IJBPAS, July, 2015, 4(7): 4822-4829

ISSN: 2277–4998

International Journal of Biology, Pharmacy and Allied Sciences (IJBPAS)

'A Bridge Between Laboratory and Reader'

www.ijbpas.com

APPPLICATION OF IIMAGE PROCESSING IN ROBOTIC INDUSTRIES: A CASE STUDY

***EBRAHIM BEHROUZIAN NEJAD, AMIN JAVADINASAB, HAMID MEHDI AND BEHROOZ SAFAEIZADEH**

Department of Computer, Andimeshk Branch, Islamic Azad University, Andimeshk, Iran

***Corresponding Author: E Mail: Behrozian.e@gmail.com**

ABSTRACT

Nowadays some of robots use a camera as their insight unit. In this method some image are taken via a camera. Then by processing this images, robot can extract necessary information to make the best decisions. In this paper we design a line following robot which no use any traditional sensor to find its rout. Our designed robot use a small camera as its insight unit. We use image processing technique and MATLAB7 software to process the images taken by camera. After processing images, control signals are generated and sent to robot. this robot has no any eye or sensor, but this robot and the robot use only a small webcam which is placed on top of it. This webcam take film of around environment and use of MATLAB software to process the taken film. Control signals earned from taken pictures and this signals use for control engine.

Keywords: Image Processing , MATLAB, Line following robot

INTRODUCTION

Image processing is a basic stage in systems which are based on machine vision. Image processing is new knowledge that its origin is return to the invention of digital computers. In fact each picture is made of some pixels which are together. Today, in most of the usage like aerial picture processing, identity discretion from pictures and fingerprint, artificial intelligent and robotic it has a special place. The purpose of image processing is to extract important information and change them into useful information to process them again. Our aim of writing this paper is to show some application of image processing which can used to

control intelligent robots. One of the important characterizations of intelligent robots is vision unit. Today, some of robots use a vision unit to detect their environment instead of using sensors[1,2,3].

GENERAL STRUCTURE AF A ROBOT

In a general view robots are include three following units:

- Mechanical unit
- Electronic unit
- Software unit (computer part)

In this paper our main discussion is about software unit which is based on image processing techniques and MATLAB7. We will talk about other units in brief.

A . Mechanical unit

Mechanical unit of this robot is simple but include some specifications which allow robot move freely in all sides. This design know as tank design which include two wheels. one of them is placed in right side and other left in left side of robot. By use of a simple differential , engines power are transferred to wheels. This allow robot to move front, back and every side.

As mentioned in past section, this robot have no any eye or sensor. It use a small webcam that is placed in above of it. webcam can see the front environment of robot, take picture or image and send images to computer. General structure of mechanical unit of this robot is shown in figure 1.

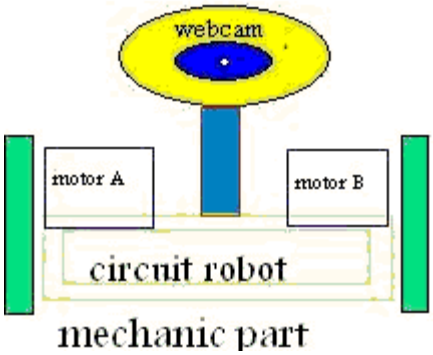


Figure 1.General structure of mechanical unit

B .Electronic unit

Because this robot has no any sensor(eye), therefore its electronic circuit is very small. As shown in figure 2, this circuit is include a small driver for electrical engines. This circuit is placed in top of engines and control robot movements. This circuit receive two control signals from computer and cutting and joining engines. In this way, causes engines wheeling in different directions.

