

## Real Time Position Control of Autonomous Robot using Still Camera Images

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**Abstract** — Now a days , most of the robot are operates and control by using wired or wireless. This paper will describe the concept of wireless communication system on which the robot is operated using personal computer (PC). Graphical user interface is used for robotic operation on personal computer using MATLAB. This paper gives the idea of real time position control of autonomous robot using still camera. Real time source to destination images coordinates are given to the robot and robot will move further to the given path. This system will be useful for drone attack in military robots.

**Keywords-** Webcam, Coordinate, MATLAB, RF communication, Robot, Wireless System.

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### I. INTRODUCTION

The image processing and its applications are the highly interesting research fields in these days. Real-time processing and automatic inspection do not only reduce the personal expenses, but make performance accurate and reliable[1].The core task of this system is the development of an image processing unit that is able to process captured images of the robot, enabling the detection of robot position. The position of a robot can be acquired from subtraction of contiguous two images. The centroid of the subtraction image[5] is the center point of the robot since the intensity values of subtraction image for moving regions are presented with higher density than those of other regions. So the centroid can be used as a position point of robot. Then we control the position of robot using camera feedback i.e. the camera provides feedback to the controller with detecting the location of the robot. The camera is connected with a PC and the PC processes the images to determine the location of the robot and then the PC commands [4] the robot for tacking a specified path wirelessly. There is a need to communicate with the robot remotely in order to control the robot movements and pass critical data both ways. The RF communication is used for transfer the data from PC to robot.

Now day's wireless communications is becoming most popular for factory and process control automation systems or industries. Part of this growth is due to the emergence of very reliable radio frequency technologies capable of handling the extreme conditions present in industries. The other fact is that the driving growth is the realized benefits that wireless presents including reduction of installation costs. For remote sites, elimination of phone line charges [6][7].

## II. IMAGE PROCESS AND COORDINATE FINDING

### 2.1 Image capture:

The webcam can interface with PC. Firstly it will capture the image of background i.e. plain image. Then we take the image with robot and calculate the source point of robot means center point of the robot using the image subtraction method. Once the source point getting then we decide the destination point from that image.



Figure 1. Plane Image

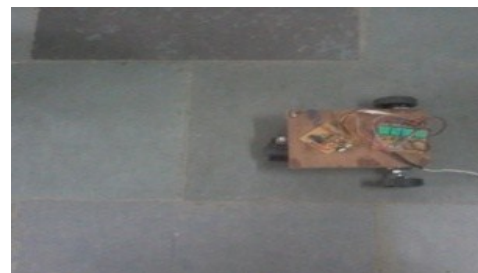


Figure 2. Robot Image



Figure 3. Center point robot



Figure 4. Destination point robot

### 2.2 Control Module:

It consist of the GUI . A graphical user interface (GUI) is used to command line the robot motion. USB to serial connector is use to tranmist the dtata from PC to RF transmitter. A set of buttons is created in GUI to remotly control the robot. As a result, this board also can use as a remote control to control the robot motion. As button is press respectivly data is transmitted to the robot by RF transmitter.

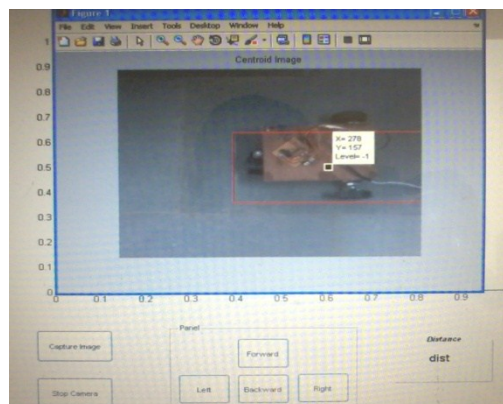


Figure 5. Control Module (GUI)

In GUI, six buttons are created for controlling the robot position.

1. Button Capture Image –It will capture image of background.  
i.e. plain Image and robot image.
2. Button Forward –It will send data , to go robot in forward direction.
3. Button Backward –It will send data , to go robot in backward direction.
4. Button Left –It will send data to move robot in left direction
5. Button Right –It will send data to move robot in right direction.
6. Button Stop-It stop the webcam.

