3D Object Detection Using Robot

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Abstract

Object detection is computer technology related to computer vision and image processing that deals with finding instances of real world object such as object, images. Object detection algorithm typically use extracted features and learning algorithm to recognize instances of object category. This project is directed towards the development of the image processing algorithm which is a pre-requisite for the full operation of a pick and place Robotic arm intended for object sorting task.

For this type of task, first the objects are detected, and this is accomplished by feature extraction algorithm. Next, the extracted image (parameters in compliance with the classifier) is sent to the classifier to recognize what object it is and once this is finalized, the output would be the type of the object along with it's coordinates to be ready for the Robotic Arm to execute the pick and place task.

For example if a ball is to be picked up by the robotic arm, an algorithm is followed by the arm where instruction to pick the object in round shape is been provided. As per the instruction provided the arm will perform the task and pick the ball. The tasks are performed as per the instruction feed to the robotic arms memory.

The robot will be able to pick up the objects as per the shapes he is introduced to. So here we have introduced square, circle and triangle to the robot.

This technology is widely used in industrial sector for welding, painting, machine and part handling, in food industry sector, in packaging so on and so such.

1. INTRODUCTION

Object recognition is considered to be one of the high level computer vision problems. Object recognition research community has been split it into two parts: Those who deal with 2D images and those who deal with 3D pointclouds ormeshes.2D images are created by projecting the scene onto alane by capturing the light intensity detected at each pixel. Alternatively, 3D point clouds captures the 3D coordinates ofpoints in the scene. The main difference between these two types of data is that 3D data includes depth information Where as 2D does not. Cheaper sensors have been developed to acquire the 3D data from real environment, such as RGB-D cameras . RGB-D cameras, such as the Microsoft Kinect, capture a regular color image (RGB) along with the depth (D)associated with each pixel in the image.On the other hand, object recognition is generally considered by vision researchers as having two types. the instance level and the category level recognitions. In the instance level, we try to identify distinct object instances. For example, a coffee mug instance is one coffee mug with a particular appearance and shape. In contrast, the category level recognition determines the category name of an object.

1.2 Problem Overview

Over the past few years, various systems robots are developed to pick an object. But those robots can only pick the object that is placed in from of them. They cannot differentiate between the shape of the objects. We are trying to design and develop a robotic arm which will be able to recognize the shape with help of the edge detection. The object recognized will be then picked up with the robotic arm. The image object will be scanned by the camera first after which the edges will be detected. After which the program memory will recognize the object based upon the input and give commands to the object to pick.

1.3 Objectives

To design a product that is used to recognize and pick a particular object and place the object in the given or requested place.

2. METHODOLOGY

2.1 Block Diagram

Fig 1: Block Diagram of 3D object detection

2.1.1 ATmega328

The Atmel 8-bit AVR RISC-based microcontroller combines 32 kB ISP flash memory with read-while-write capabilities, 1 kB EEPROM, 2 kB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughput approaching 1 MIPSper MHz.

2.1.2 Camera

Object detection is a branch of Computer Vision, in which visually observable objects that are in images of videos can be detected, localized, and recognized by computers. An image is a single frame that captures a single-static instance of a naturally occurring event . On the other hand, a video contains many instances of static images displayed in one second, inducing the effect of viewing a naturally occurring event.

Specification:-

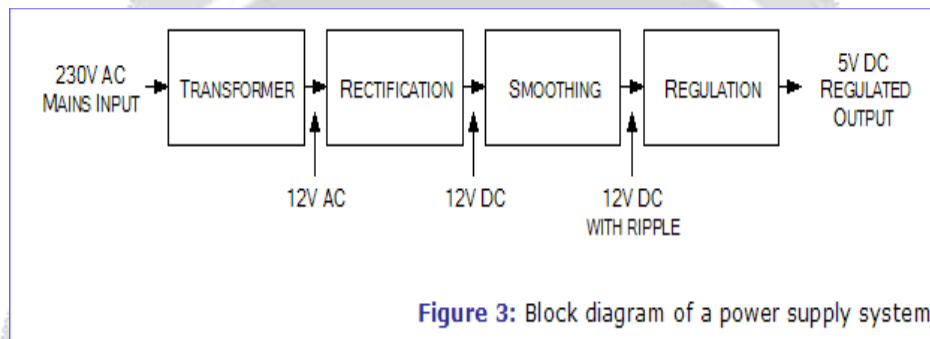Resolution : 1280*960
Pixels : 5MP
Power supply range : 3.3 – 5V
Wide-angle : 120 degree
Standard Lens : 1.8 mm
Format : PAL / NTSC(National Television System Committee)

2.1.3 Regulated Power Supply

The Parts Of A Power Supply

Figure shown below is a block diagram of a power supply system which converts a 220V AC mains supply (220V is the mains voltage) into a regulated 5V DC supply.

Figure 3: Block diagram of a power supply system

A simple power supply circuit that includes each of these blocks in given in Figure. The following articles in this series look at each block of the power supply in detail, but if you just want to build a 5V regulated power supply without understanding how it works, you can follow the instructions later in this article.

3.SOFTWARE IMPLEMENTATION:

Matlab (Software):

MATLAB is a high-performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation.

