DRAWING BOT

PROJECT MENTOR :

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PRESENTED BY

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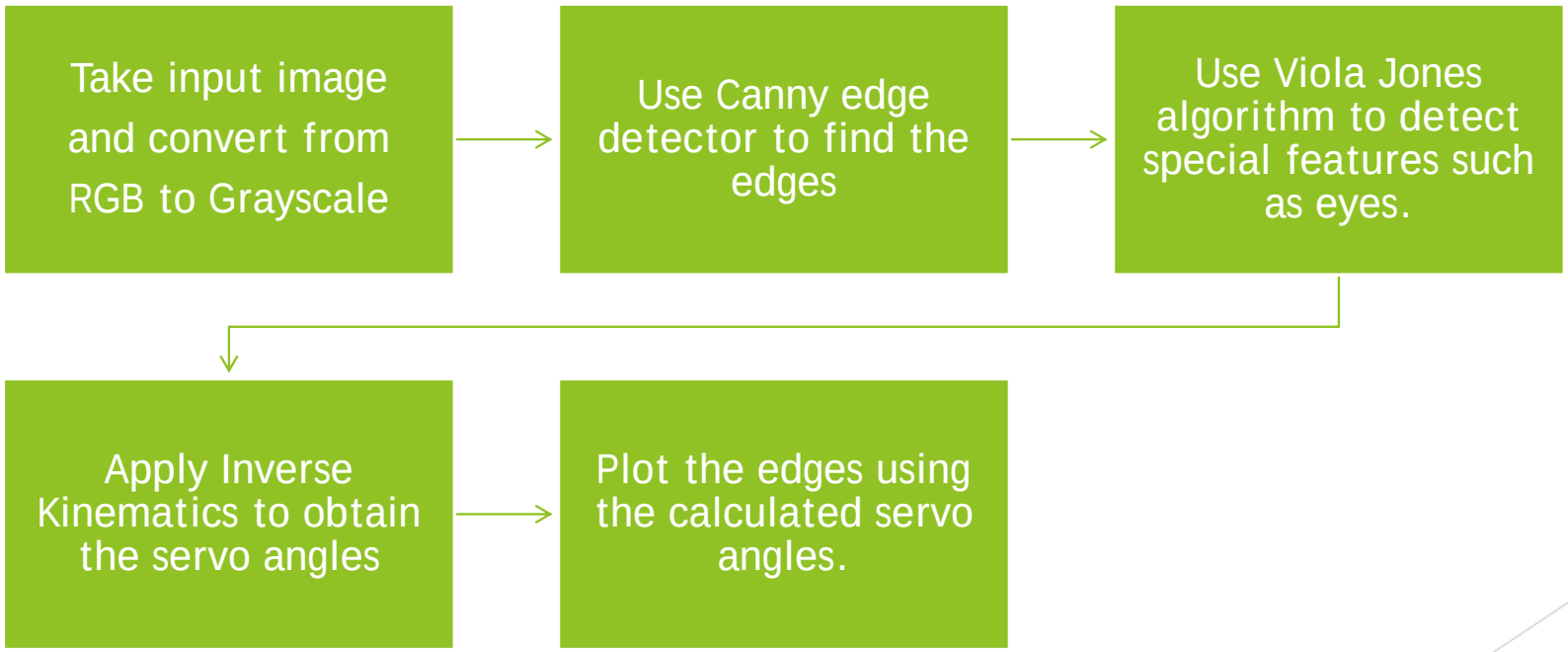
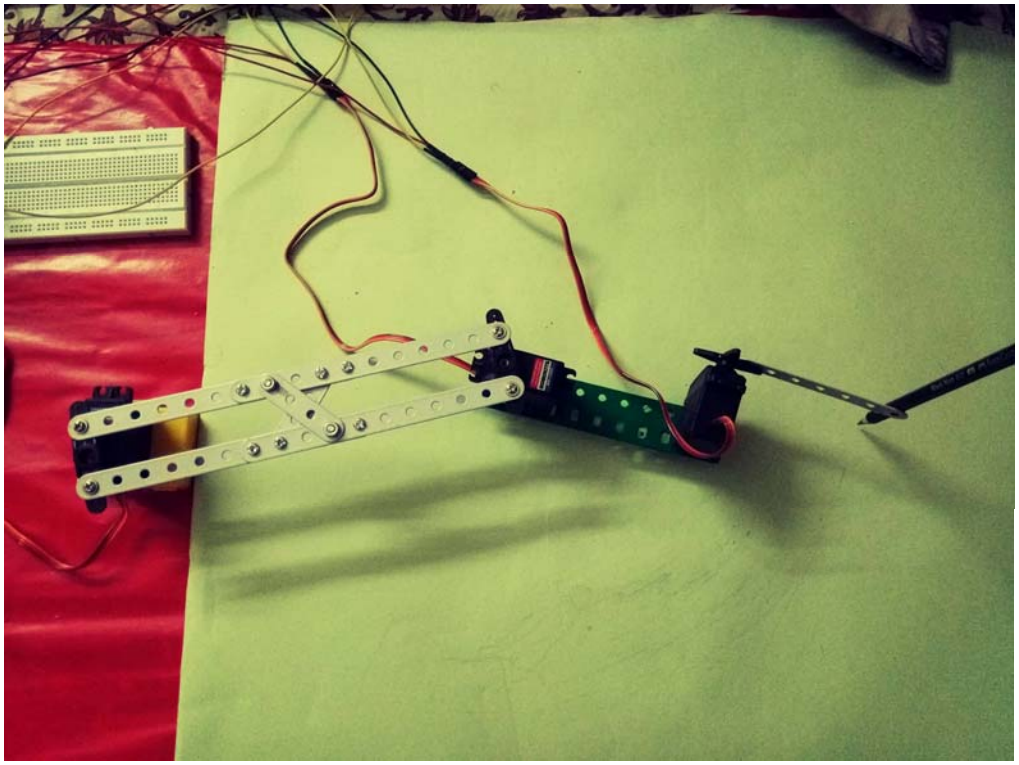
PROBLEM DEFINITION

