

SYNOPSIS
ON
ROBOTICS APPLICATIONS
SUBMITTED IN THE PARTIAL FULLFILMENT OF THE
REQUIREMENTS
FOR THE AWARD OF THE DEGREE OF
BACHELOR OF TECHNOLOGY
KURUKSHETRA UNIVERSITY, KURUKSHETRA



DEPARTMENT OF INFORMATION TECHNOLOGY
Seth Jai Parkash Mukand Lal Institute of Engineering and Technology
Chhota Baans, Radaur-135133, District - Yamuna Nagar

TEAM DETAILS

First Team Member

Name : Tanuj Chawla
Roll No. : 1210659
Semester : 7th Semester
Department : Information Technology
Academic Session : 2010-2014
Correspondence Address : H.No. 1084, Sector-9, Urban Estate, Karnal-132001
Contact Number : +91-9034260560
E-Mail : tanujchawla1991@gmail.com

Second Team Member

Name : Kunal Lalit
Roll No. : 1210622
Semester : 7th Semester
Department : Information Technology
Academic Session : 2010-2014
Correspondence Address : H.No. 47, Sector-13, Urban Estate, Kurukshetra-136118
Contact Number : +91-7206683995
E-Mail : kunalkumarlalit@gmail.com

Third Team Member

Name : Lovekesh Goel
Roll No. : 1210623
Semester : 7th Semester
Department : Information Technology
Academic Session : 2010-2014
Correspondence Address : 645/22, Prabhu Nagar, Sonapat-131001
Contact Number : +91-9034237794
E-Mail : lovekesh.only@gmail.com

Fourth Team Member

Name : Shubham Jain
Roll No. : 1210650
Semester : 7th Semester
Department : Information Technology
Academic Session : 2010-2014
Correspondence Address : 138/11, Kishan Pura, Ganaur, Sonapat-131101
Contact Number : +91-9992211108
E-Mail : jain.j.shubham@gmail.com

Fifth Team Member

Name : Tushar Sharma
Roll No. : 1210660
Semester : 7th Semester
Department : Information Technology
Academic Session : 2010-2014
Correspondence Address : 1666-a\8, Vishnu Colony, Kurukshetra-136118
Contact Number : +91-9416792369
E-Mail : tushar_on@yahoo.com

Sixth Team Member

Name : Sunil Kumar
Roll No. : 1210656
Semester : 7th Semester
Department : Information Technology
Academic Session : 2010-2014
Correspondence Address : Ward No. 16, Near Old Bus Stand, Barwala, Hisar
Contact Number : +91-9468327332
E-Mail : sunilsingla14@gmail.com

PROJECT DESCRIPTION

Robotics

Robotics is the science and technology of robots, and their design, manufacture, and application. Robotics is related to electronics, mechanics, and software.

A robot is a virtual or mechanical artificial agent. In practice, it is usually an electro-mechanical system

Robotics requires a working knowledge of electronics, mechanics and software, and is usually accompanied by a large working knowledge of many subjects.

Although the appearance and capabilities of robots vary vastly, all robots share the features of a mechanical, movable structure under some form of autonomous control. The structure of a robot is usually mostly mechanical and can be called a kinematic chain (its functionality being similar to the skeleton of the human body). The chain is formed of links (its bones), actuators (its muscles) and joints which can allow one or more degrees of freedom. Most contemporary robots use open serial chains in which each link connects the one before to the one after it. These robots are called serial robots and often resemble the human arm. Some robots, such as the Stewart platform, use closed parallel kinematic chains. Other structures, such as those that mimic the mechanical structure of humans, various animals and insects, are comparatively rare. However, the development and use of such structures in robots is an active area of research (e.g. biomechanics). Robots used as manipulators have an end effector mounted on the last link. This end effector can be anything from a welding device to a mechanical hand used to manipulate the environment.

Colour of the object plays a very important role in daily life of a human generally used to differentiate and recognize the objects in the environment. The main applications where colour is used as feature are object sorting, object recognition, face detection, localization and tracking of a particular object. Remote sensing, medical imaging, non-destructive evaluation, forensic studies, textile industry, material science and military are the most common fields where object recognition using colour plays a very important role. Colour detecting robot using a vision system in automation industry is considered to be the most powerful sensor. All the complex analysis done by our brain in differentiating one object with a similar kind of object is done in minutes using a robotic vision system with the help of artificial intelligence. The objective of the paper is to separate the red, green and blue coloured objects from a set and place them at the desired locations using a robotic arm. Generally robot is mounted with a camera or the camera is mounted in the workspace to detect the object. This technology is

used in an industry where the objects moving through a conveyer belt can be separated using a colour detecting robot. MATLAB is used to detect the three different colours using image processing and send the commands the robotic arm using serial communication to perform the motor operation.

Robotic Vision is the process of interpreting pixels that are captured using digital device such as Webcam. The Proposed project is an Autonomous Robot with a camera vision integrated with it. The objective is to make a fast program for object localization using MATLAB. Application involves in the field of Robotics for identification and tracking of objects.



DETAILS OF MODULES

Object Following Robot:

Build an autonomous bot that can track a ball's motion and follow it.

