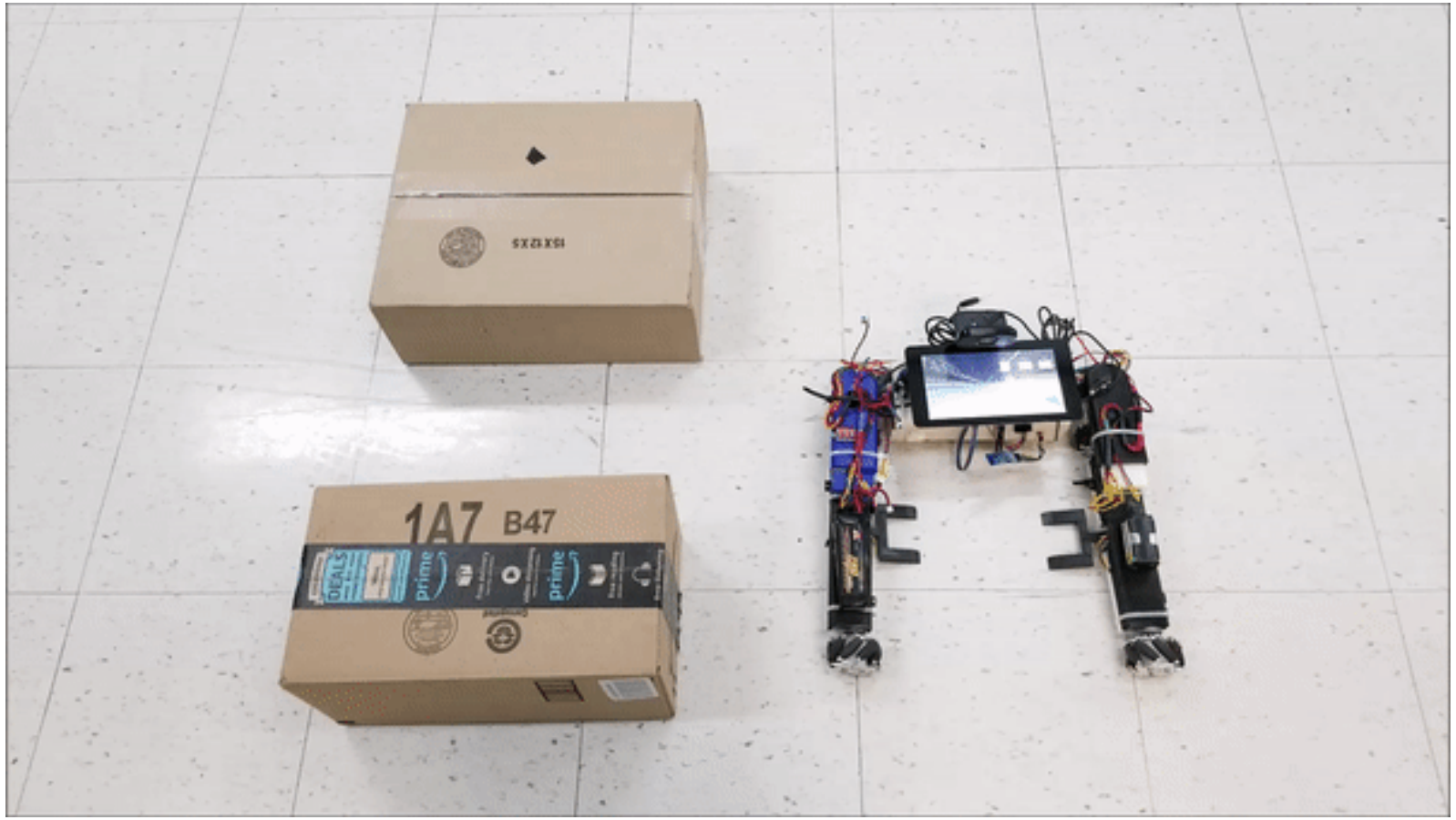
Project Overview

- The conventional robotic snakes are inefficient in locomotion and as the size of the robotic snake increases the complexity in controlling degree of freedom increases.



