R. V. College of Engineering, Bengaluru-59

(Autonomous Institution Affiliated to VTU)

Department of Electronics and Communication Engineering

3rd Semester Phase-2 report for the Minor Project 2018-19

Project on : Target Detection and Tracking using Image Processing

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Accepted/Rejected

Comments

2018-2019

INDEX

- **Aim ……1**
- **Motivation ……1**
- **Objective…….1**
- **Introduction……2**
- **Software Used…….3**
- **Hardware Used…….4**
- **Progress……..7**
- **Block Daigram……7**
- **Methodlogy…….8**
- **Future Scope……..9**
- **Result...…….....9**
- **Conclusion……10**
- **Budget……...10**
- **Reference…….10**

AIM : DETECTION AND TRACKING OF THE TARGET

COMPONENT REQUIRED:

- Ardiuno Nano
- HC-05 (Bluetooth Module)
- L298N (H Bridge)
- 150 rpm Motor-2
- Connectors (male to female ,male to male)
- 9v Battery -3
- Chasis , wheels

Motivation:

Nowadays its the trend of Robotic Application , almost all of the work is being Robotizing ,This era of the Robotics , Due to Interest in Robotics we are motivated choose the Project based on Detection and Tracking of target which is carried out through the Image Sensing Principle by this we can also gain knowledge regarding the Image Processing Technology which is at the notch of today compitational World

Here we can compute the device to work in the real Time application which is Hot Area of the Projects nowadays , and This prpjet can aso used in the automotive Industry which are increasing in Tremendous Sped

Objective :

- Detection of the Target using Image Sensing.
- Tracking of Target with the Robot
- To Interface the Ardiuno and BlueTooth Module
- To interface and Control The Motor using L298N Motor Driver
- To Use Buck convertor for efficient Power Supply
- To Communicate Between Open CV and Ardiuno

INTRODUCTION

Robotic vision continues to be treated including different methods for processing, analyzing, and understanding. All these methods produce information that is translated into decisions for robots. From start to capture images and to the final decision of the robot, a wide range of technologies and algorithms are used like a committee of filtering and decisions.

Another object with other colors accompanied by different sizes. A robotic vision system has to make the distinction between objects and in almost all cases has to tracking these objects. Applied in the real world for robotic applications, these machine vision systems are designed to duplicate the abilities of the human vision system using programming code and electronic parts. As human eyes can detect and track many objects in the same time, robotic vision systems seem to pass the difficulty in detecting and tracking many objects at the same time.

A robotic system finds its place in many fields from industry and robotic services. Even is used for identification or navigation, these systems are under continuing improvements with new features like 3D support, filtering, or detection of light intensity applied to an object.

Applications and benefits for robotic vision systems used in industry or for service robots:

- automating process;
- object detection;
- estimation by counting any type of moving;
- applications for security and surveillance;
- used in inspection to remove the parts with defects;
- defense applications;

- used by autonomous vehicle or mobile robots for navigation;
- for interaction in computer-human interaction;

In this article, I make an overview of vision tools and libraries used for machine vision as well as most common vision sensors used by engineers to apply machine vision in the real world using robots.

Object tracking software

A tracking system has a well-defined role and this is to observe the persons or objects when these are under moving. In addition, the tracking software is capable of predicting the direction of motion and recognizes the object or persons.

OpenCV

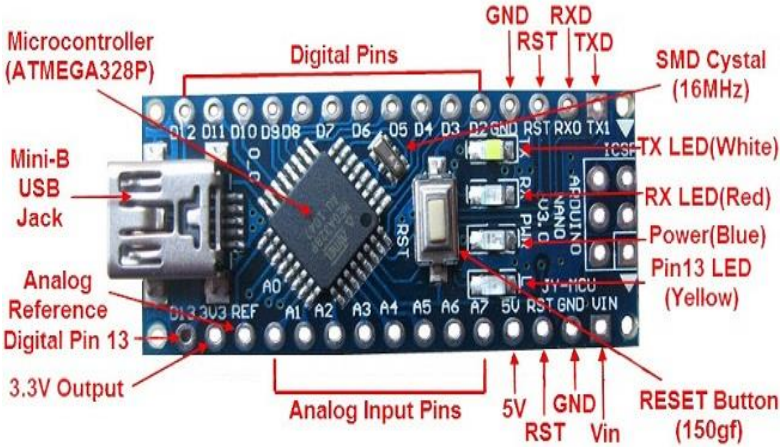
OpenCV

OpenCV is the most popular and used machine vision library with open-source code and comprehensive documentation. Starting with image processing, 3D vision and tracking, fitting and many other features, the system include more than 2500 algorithms. The library interfaces have support for C++, C, Python and Java (in work), and also can run under Windows, Linux, Android or Mac operating systems.

