

The Artist Robot using Arduino and MATLAB

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Abstract:

Latest research on robots has been attempting to create intelligent robots that can coordinate human behaviour on high level intelligent tasks that require, intelligence, and Sensing and Complex motion. In the current couple of years robot is given some imaginative behaviour that robot can sing, Dance, move even robot can play games. This paper shows a control technique for a robotic arm to let the robot to gain another human artistic behaviour "drawing". In the proposed plan MATLAB has been utilized for Image Processing interface. Value of co-ordinate position of a pixel of Binary picture is changed over into joint angle applying Inverse kinematics and servos are controlled with Arduino UNO. Canny is applied for Edge detection method. Picture is given contribution through Matlab, which is user interactive.

Keywords — Arduino Uno Microcontroller, MATLAB Simulink for Arduino, Servo Motor, ATmega328P, IC 7805 regulator, Canny EDGE Detection, Inverse Kinematic Algorithm.

I. INTRODUCTION

Robotic industry has turned into a big area in the current world. Researchers, Scientists and technologists have been attempting to add different dimension in robot behaviour. Present day improvements on Robotics have different sorts of utilizations in an extensive variety of industries, education, military, healthcare, entertainment, and so forth. Drawing is art which requires high level of innovative and artistic mentality of human mind. So it is a complex and challenging task to habituate a robot with this creative art. Our research work is to add a different shade of robotic behaviour in artistic way that is attractive, eye catching, motivational and human friendly and inspiration to the general people to know about robotic activities.

II. LITERATURE SURVEY

detection in gray-scale pictures is a Canny edge detection algorithm. The two critical highlights of this strategy are presentation of NMS (Non-Maximum Suppression) and double threshold of the gradient picture [1]. Image segmentation is a basic advance in picture examination. Division isolates a picture into its segment parts or protests. The most generally utilized edge detection methods for Image Segmentation and furthermore the correlation of these systems is done with a trial by utilizing MATLAB programming [2, 3]. The canny edge detection operator was a decent device for identifying picture edges, yet it was excessively touchy and under the environment with noise, the canny operator was too simple to recognize edges mistakenly. Edge detection is the way toward discovering speedy differentiations in powers in a picture. This procedure essentially decreases the amount of information in the picture, while protecting the larger part imperative auxiliary

highlights of that image. MATLAB is a high-performance language for specialized measures and additionally computations. It combines apparition, calculation and programming in a simple to-work environment [4, 5]. Servo motor is position controlled motor. It can without much of a stretch control physical development of articles because of its position controlled element [6].

III. PROPOSED METHODOLOGY AND WORKING

The working of the algorithm is exceptionally straightforward; it is only the matter of envisioning how the bot approaches the picture drawing. This is an expand explanation. Firstly, we change over the picture that we need to draw in .png format utilizing some picture editorial manager, and after that we save the Image in the MATLAB directory. Presently our algorithm changes over this picture utilizing canny edge detection as given in the picture above. The mysterious part is drawing this image. What the algorithm does is it begins checking the pixels of the changed over picture and when it discovers 1 which is shown as the white pixel in the picture over, the pen tip achieves that and puts the pen down then it checks neighbouring 8 pixels, on the off chance that it finds a 1 it achieves that point without lifting the pen up and erases the past pixel to stay away from redundancy. Presently this proceeds till it finds no 1s in the area (this is a recursive capacity) subsequently it draws smooth line erasing it at the same time. Then it complete different branches of lines that rise up out of the drawn line as it checks each neighbouring pixel. This algorithm at last makes the entire picture.