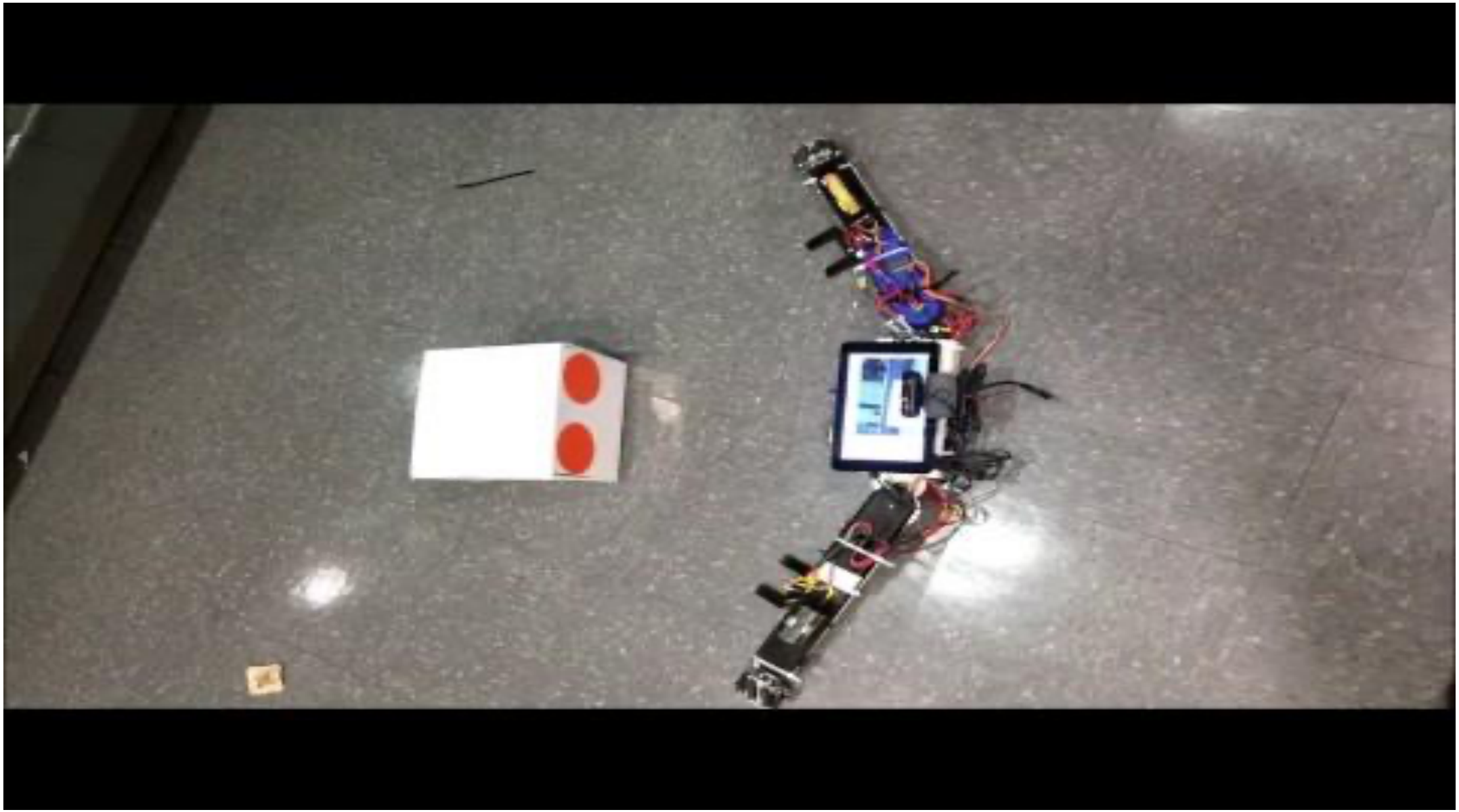
Why ShapeShift?



Manual vs Auto

ShapeShift

NYU Tandon School of Engineering (Spring 2018)



ShapeShift

NYU Tandon School of Engineering (Spring 2018)

Challenges

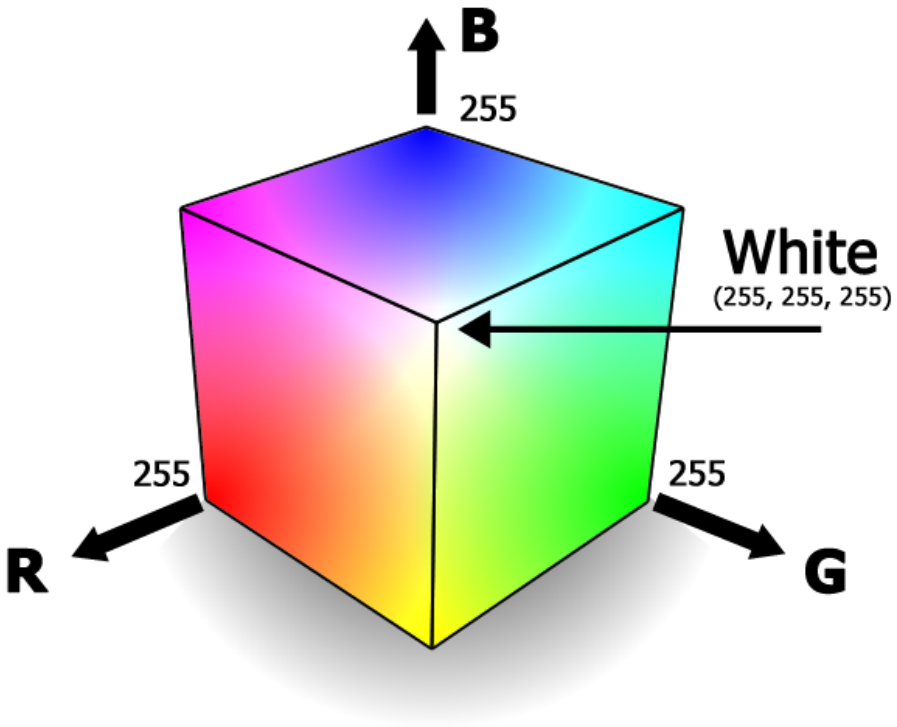
- The added weight resulted in less torque, which required to be replaced with high torque motors
- Brownout issue occured due to single power source. A separate voltage source was supplied to Arduino.
- Color detection in different lighting conditions and backgrounds which was solved by applying fusion algorithm using different color spaces and then applying different filters.