The project deals with a robot that locates and follows a ball across mounted with a web camera above and being controlled by a pc. The robot specified uses a microcontroller ATmega328 with a web camera mounted on it which is having video stream in a running mode where actually it sees the ball and where ever the ball is moving it just follows it automatically without any external control. For using a web cam we need to include a software which is MATLAB, it helps in taking images in current stream and allows camera to locate the ball and follow it using the concept of threshold.

The domain of Image Processing was completely new for me. Yet, within a span of few days, I am able to put together an autonomous bot capable of tracking and following a ball. But I did manage to pack in a lot of fun and learning in the process.

DTMF Controlled Wireless Robot:

“DTMF Controlled Wireless Robot” is capable of receiving a set of command (instructions) in the form of DTMF tones and performs the necessary actions. Here DTMF stands for “Dual tone multiple frequency”. We will be using a dedicated modem/mobile at the receiver module i.e. with the robot itself and send the commands using DTMF tones as per the required actions.

The mobile unit which is dedicated at the robot is interfaced with an intellectual device called Microcontroller so that it takes the responsibility of decoding the tones received and perform the corresponding predefined tasks such as move front or back, left or right etc. The micro controller is also interfaced with few DC motors in order to move the robot in different directions. The ON and OFF of the DC motors depends on the direction it has to move which is the complete responsibility of the controller to take those intelligent decisions.

Light Following Robot:

The light following robot is a mobile machine which is capable of detecting and following the light source on the traveling path. It is developed without the help of a micro-controller for providing easier connections and understanding of the circuit. It requires fewer numbers of electronic components and very cost-effective as well.

The concept of this light following robot is very simple. It includes two photodiodes, one on the right and other on the left. When the light falls on the right photodiode, the robot will

move on the right side. Similarly, the robot will move on the left side when the light falls on the left photodiode.

Accelerometer Controlled Robot:

A Gesture Controlled robot is a kind of robot which can be controlled by your hand gestures not by old buttons. You just need to wear a small transmitting device in your hand which included an acceleration meter. This will transmit an appropriate command to the robot so that it can do whatever we want. The transmitting device included a comparator IC for analog to digital conversion and an encoder IC(HT12E) which is use to encode the four bit data and then it will transmit by an RF Transmitter module.

Gesture Controlled Robot:

Touchless user interfaces are an emerging technology for embedded electronics as developers seek to provide innovative control methods and more intuitive ways for end users to interact with electronics products. Active IR (infrared) proximity-motion-sensing technology can solve this human-interface design challenge. Thanks to the advent of highly integrated proximity/ambient-light sensors, implementing motion sensing using IR technology is now easier. The two primary methods used to enable gesture sensing are position-based and phase-based sensing. Position-based gesture sensing involves finding gestures based on the calculated location of an object. Phase-based gesture sensing is based on the timing of the changes in signals to determine the direction of an object's motion. Both technologies are complementary enablers of IR gesturing applications, such as page turning for e-readers, scrolling on tablet PCs, and navigating GUIs (graphical user interfaces) in industrial-control systems.

Touch-Screen Controlled Robot:

The project is designed to wirelessly control electrical appliances using RF communication. It uses a control board at the receiver end and another control board at the transmitting end. A touch screen display along with a microcontroller is used at the transmitting side. By using this display one can transmit the information on which load is to be ON / OFF. On the

receiver side a microcontroller along with other peripherals is used to process the data received by the transmitter.

NOTE:

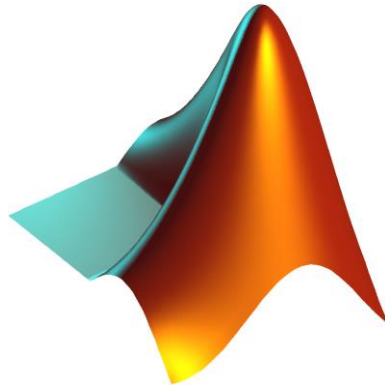
Modules may be added or dropped as per the requirements realized during the development of the project.

TECHNICAL DETAILS

FRONTEND

:

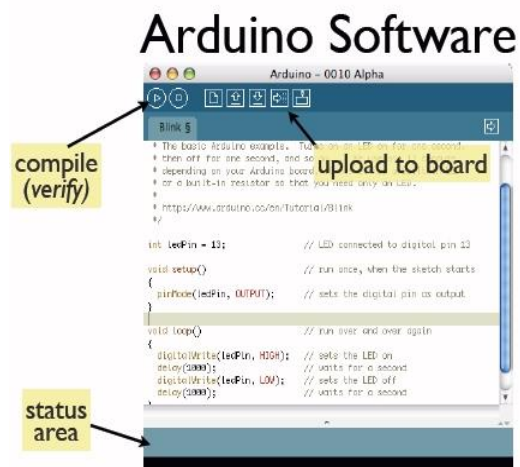
Android ADT + MATLAB + Embedded C



BACKEND

:

Arduino IDE



HARDWARE REQUIREMENTS

Chasis

Wheels

Caster Wheel

Motors

Motor Shield

Roboduino Board (ATmega 328)

Serial to USB Cable

Accelerometer

DTMF Shield

IR Sensor Board

Webcam

Female to Female Wires

Battery

Power Adapter

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