PROJECT
ShapeShiftV3.0

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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
Challenges

- The added weight resulted in less torque, which required to be replaced with high torque motors.
- Brownout issue occurred 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.
Two images of the same cube taken under different illumination
RGB Color Space

White (255, 255, 255)

Different Channels Blue (B), Green (G), Red (R) of the RGB color space shown separately.
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
1. H – Hue (Dominant Wavelength).
2. S – Saturation (Purity/shades of the color).

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