IV. BLOCK DIAGRAM AND MAJOR COMPONENTS

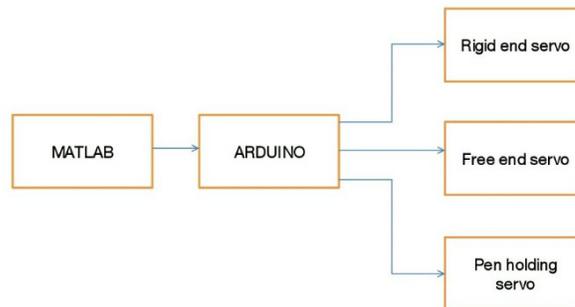


Figure.1. Block diagram

Figure 1 shows the block diagram. Firstly, we save the image in MATLAB directory which we want to draw. In which the RGB image is converted into gray-scale image. Then the image is detected and converted by using canny edge detection. This output is given as an input to Arduino. Arduino sends the information to the servos.

A. Servo Motors

Servo Motor is a straight actuator or rotating actuator that takes into account exact control of angular or linear position, acceleration and velocity. Servos are controlled by sending an electrical pulse of variable width through the control cable. The PWM sent to the motor which characterizes the situation of the shaft and in view of that pulse duration the rotor will swing to the appropriate direction. PWM is the analog output by advanced means which is taken by Arduino in this venture for drawing the picture. Servo motors are little in size and light in weight which empowers robot to draw picture easily. The Power, signal and ground are the three types of servo motors. The power wire is commonly red, and ought to be associated with the 5V pin on the Arduino board. The signal pin is ordinarily yellow, orange or white and ought to be associated with an advanced stick on the Arduino board. The ground wire is regularly dark or darker and ought to be associated with a ground pin on the Arduino board.



Figure.2. Servo Motor

The ATmega328P is a low power CMOS 8-bit microcontroller is depend on the AVR enhanced RISC architecture by executing effective guideline in a single clock cycle. ATmega328P achieves throughputs closed to 1MIPS for each MHz This enables system designer to improve the device for control utilization as opposed to processing speed.



Figure.4. ATmega328P

B. ARDUINO UNO

The ATmega328 is the origin of an Arduino UNO microcontroller. It has 32k Byte in framework programmable flash, 14 advanced I/O pins (of which 6 can be utilized as PWM yields), 6 simple data sources, a 16 MHz ceramic resonator, a power jack, reset button and USB connection. It contains everything expected to help the microcontroller. "UNO" is an Italian word and denoted the arrival of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference version of Arduino and it is the first in a progression of USB Arduino boards, atthe reference display for the Arduino stage.



Figure.3. Arduino UNO

C. ATmega328P

D. 7805 REGULATOR IC

A voltage regulator IC keeps up the output voltage at a constant value. 7805 IC, an individual from 78xx arrangement of settled linear voltage controllers used to keep up such variances, is a prevalent voltage controller coordinated circuit (IC). The xx in 78xx demonstrates the output voltage it gives. 7805 IC furnishes +5 volts controlled power supply with arrangements to include a heat sink.

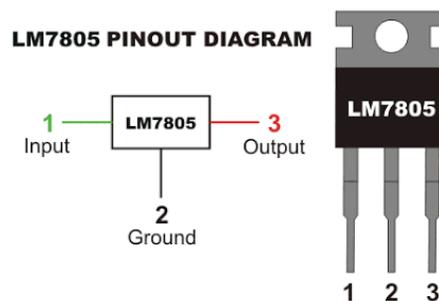


Figure.5. 7805 IC Regulator

E. TRANSFORMER

A transformer is an electrical device that exchanges electrical energy between at least two circuits through electromagnetic induction. Transformers are utilized to increments or reduction substituting voltage in electrical power application.



Figure.6. Transformer

V. HARDWARE AND FLOWCHART

As appeared in Figure 6 there are three servo join with Arduino. 1. Pen holding servo move pen all over for drawing. 2. Inflexible servo moves the arm to left side and right size.3. Free end servo utilized for arc movement for little circular segment drawing. Arduino control servo position tossed PWM pulse. Arduino and MATLAB impart through UART convention with 9600 baud rate. Utilizing watchful edge recognition technique MATLAB control servo position tossed MATLAB Simulink Arduino and draw finish picture on paper.