Typical uses include:

- ✓ Math and computation
- ✓ Modeling, simulation, and prototyping
- ✓ Data analysis, exploration, and visualization
- ✓ Scientific and engineering graphics
- ✓ Application development, including Graphical User Interface building
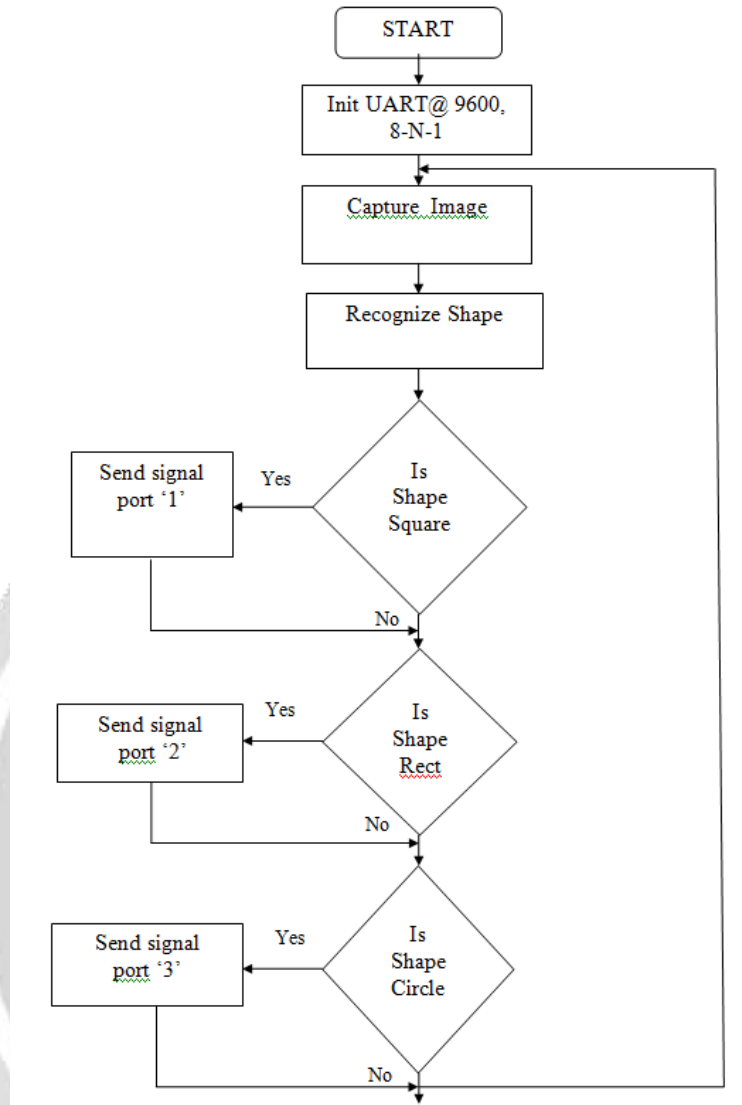- ✓ Algorithm development
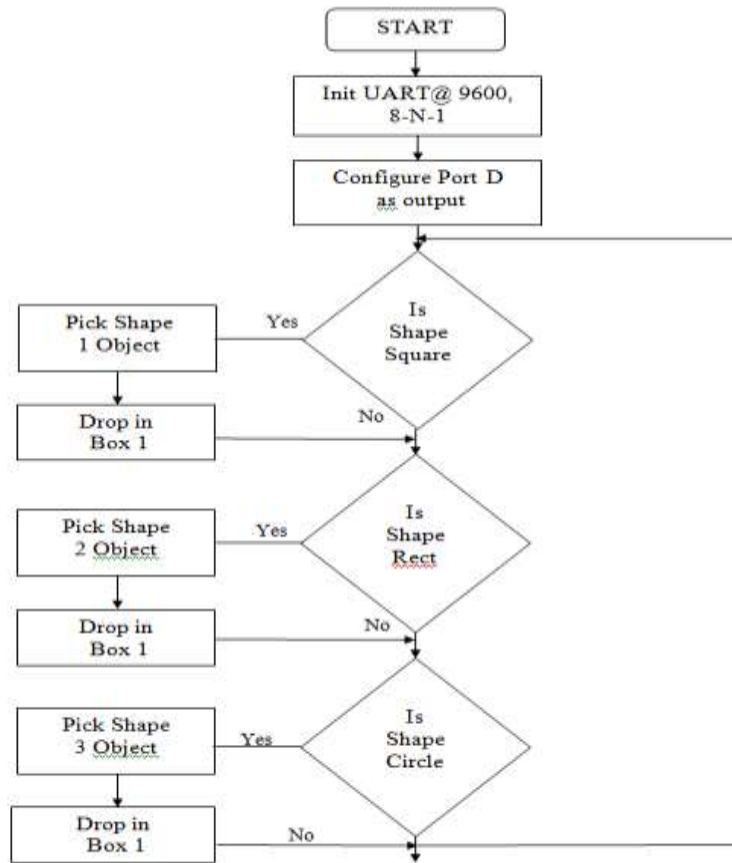
Fig 2. Shows the flowchart of MATLAB.

Fig 3. Shows the flowchart of Controller.

4. CONCLUSION

As the technology progresses the need of the accuracy increases. As the technology gets updated the human efforts are reduced. We implemented the same, where our robotic arm is successfully able to identify the object and place it in the specified location as instructed. This will reduce the human error and speed up the process.

5. REFERENCES

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