iBot

Introduction:

iBot is an image processing robot which with help of an overhead camera acquires image and navigates through the required path. There would be four paths of different colours, varying lengths and bonus points. The participant has to choose a path, autonomously which fetches him maximum points.

The Hardware of iBot:

The hardware of iBot includes a

(1) A Serial Port communicating IC
(2) A Microcontroller circuit
(3) Motors and Motor Drivers
(4) Wireless Communication Module (optional)

Serial Port Communicator:

Serial port communicating IC enables to communicate between the serial port of the computer and the iBot. The images from the over head camera are processed using Matlab and the necessary decisions made are sent to the bot using this IC. An IC MAX 232 can be used for this purpose. The detailed pin diagram can be obtained from the datasheet.

A Microcontroller circuit:

The data received from the serial port via the IC MAX 232 is processed using a micro controller circuit. The necessary details for the maneuverability of the iBot are passed to the motor driving circuit using this microcontroller. An ATmega 16 or ATmega 32 can be used for this purpose.

Motors and Motor Drivers:

Motors, preferably stepper motors with optimum speed shall be used in iBot. Stepper motors are much preferred due to the reason that they have better control on both direction and speed. If in case of ordinary motors IC L293D can be used as a motor drive, while in the case of stepper motors IC ULN2003 can be used.

Wireless Communication Module:

It is an optional hardware component in iBot. This is provided to ensure 'undisturbed' communication between the serial port of the computer and serial port communicating IC.

This can also be done with help of wires. I such cases there is a possibility of the wires altering and obstructing the paths acquired through with the help of an overhead camera. So it is preferable to have a wireless module which passes the necessary information.

Sample Codes and Algorithm:

This is a sample code for solving the iBot. The code only consists of the major parts of the code.

```
Image= imread('your image.ext');

             // Reads Image from the File//

Img = bwlabel(Image);
            //This command actually gives labels for the connected points in the image.//


s  = regionprops(Img, 'centroid');
            //regionprops is a command that measures the property of each labeled region in the
            matrix. Property can be Area, Centroid, and Perimeter etc.
            For measuring area replace centroid with area.//


centroids = cat(1, s.Centroid);
            //This will extract the coordinates of centroids from the “s” class.
            For extracting replace Centroid into Area
            cat stands for Concatenating arrays along specified dimension//

imshow(bw)

hold on

plot(centroids(:,1), centroids(:,2), 'b*')
            //This will mark all the centroids in the image, as “*”//
hold off
```

For iBot, we have to take the area and the centroid to detect the differences between the squares and bigger circles. As these commands, won’t differentiate between a circle or a square, it just finds out the connected points and extract the centroids and areas of connected points.

First find the centroid of all points, and then differentiate the centroid based on colour. This can be done by simply comparing the RGB values.

E.g.: For Red colour, RGB value would be [255 0 0]. So have a code to check the RGB value, if R > 220, G < 20; B < 20; then the colour can be assumed RED. This check has to be done for each centroid separately.

Once we classified the centroids based on colour, we can then use distance formula to get the adjacent squares.

This tutorial is aimed to get a brief introduction an introduction to iBot. You may browse through the web for more information. Thank you for patiently reading this tutorial and for any doubts or queries do contact:

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