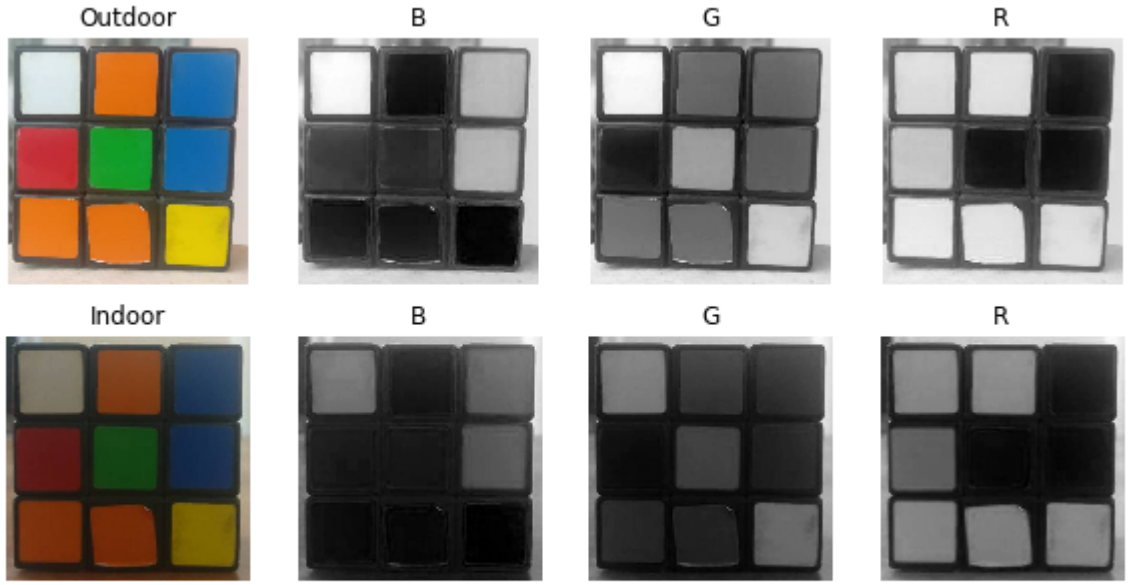
Outdoor

Indoor

Two images of the same cube taken under different illumination

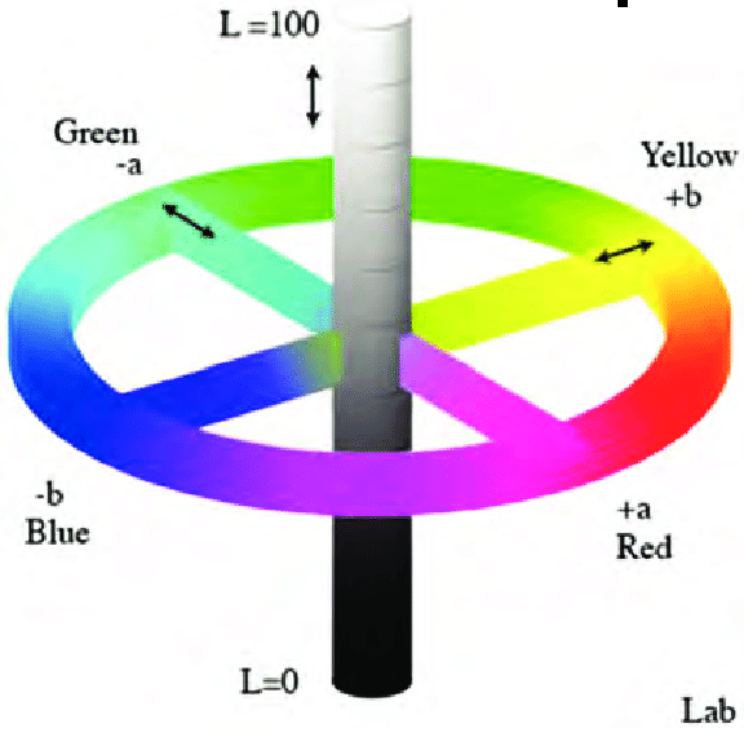
RGB Color Space

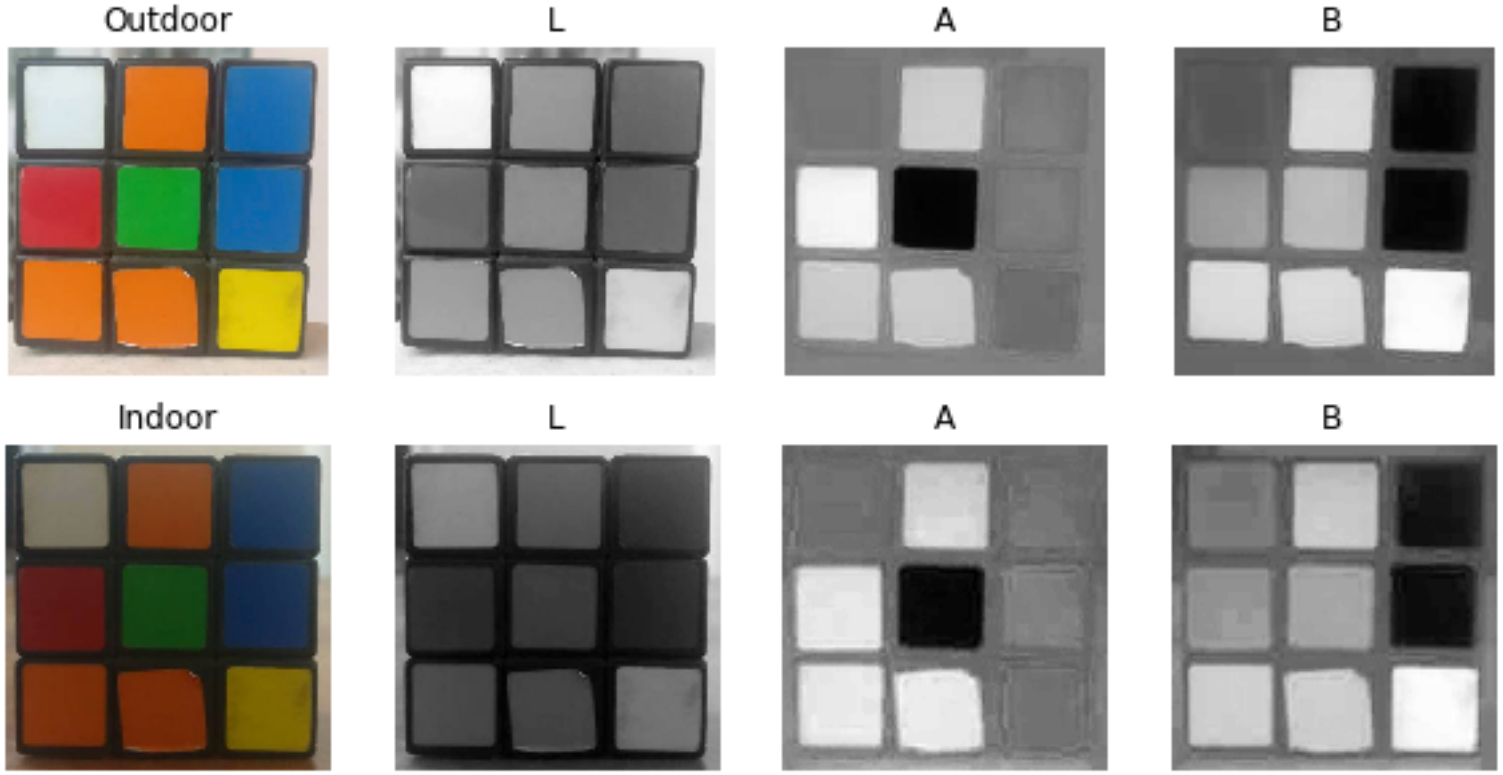




Different Channels Blue (B), Green (G), Red (R) of the RGB color space shown separately