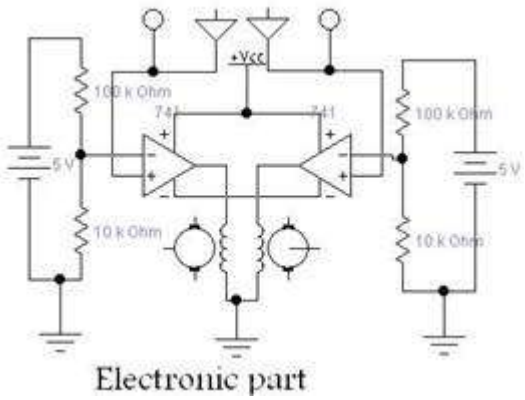


Figure 2. Electronic unit

C . software unit

The Software which is used in this work is MATLAB7. This software include new specifications rather its old versions.

One of important new specifications of MATLAB7 which we had used it, is establishment relationship MATLAB7 with USB port. we use this characteristic to fast transfer of taken image into computer and process them by MATLAB7.

taken images entered to computer via USB port as real-time stream of images. because MATLAB7 can detect and work with USB port. The entered images are processed real time, control signals are generated and sent out to robot via parallel port of computer. This process can be done continuously with fixe and high speed.

In a general view, we can describe the operations of robot as below:

At first robot take some image form its front environment by means of a camera and sent these images to computer through USB port.

Then taken images are changed to pictures into computer. In fact, basic task of software unit is analysis and dissolving pictures that had taken continuously and almost have speed as 7 pictures per second.

Then virtual eyes for robot should be designed in computer software (MATLAB7). The output of virtual eyes is some digital signals as 0 or 1.

Note that the taken image is a real image and we should change this image into black and white image by filter.

Then we can consider black color as 0 and white color as 1. In fact main task of this robot is following a line on page. After changing taken film to picture, we should consider eyes for it, and then this signal changing to two control signals. This control signals will sent to robot[4,5].

BASIC STEPS OF IMAGE PROCESSING

First step: imaging

In this step we image the environment of robot, specially the front side of robot. This image is a digital image. So, to do this work, we need an imaging sensor and a device which be able to digitalis output signals of the imaging sensor.

Second step: preprocessing

After catching digital image, next step is preprocessing. Preprocessing enhances and improves the image so that increases possible success of the other later processes. In this project preprocessing usually refer to methods to raising differences and omit and isolation of background area.

Third step: image segmentation

In this step each image is divided into multiple segments.

The output of this step is pixels which form an area or boundaries of it. In each case, we should proper data to efficient processing.

At first we should make decision data shown to shape a boundary or a complete area. Boundary show is efficient when some specifications such corners, angles or curvatures are needed[6,7].

The area show is important when inner specifications of a shape are needed.

CONTROL PROGRAM OF ROBOT

The program which is written for this robot, is a MATLAB M file. This program including several parts:

1. Recognition (detecting) the camera or webcam and communication with it.
2. Taking the images by webcam and convert it into digital images.
3. Processing digital images.
4. Definition virtual eyes for robot.
5. Recognition computer parallel port by MATLAB and send out information up on it.
6. Stimulate circuit drive.

A. Webcam recognition by MATLAB7

For do this, image acquisition tools box is used. This tool box can be used to control the camera or webcam. To use this tool box the following steps should done :

Step 1: installing image acquisition device. This device may be a webcam or digital camera.

Step 2: making a video topic by following instruction:

Obj= video input ('adaptor name', device id,'format')

To determine adaptor name the following instruction can be used:

Imaghw info

After running this instruction, MATLAB will give us, an adaptor name.

Step 3: activating camera display windows. This part enables us to see the pictures which are taken by camera. Also it can be used to setup and regulate the light, camera direction and the size of the display windows. To do this, the following instruction can be used :

Preview ('object name')

Step 4: regulate topic specifications

After making input video topic and watching it, it is possible to change some properties of a shape, like light. To do it, the following instruction can be used:

Set (obj, 'property name', property value)

Step 5:

When there was no need to image acquisition topic, it can cleaned from MATLAB workspace and memory by the following instruction:

Delete (obj)

B. Taking the images by webcam and convert it into digital images.

We can take a photograph by webcam and change it to digital image via the following instruction :

I=Get snapshot (obj)

C. Processing digital images

shape conversion: the taken photograph is a RGB shape. It is necessary to convert the shape to index type. To do this, the following instruction can be used:

I=rgb2ind (I, color cube (300))

Finding edges:.