- Our project focuses on constructing a 2-DOF (degrees of freedom) robot that creates a sketch of a given image on paper.
  - To use image processing to generate a line sketch of an image.
  - To perform detection of facial features in case image is a portrait of a human or animal.
  - To mechanically construct a robot that draws the processed sketch on paper.

FLOWCHART


Take input image and convert from RGB to Grayscale
Use Canny edge detector to find the edges
Use Viola Jones algorithm to detect special features such as eyes.
Apply Inverse Kinematics to obtain the servo angles
Plot the edges using the calculated servo angles.

❖ MECHANICAL CONSTRUCTION



❖ MECHANICAL CONSTRUCTION

- Three servos are used: one acts as the rigid end of the two-link manipulator, one acts as the free end, and one servo is used for manipulating the sketching instrument, for example, a pencil.
- The rigid end servo is fixed on a small platform.
- Two of the servo horns are drilled with two holes each spaced at equal distances from their centre of mass.
- The rigid end servo and the free end servo are linked together at 20 cm apart, using mechanix kit tools and through the holes drilled in the servo horns.

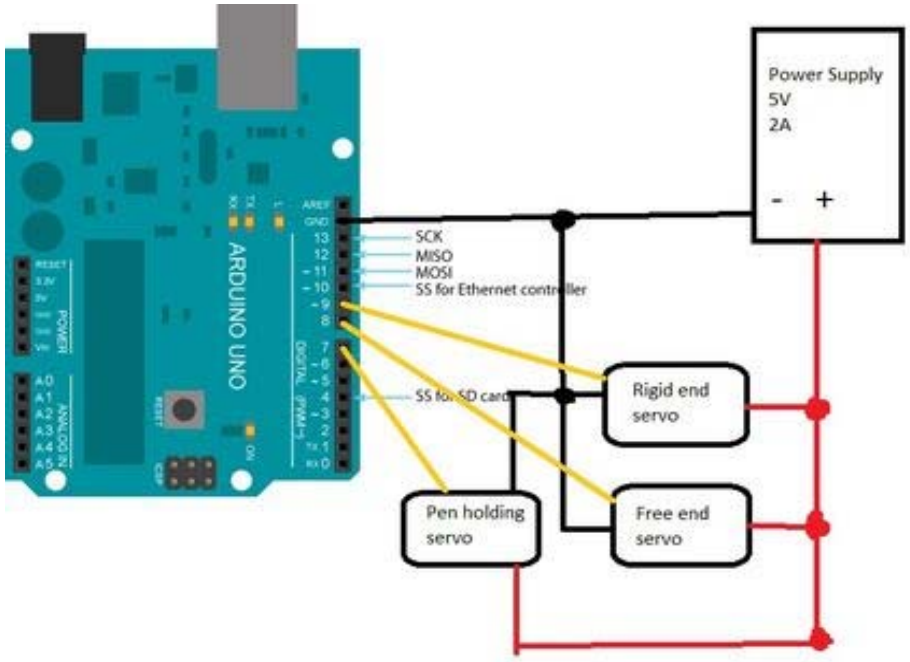
❖ MECHANICAL CONSTRUCTION

- The free end servo and the sketching instrument manipulating servo are connected using mechanix kit tools.
- A sketching tool is then attached to the manipulator servo such that the distance between the sketching tool and the free end servo is 20 cm.
- The bottom of the link between the free end and manipulator servos is attached with caster wheels to support the weight of the servos.

❖ Connecting Arduino to the Robot

- The signal wire (orange) of rigid end servo is connected to pin 9 of the Arduino board.
- The signal wire (orange) of free end servo is connected to pin 8 of the Arduino board.
- The signal wire (orange) of sketching tool holding servo is connected to pin 7 of the Arduino board.
- The power wires (red) of all servos are connected to the 5V pin of the Arduino board.
- The ground wires (brown) of all servos are connected to the ground pin of the Arduino board.

❖ Connecting Arduino to the Robot



Red represents positive potential
Black represents ground
Yellow represents signal wire

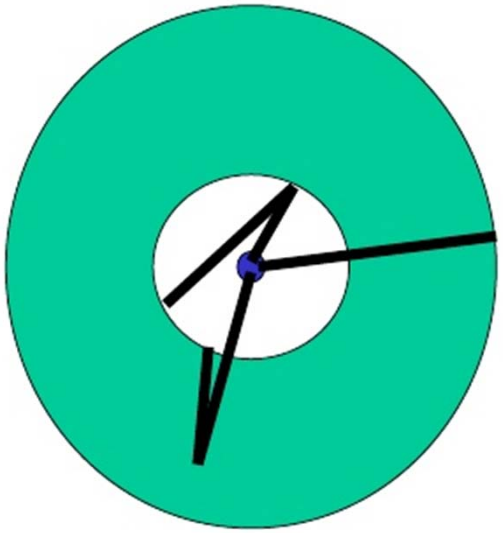
❖ CANNY EDGE DETECTION

- The canny edge detection algorithm comprises of the following steps :
  - Gaussian filter is applied to remove noise by smoothening the image.
  - Intensity gradients of image are found.
  - Non-maximum suppression is applied to get rid of spurious response to edge detection.
  - Double threshold is applied to determine potential edges.
  - Detection of edges is finalized by suppressing all other weak edges that are not connected to strong edges.

