Robotic Arm for Smart Wheelchair

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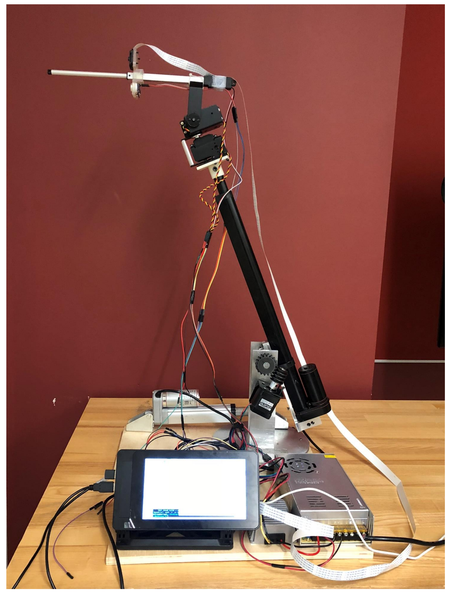
User Story



(a) A robot arm to help the physically challenged to access handicapped doors.

(b) The user can activate the arm by pressing the button.

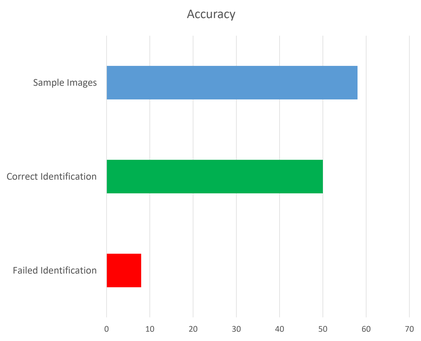
(c) Our arm searches for a handicapped button in the frame, and activates the door.

1. Complete arm with a Raspberry Pi.

Arm Design

- 6 Degrees of Freedom, with a maximum extension of 36 inches.
- It can support a maximum linear load capacity of 230lbs, with a torque of 3000Ncm^{-1}.

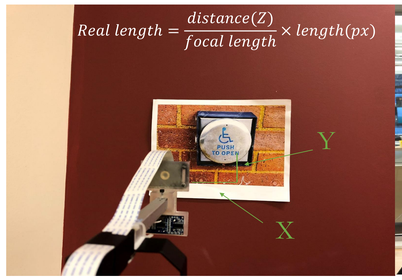
MobileNet SSD Model (TensorFlow)



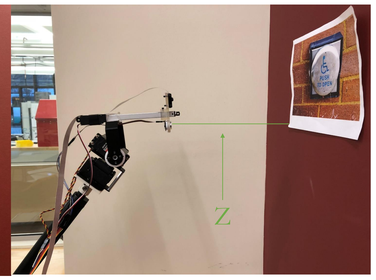
2. Model Accuracy – 86.7%

3. Training and Testing Data

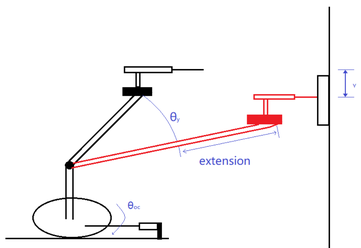
Equations



4. Calculation of 2-D parameters



5. Calculation of depth of view



$\alpha = 45°$

$\theta_x = \alpha\text{-}\tan^{-1}(\frac{21\sqrt{2}-dy}{21\sqrt{2}+2-extension})$

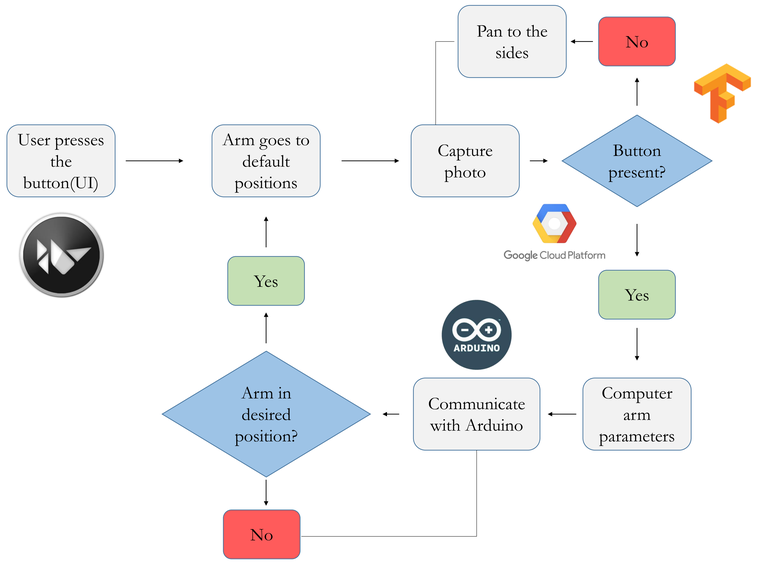
$\theta_y = \tan^{-1}(\frac{x}{total\ length})$

$total\ length = (\frac{21\sqrt{2}-dy}{\sin(d-\theta_y)})$

$extension = total\ length - 42$

6. Equations

Workflow



7. Current workflow

Image recognition

8. Logo Detection

8. Google Cloud Vision OCR

Speed Evaluation

9. Google Cloud Vision on a Raspberry Pi

10. Tensorflow running on the Raspberry Pi.

Note : All values reported are an average over 5 runs, and running on a single thread on the raspberry pi, without GPU acceleration.