LAB Color Space



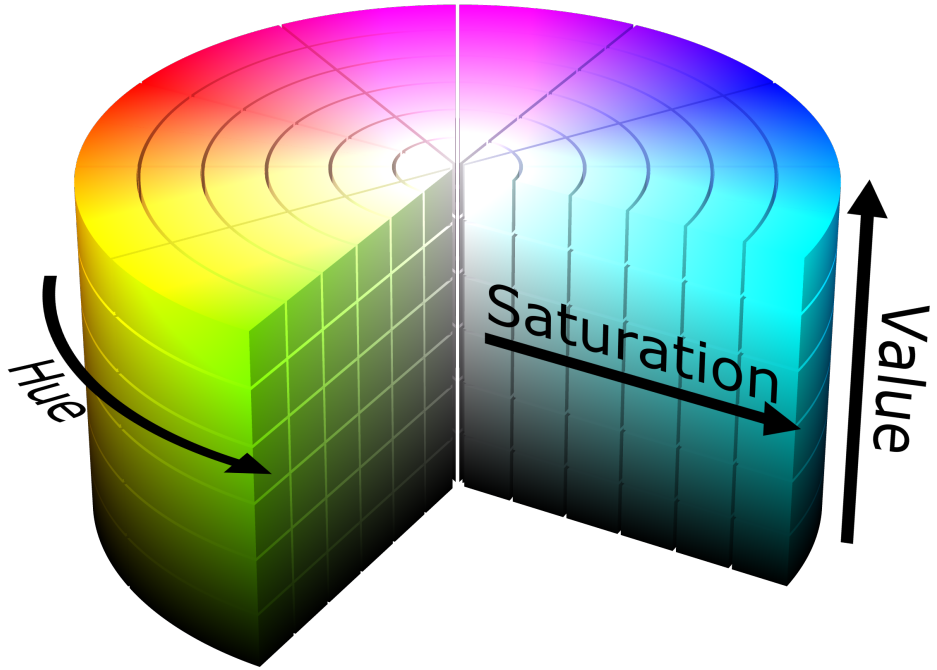


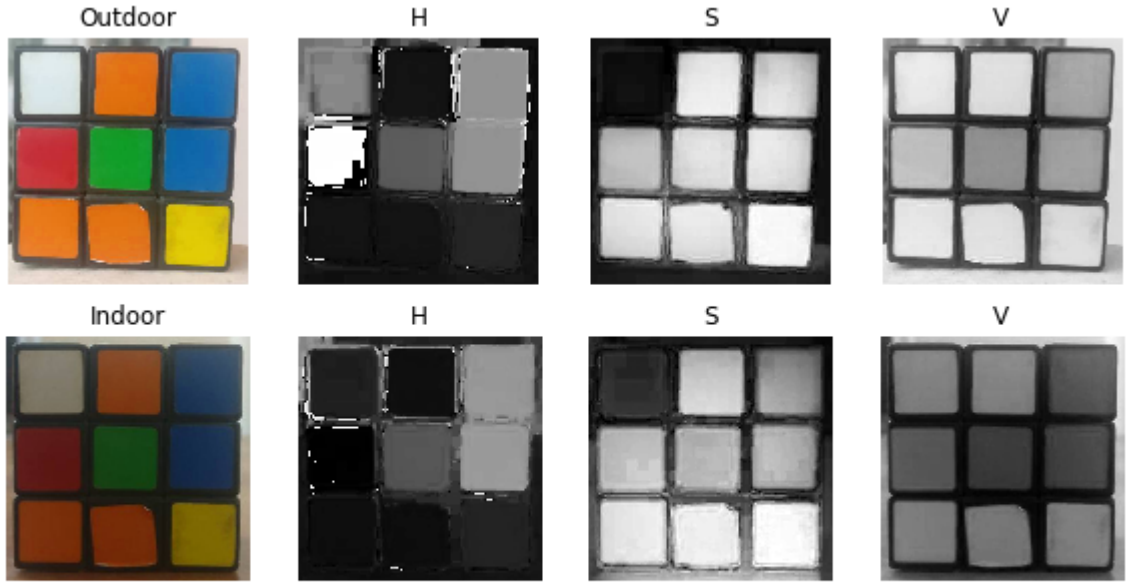
The Lightness (L), and color components (A, B) in LAB Color space.

L – Lightness (Intensity).
a – color component ranging from Green to Magenta.
b – color component ranging from Blue to Yellow.

References
https://www.researchgate.net/figure/Lab-color-coordinates-Photoscreenprintcom_fig1_319007940
https://www.learnopencv.com/color-spaces-in-opencv-cpp-python/