I=edge (I, 'sobel', (graythresh (I).1))*

Omit noise:.

Se90=strel ('line', 3, 90

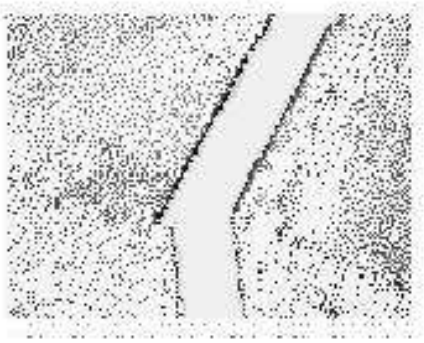
Se0=strel ('line', 3, 0)

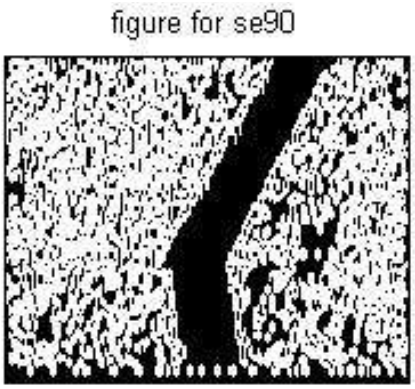
I=imdilate (I, [se90 se0])

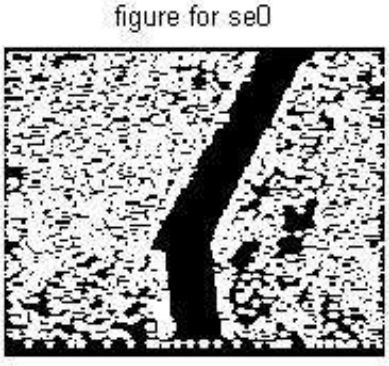
I=imfill (I,' holes')

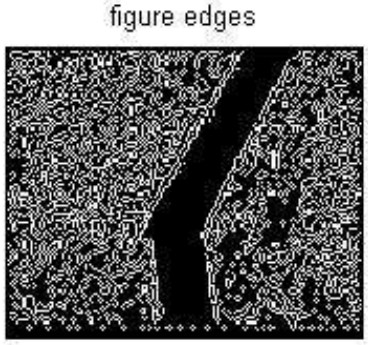
All of above mentioned steps are shown in figure 3, 4,5,6,7 in detail.

Figure 3. Original









image

figure for imdilate

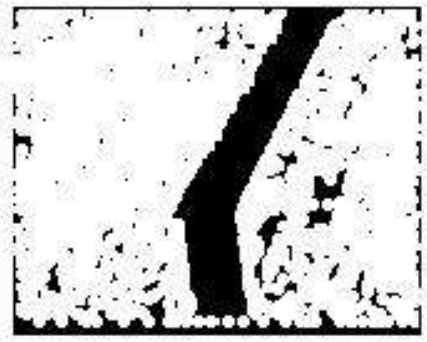
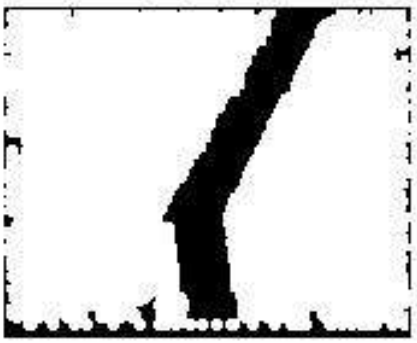
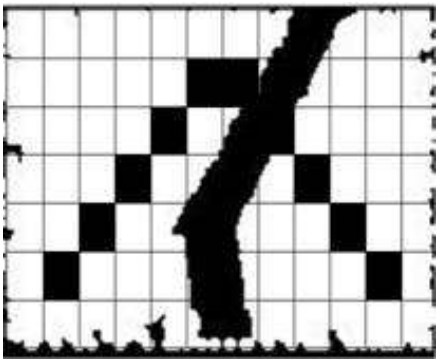
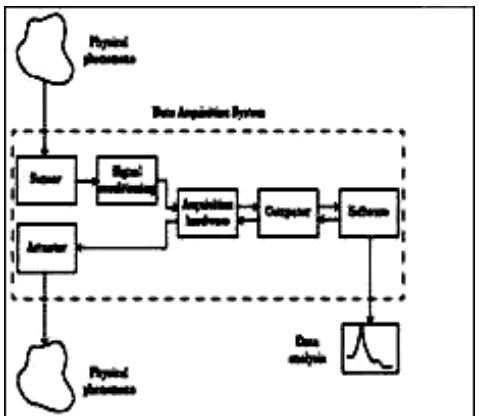