ARDUINO NANO V3.0 SPECIFICATION

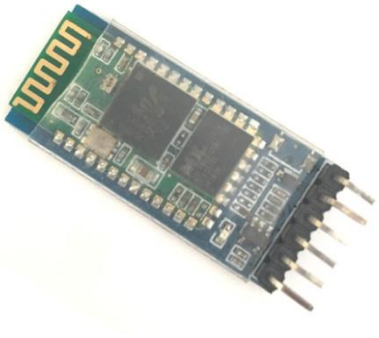
The Arduino Software (IDE), is used to program Arduino Nano. The Arduino Software is an Integrated Development Environment that is common to all Arduino boards and runs both online and offline.
The detailed specification of the **Arduino Nano** board is as follows:

- Microcontroller ATmega328
- Operating Voltage (logic level): 5 V
- Input Voltage (Recommended): 7-12 V
- Input Voltage (limits): 6-20 V
- Digital I/O Pins : 14 (of which 6 provide PWM Output)
- Analog Input Pins: 8



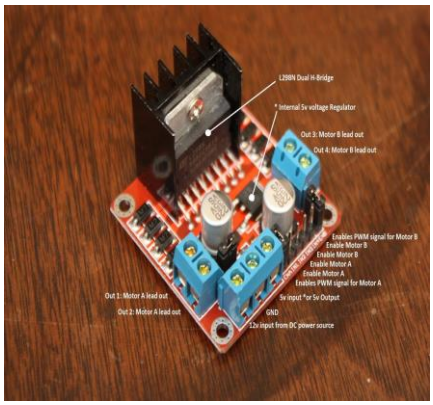
- DC Current per I/O Pin: 40 mA
- Flash Memory 32 KB (ATmega328) of which 2 KB used by bootloader
- SRAM: 2 KB (ATmega328)
- EEPROM: 1 KB (ATmega328)
- Clock Speed: 16 MHz
- Measurements: 0.73" x 1.70"

HC-05 Technical Specifications



- Serial Bluetooth module for Arduino and other microcontrollers
- Operating Voltage: 4V to 6V (Typically +5V)
- Operating Current: 30mA
- Range: <100m
- Works with Serial communication (USART) and TTL compatible
- Follows IEEE 802.15.1 standardized protocol
- Uses Frequency-Hopping Spread spectrum (FHSS)
- Can operate in Master, Slave or Master/Slave mode
- Can be easily interfaced with Laptop or Mobile phones with Bluetooth
- Supported baud rate: 9600,19200,38400,57600,115200,230400,460800.

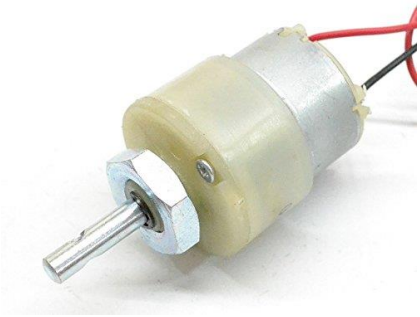
L298N Dual H Bridge Motor Driver



- Double H Bridge Drive Chip: L298N
- Logical Voltage: 5V
- Drive Voltage: 5V-35V
- Logical Current: 0-36mA
- Drive current: 2A (MAX single bridge)
- Max Power: 25W
- Dimensions: 43 x 43 x 26mm
- Weight: 26g