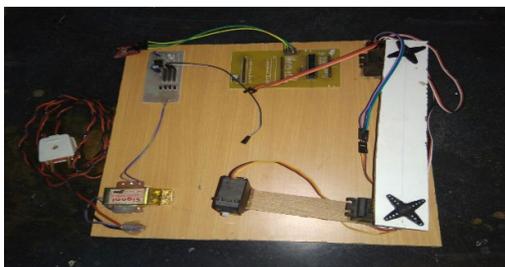


Figure.6. Working of Hardware

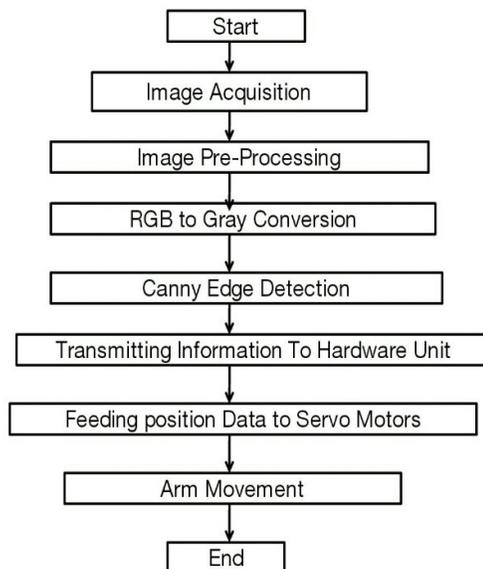
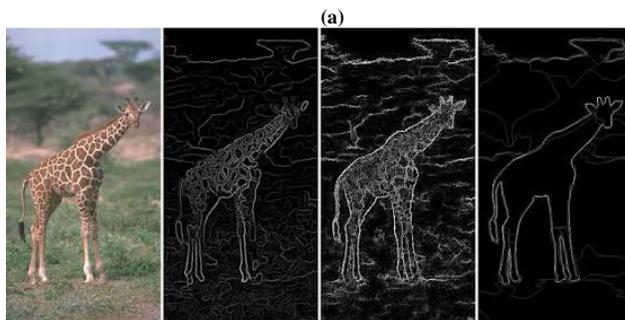


Figure.7. Programming Flowchart



(b)

Figure .8. MATLAB Output

As appeared in Figure 7 First we take a picture and discover its edges with the assistance of canny edge detection which yield given in Figure 4 and we will draw this picture. Drawing the picture has two sections:

PART 1: First we discover the pixel which is 1 as our picture is currently as 1s and after that check its nearby pixels if any of them is likewise 1 then the pen achieves that pixel and erases the past 1. The capacity refreshes itself recursively and makes smooth lines.

PART2: The second part includes the Inverse kinematics part of how to achieve that specific pixel. It essentially takes in the directions of the pixel and computes the relating plots for the turns, the computations are appeared in the beneath picture.

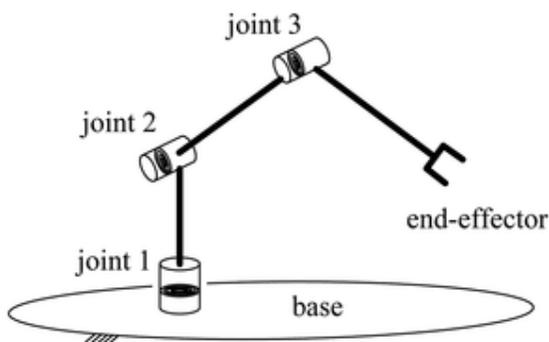


Figure.9. Inverse Kinematics

Input Image	Robot Drawing

Figure.10. Input Image and Output Image drawn by robot

VI. APPLICATION

There are a significant number of the uses of drawing robot are Sketching,PCB Design, Drawing in 3D, Wall Painting, Decorating made products, Animation.

VII. CONCLUSION AND FUTURE WORK

By interfacing Arduino with IOT we can work over illustration robot through web. All the physical items (things) are associated together utilizing web foundation. Arduino board is a standout amongst the most imperative protests in this ecosystem.

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