figure for imfill







D. definition of robot eyes

Following shape is shape taking assume eyes in MATLAB.

C. Recognition parallel port by MATLAB and send information to upon it:

For this work should experimented work by data acquisition tool box.

Data acquisition tool box: MATLAB had use of this tool box had relationship with parallel port and sound card. This tool box had used for relationship MATLAB with exit computer environment.

Now for reading and writing digital data of parallel port do following stage.

First stage: previous a digital topic I/O

With order: dio=digitalio('parallel','lpt1')

Second stage: add line and definition if for exit or enter.

Add line (dio, 2:3, 0,'out')

Third stage: reading or writing data upon port for example: data= [1 0]

By this order had taken picture take number in I in shape matrix.

E. Stimulation circuit drive:

After had exist control signals, this signals should stimulation in circuit driver. as same previous part that you see , circuit robot is include two op-amp for every motor that when arrive signal to op-amp, stimulation and cause that turn on and turn out reinforcement of circuit .

PROGRAM EXECUTION

For execution program is sufficient executing it that can push RUN or F5 key, after execution program see two graphic pictures that one real image is around environment and other picture shape is black and white. This is a program ON line, it means do continuous, for this work, should had taken image change to picture unit earn of every picture a control signal. Of course in yesult if speed in crease the speed robot will increase. for earning assume eyes of robot should change picture to matrix and take characterizes for every eyes , in this project , if you want be more possible correcting signal , with assuming a equal , if the imaging of color black more cycle it's black.

CONCLUSION

In this paper had designed a robot that can be more abilities and by use of science image processing can analysis now world for robots and more comfort writing program and proposal that is designed in this study , better is instead use of sensors in this robot use of camera that had more feasibility .

REFERENCES

[1] Z. Sun, G. Bebis, R. Miller.: Boosting object detection using feature selection. IEEE International Conference on Advanced Video and Signal Based Surveillance, (2003), pp. 290-296.

[2] Z. Sun, G. Bebis, and R. Miller.: Object detection using feature subset selection. Pattern Recognition, Elsevier, Vol. 37, No. 11, (2004), pp. 2165-2176.

[3] A. Jain, R. Duin, and J. Mao.: Statistical pattern recognition: a review. IEEE Trans Pattern Anal Machine Intel, Vol. 22, No. 1, (2000), pp. 4-37.

[4] P.N. Exhumer, J.P. Hespanha, and D.J. Kriegman.: Eigenfaces vs. Fisherfaces: Recognition usingclass specific linear projection. IEEE Trans Pattern

Anal. Machine Intell, Vol.19, (1997), pp. 711-720.

[5] B. Moghaddam.: Principal manifolds and probabilistic subspaces for visual recognition. IEEE Trans Pattern Anal. Machine Intell, Vol. 24, No.6, (2002), pp. 780-788.

[6] H. Othman and T. Aboulnasr.: A separable low complexity 2D HMM with application to face recognition. IEEE Trans. Pattern Ana, Machine Intell, Vol. 25, No. 10, (2003), pp. 1229-1238.

[7] M.J. Er, S. Wu, J. Lu, and H. L. Toh.: Face recognition with radial basis function (RBF) neuralNetworks. IEEE Trans. Neural Networks, Vol. 13, No. 3, (2002), pp. 697 – 710.