150 RPM, 12V DC Geared Motor

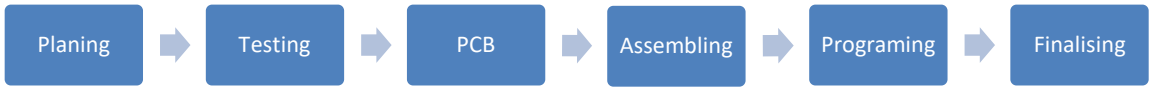
- 150RPM 12V DC motors with Gearbox
- 6mm shaft diameter with internal hole
- 125gm weight
- Stall Torque = 1kgcm torque
- No-load current = 60 mA(Max), Load current = 300 mA(Max)



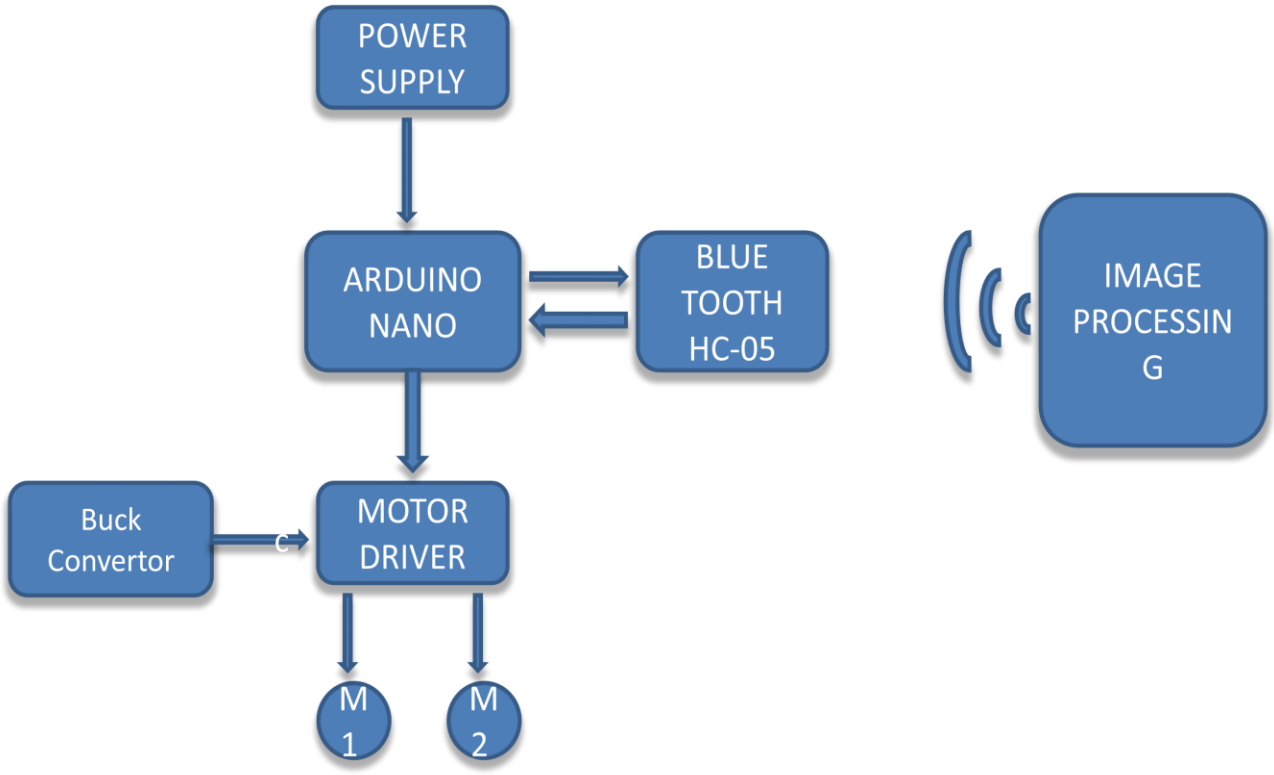
DC-DC Buck Converter LM2596 :

- Conversion efficiency: 92%(highest)
- Switching frequency: 150KHz
- Output ripple: 30mA maximum)
- Load Regulation: ± 0.5%
- Voltage Regulation: ± 0.5%
- Dynamic Response speed: 5% 200uS
- Input voltage:4.75-35V
- Output voltage:1.25-26V(Adjustable)
- Output current: Rated current is 2A
- Rectifier: Non-Synchronous Rectification
- Short Circuit Protection: Current limiting, since the recovery
- Operating Temperature: Industrial grade (-40 to +85) (output power 10W or less)

Progress



Block Daigram



METHODOLOGY

- This project is aimed to design and develop a mobile robot which can track a moving Target.