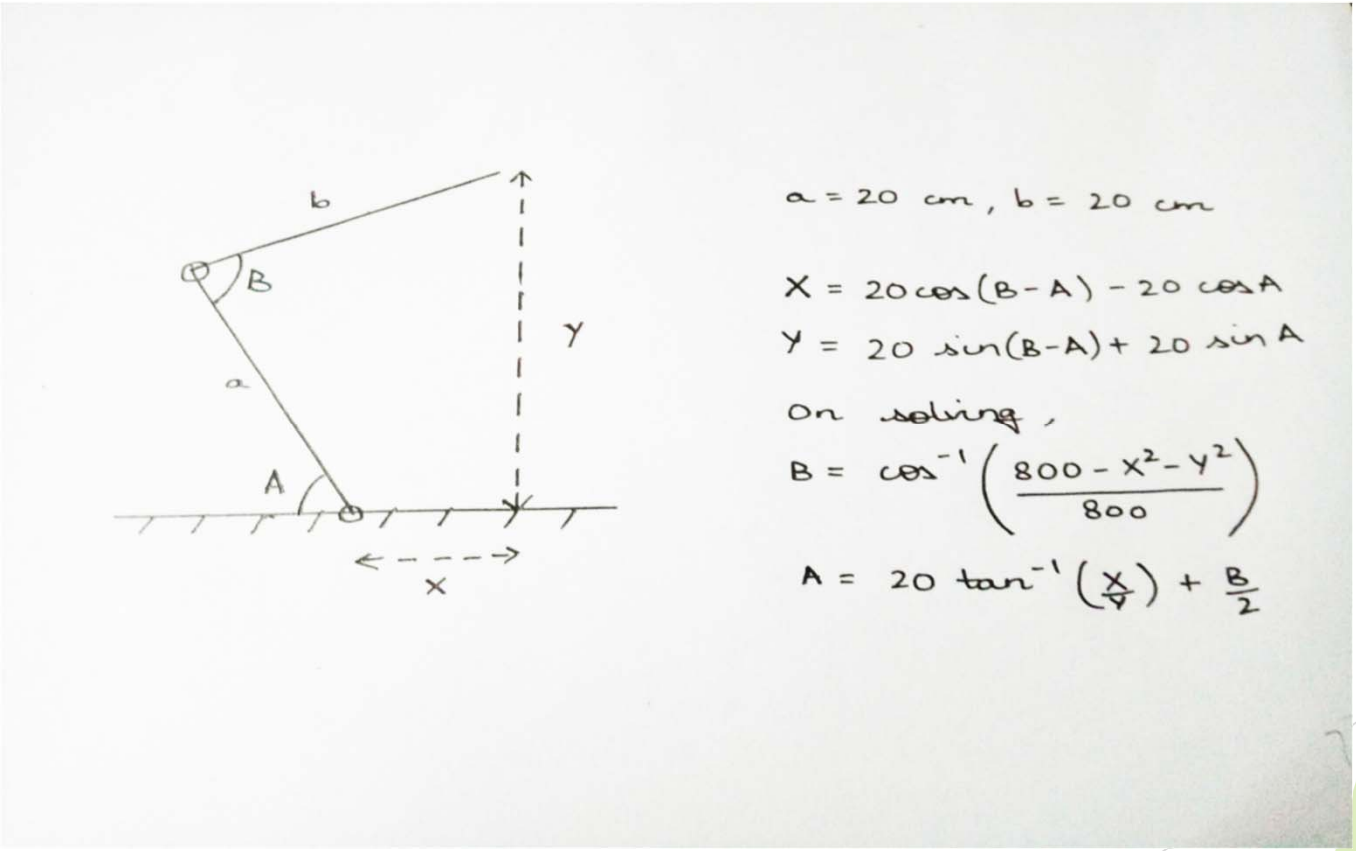
✓ Viola-Jones algorithm is used to detect special features like eyes, etc.

❖ INVERSE KINEMATICS

- A two-link planar manipulator has a defined workspace.
- The defined workspace is due to joint limits and presence of obstacles.



❖ Implementation of Inverse Kinematics



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