HSV Color Space

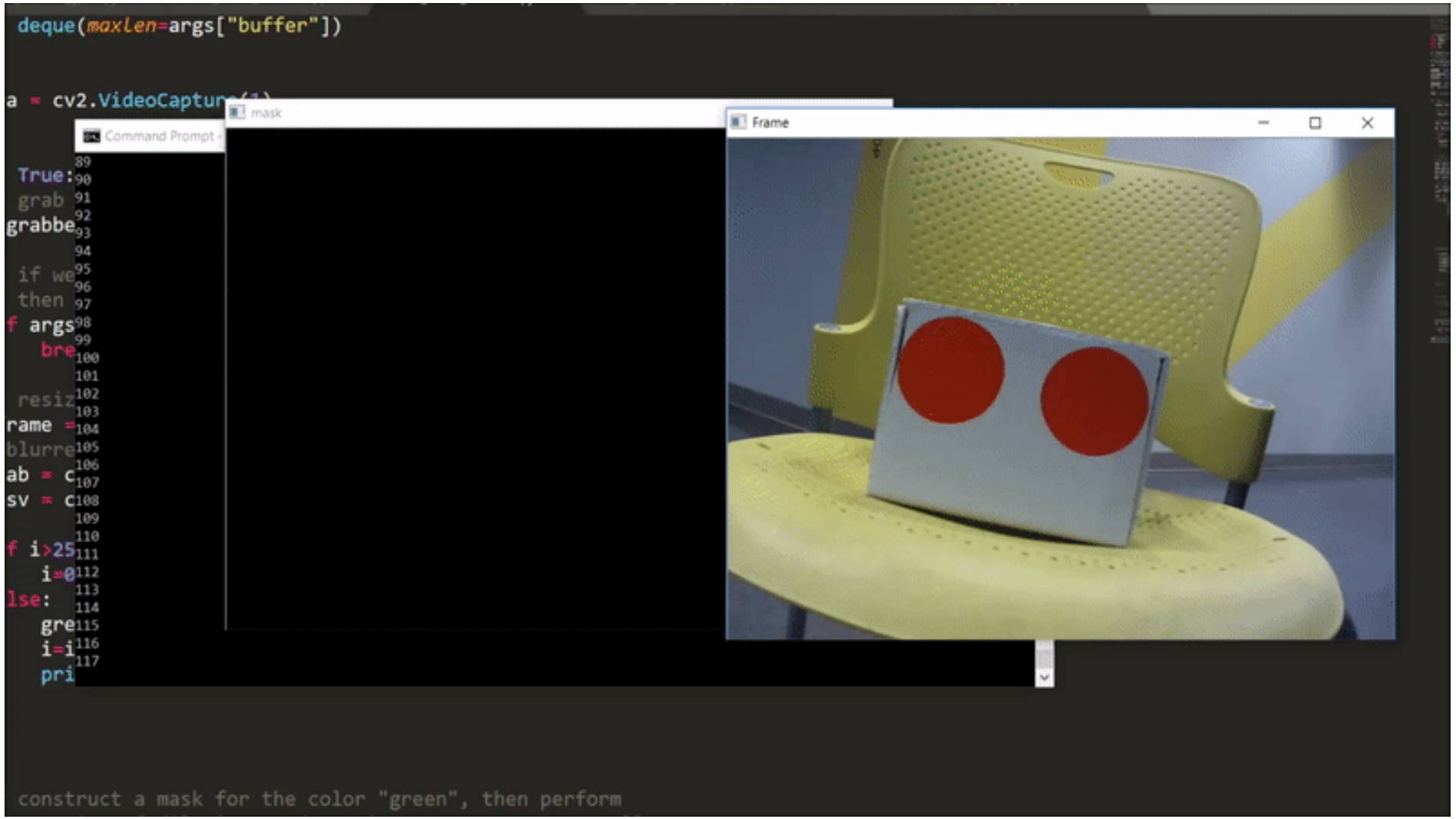




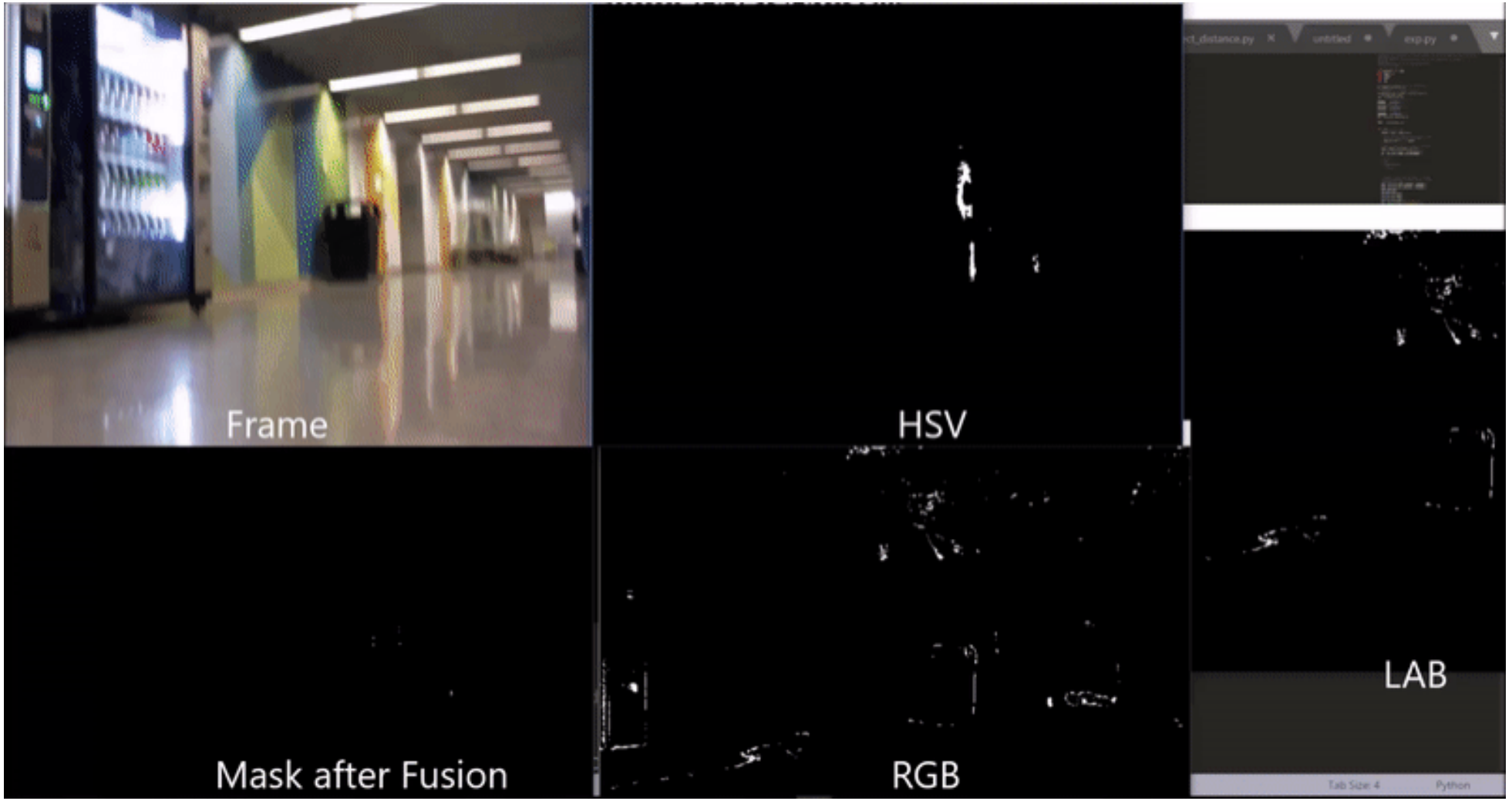
Hue (H), Saturation (S) and Value (V) components in HSV color space

1. H – Hue (Dominant Wavelength).