- We used our smartphone camera to capture the images and the frames from the Smartphone camera are processed by Open CV software to track the target. The parameters of the target such as the color, shape, size can be used for tracking the Target.

- In this project we have used the colour information of the Target for tracking. Better performance of the robot can be obtained if multiple features are monitored. The movement of the robot is controlled by the microcontroller based on the control signals received from the application.

- The variation in horizontal and vertical axis of the target generates control signals which is sent to the controller wirelessly with help of Bluetooth HC-05 Module.

- The captured images of the target are processed using OPENCV MANAGER application, The Open CV application will generate the code which represent the cordinaton of the Target,These codes can be used as the control signal for the Robot for its mobility .

- Open CV first Converts the Data in terms of NUMPY Array, Numpy which stands for Numerical Python, is a library consisting of multidimensional array object and a collection of routines for processing those arrays ,using Numpy ,mathematically and logical operations on arrays can be performed;

- Depending upon the change in position of Target, commands are given to the robot to track the moving Target , and meanwhile the Prewritten code in Ardiuno will help to process the command and Track the Target.

- We have used 2 Gear Motor ,1 caster wheel for the locomotion of the Robot and this Motor are controlled by the L298N Motor Driver IC ,The Speed of the Motor can be controlled with the EnA, EnB pin by connecting them to the PWM output pins of the ardiuno .

- For the Power Supply ,We have used 3-9v battery , 1 battery is solely used for the Ardiuno and other 2 battery are connected in series and given to the motor through the Buck Convertor

- Working principle of Buck Converter. The working operation of the DC to DC converter is the inductor in the input resistance has the unexpected variation in the input current. If the switch is ON then the inductor feed the energy from the input and it stores the energy of magnetic energy.The switching transistor between the input and output of the Buck Converter continually switches on and off at high frequency. To maintain a continuous output, the circuit uses the energy stored in the inductor L, during the on periods of the switching transistor, to continue supplying the load during the off periods.

FUTURE SCOPE

The future of image processing will involve scanning the heavens for other intelligent life out in space. Also new intelligent, digital species created entirely by research scientists in various nations of the world will include advances in image processing applications. Due to advances in image processing and related technologies there will be millions and millions of robots in the world in a few decades time, transforming the way the world is managed. Advances in image processing and artificial intelligence6 will involve spoken commands, anticipating the information requirements of governments, translating languages, recognizing and tracking people and things, diagnosing medical conditions, performing surgery, reprogramming defects in human DNA, and automatic driving all forms of transport. With increasing power and sophistication of modern computing, the concept of computation can go beyond the present limits and in future, image processing technology will advance and the visual system of man can be replicated. The future trend in remote sensing will be towards improved sensors that record the same scene in many spectral channels. Graphics data is becoming increasingly important in image processing app1ications. The future image processing applications of satellite based imaging ranges from planetary exploration to surveillance applications.

Using large scale homogeneous cellular arrays of simple circuits to perform image processing tasks and to demonstrate pattern-forming phenomena is an emerging topic. The cellular neural network is an implementable alternative to fully connected neural networks and has evolved into a paradigm for future imaging techniques. The usefulness of this technique has applications in the areas of silicon retina, pattern formation, etc.

Result:

Robot is able to Detect the Target based on Color Criteria, and its can also Search the Object when it Disappears , When the object is detected the Robot will Track it down and follow it.

CONCLUSION

A major challenge for automatic image analysis is that the sheer complexity of the visual task which has been mostly ignored by the current approaches. New technological breakthrough in the areas of digital computation and telecommunication has relevance for future applications of image processing1. The satellite imaging and remote sensing applications programs of the future will feature a variety of sensors orbiting the earth. This technology is required for military and other types of surveillance, statistical data collection in the fields of forestry, agriculture, disaster prediction, weather prediction. In order to extract scientifically useful information, it will be necessary to develop techniques to register real-time data recorded by a variety of sensors for various applications.

Budget of Project: ₹1,200 (approximately)

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