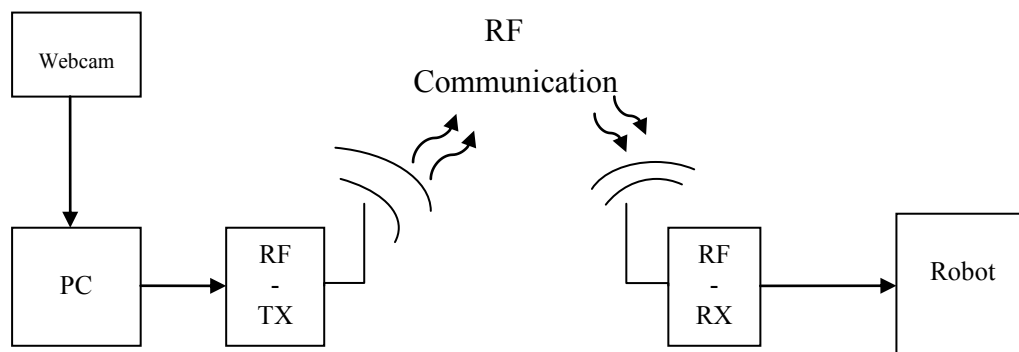
### III. METHODOLOGY AND SYSTEM ARCHITECTURE

#### 3.1. Webcam

It will capture the continuous images and give the continuous feedback to the PC. Different types of webcam are available in the market. This webcam can easily interface with PC. Using USB we can interface the web cam. Once interface is done then capturing the multiple images at every time is easy.

#### 3.2. PC (Personal Computer)

It will collect the images which is taken from webcam and give command to robot through GUI (Graphical user interface).The PC send data through serial communication to the RF transmitter. USB to serial connector are used for this communication



*Figure 6. Block diagram of proposed System*

#### 3.3. RF Communication

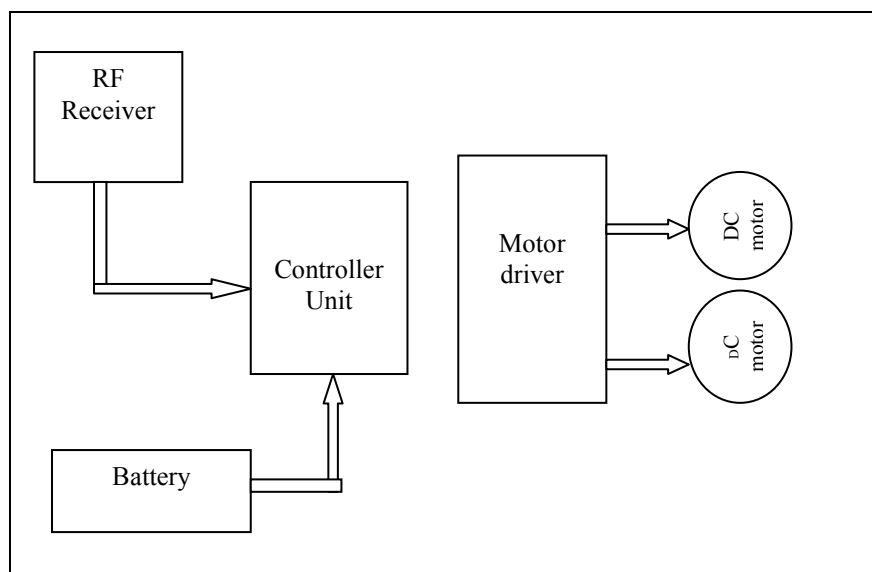
RF communication [5] consist of a transmitter and receiver module. A transmitter creates electromagnetic waves in a particular frequency (i.e.433 MHz) and receiver captures this signal. A controller can decode this signal and use it to control other peripherals i.e. Robot.

#### 3.4. Robot

The Robot is operating on the user command which is receive by RF receiver. The robot is totally control by user command using wireless communication.

### 3.4.1. Receiver System (Robot)

At the receiver module RF communication channel used for receiving controlling signal from control module which control the robot.



*Figure 7. Receiver section Robot*

## 3.5. Radio Frequency channel

### 3.5.1. Transmitter Circuit:

The USB to serial connector are connected to the RF transmitter. The button transmitted data through 433 MHz transmitter module.

### 3.5.2. Receiver Circuit Operation:

RF433-Rx is 433 MHz radio[3] receiver which receives the transmitted data from the remote place PC through GUI .The transmitted data are converted to digital format and output is available at microcontroller, this is the Rx pin of inbuilt UART of the microcontroller operate and DC motor will drive. Robot will performs the following operations:

Press Button Forward –Forward Direction.

Press Button Backward –Backward Direction.

Press Button Left – Left Direction.

Press Button Right –Right Direction.

#### **IV. EXPERIMENTAL RESULTS**

The experimentation is carried out with the help of MATLAB software using GUI, real time images ,robotic operations. Once we get the centroid of the robot then pressing the buttons forward , backward, right and left robot reached to the destination point



**Figure 8.. Robot reached at destination point**

#### **IV.CONCLUSION**

In this paper, image subtraction method and centroid detection method is used to find out robot position in image and exact center point of the robot. This methodology of object position finding can be used for one moving object tracking at any background.

In future we want to track the robot up to destination point. The destination point is given in co-ordinate form.

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