2. S – Saturation (Purity / shades of the color).
3. V – Value (Intensity).

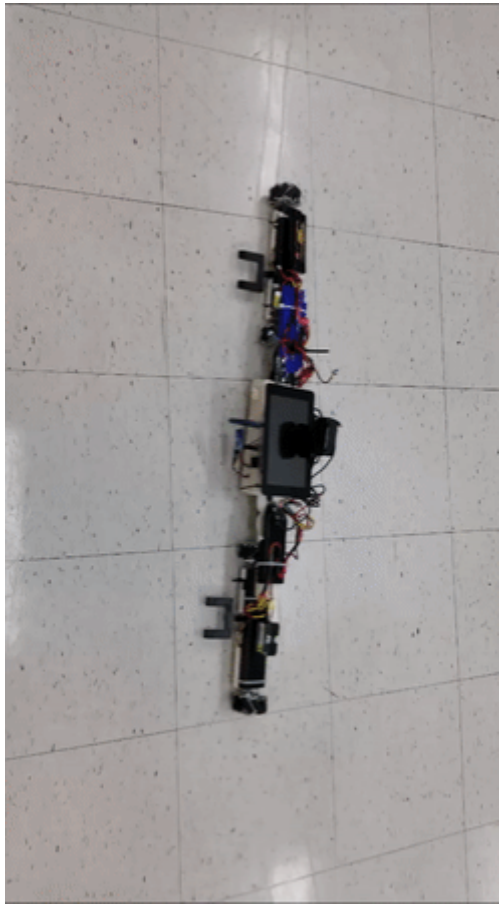
Effect of varying the thresholds of different channels

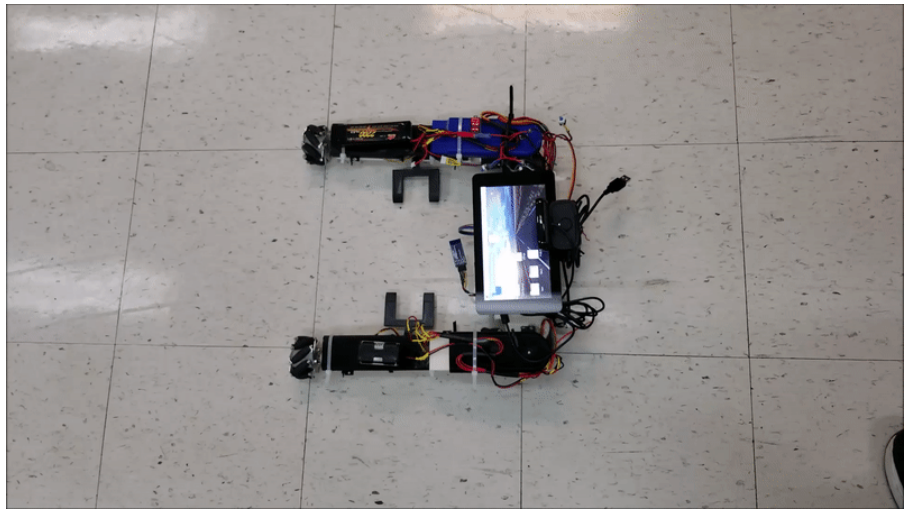


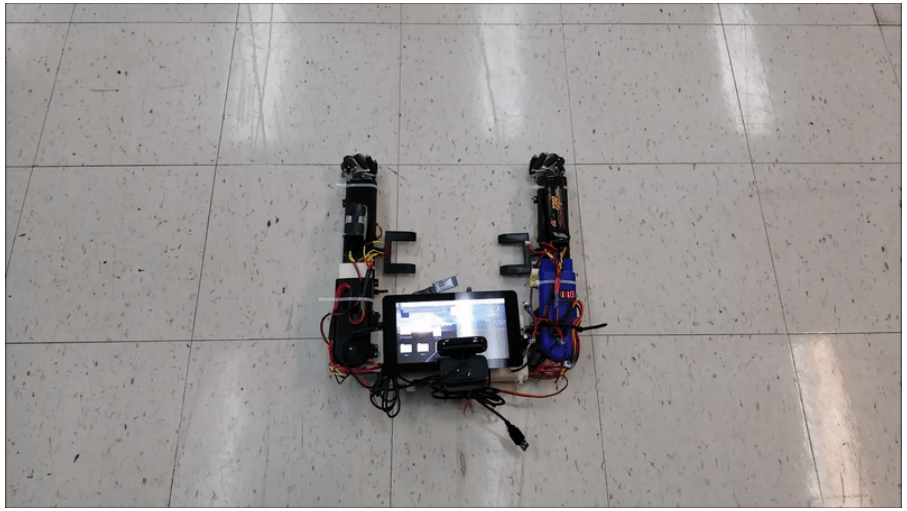
Color Space thresholding fusion

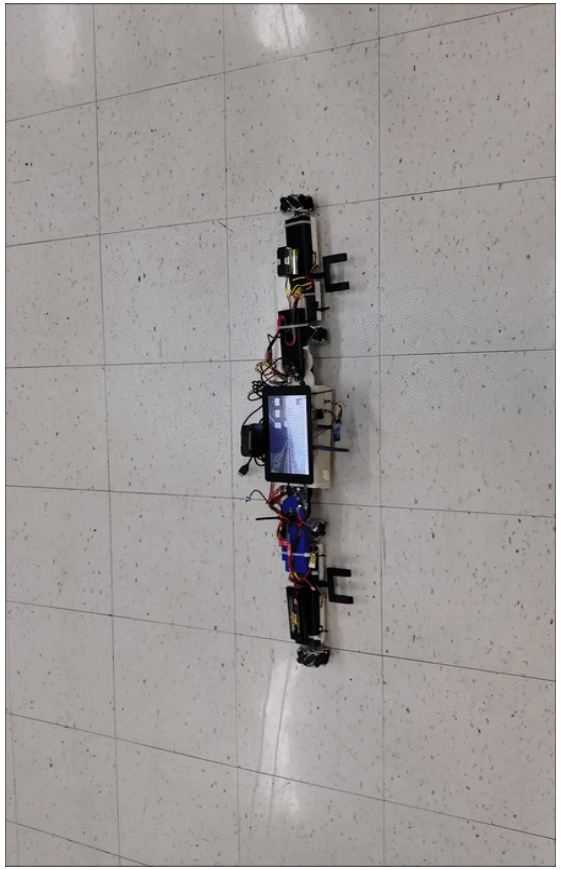


Possible Movements of Shape-Shift

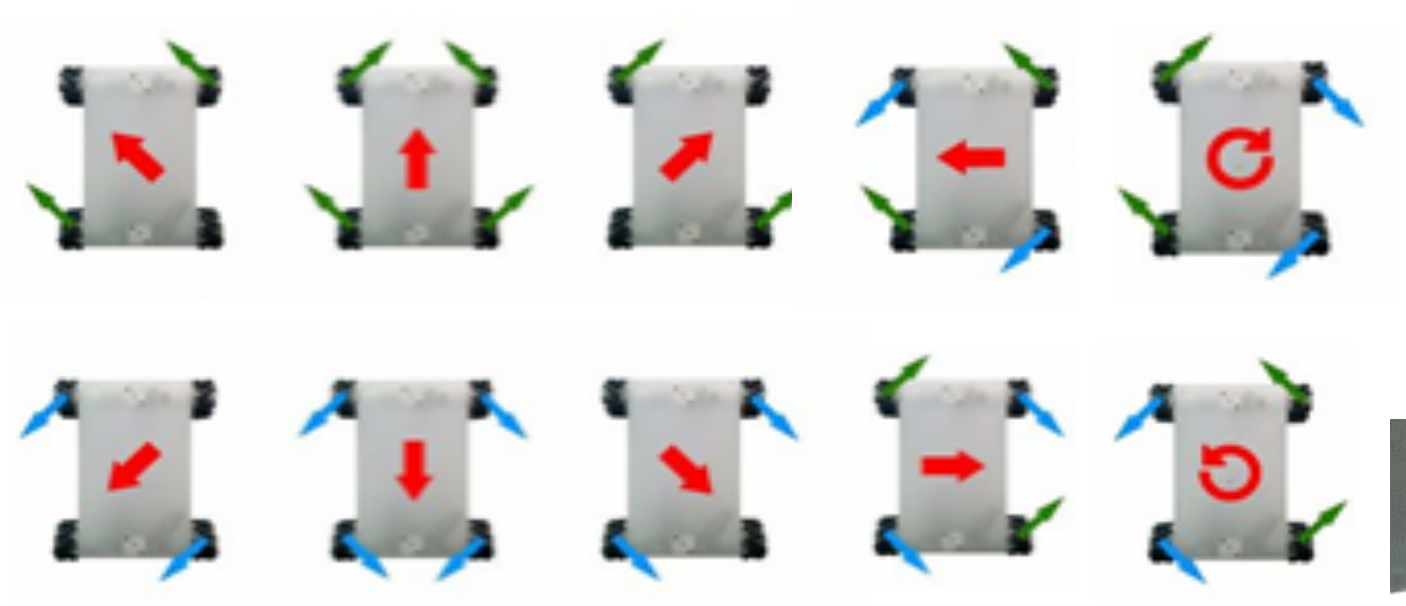


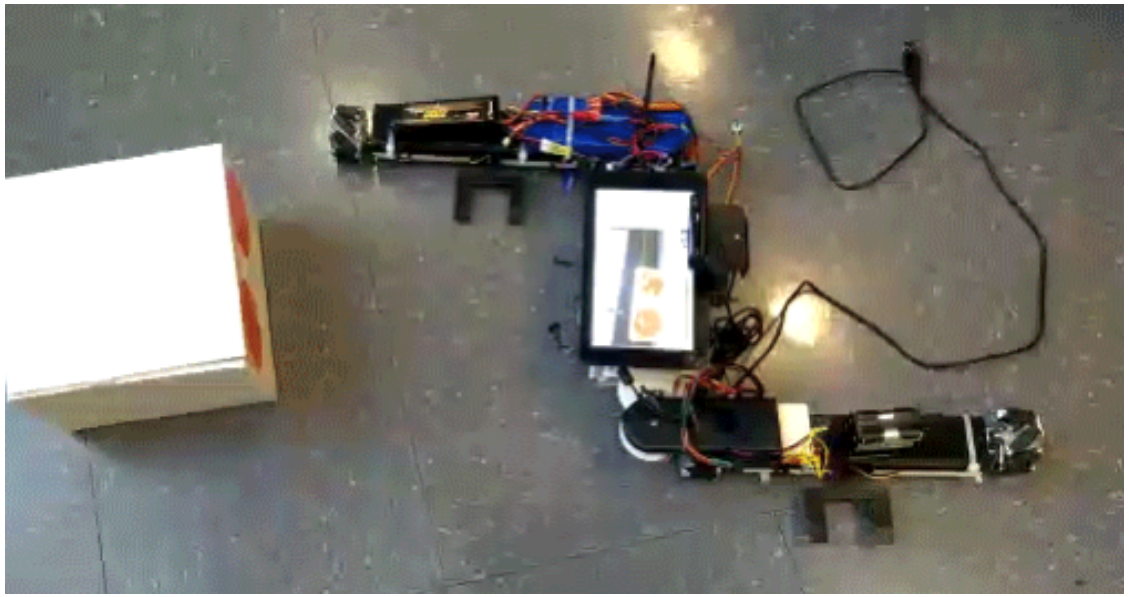






Other Movements of Shape-Shift





Applications

- The bot can change shapes from conventional car mode to snake for ease in locomotion.
- The robotic snake has better dexterity which can aid in pipe inspections used in nuclear power plants, gas power plants and chemical plants.
- The bot can carry objects and deliver without physical human interventions.
- The bot can detect objects autonomously and pick it using forklift for transportation.


ありがとう
grazie
謝謝
kiitos
তোমাকে ধন্যবাদ
pldies
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спасибо
Gracias
Danke
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