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OPENCV BASED VIRTUAL TOUCH SCREEN FOR ROBOTIC NAVIGATION

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***Abstract*— Touch-screens have emerged as a very popular technology. The major advantage of virtual touch screens is its low cost as compared to its counterparts and their up gradation also involves minimal changes to hardware. In areas where there is no necessity of slim touch-screens, image processing touch screens are of a great asset. This paper presents very new and innovative method of robotic Navigation. In this paper we attempt to address the various problems, by focusing on achieving a high level of Accuracy at low costs, utilizing GUI techniques, all the while keeping the process simple and fast.**

By using web camera at PC side we have controlled robot and the communication range is also increased as the very new technology i.e. Zigbee have been introduced here.

Keywords— Webcam controlled robot, ZigBee wireless communication

I. INTRODUCTION

Touch-screen technology has soon passed out of its infancy and is now becoming a choice interactive mechanism for all devices, especially mobile phones. The reason for its popularity is not only its ease of use, but also the wide scope of functionalities it offers, including writing-to-text, multi-touch, and most importantly, providing a virtual interface between the device and the user which makes the user feel that he/she is interacting directly with the device rather than interacting through an intermediate device (such as mouse, keyboard etc).

Virtual Touch Screen i.e. without using any type of Touch Screen Device thus any surface will act as a Touch Screen like desk of table.

The proposed system will use a web camera connected with the PC user has to just move fingers on the surface (within the visibility range of the web camera) and the PC side software will interpret the movements as various navigational commands viz. forward, backward, right, left and stop. These commands will be then transferred to the robot using radio link.

The following are some existing methods of Robotic Navigation.

II. BACKGROUND OVERVIEW

A. *Existing System*

- PC Based Wired Robotic Navigation,
- PC Based Wireless Robotic Navigation,
- SMS Based Robotic Navigation,
- Bluetooth Based Wireless Robotic Navigation,
- RF Based Remote Controlled Robotic Navigation

B. *Drawbacks of Existing System*

In all the above mentioned system there is no visual intelligence in the robot which can help it for understanding the gesture based commands given by human being.

C. *Proposed System*

This paper consists of a robot that can directly understand the navigation or any other commands given by moving the fingers in front of its vision. To demonstrate this we have taken small initiative by developing a prototype.

In this system there will be a web camera connected to the PC. And the view range of the camera on the desk will act as a touch screen. When the user will move his finger in any direction on the said Touch Screen, the Robot will also take a movement in the same direction. Say for example if the user moves his finger in forward direction then the wireless robot at a far place will also move forward. And so on for the rest.

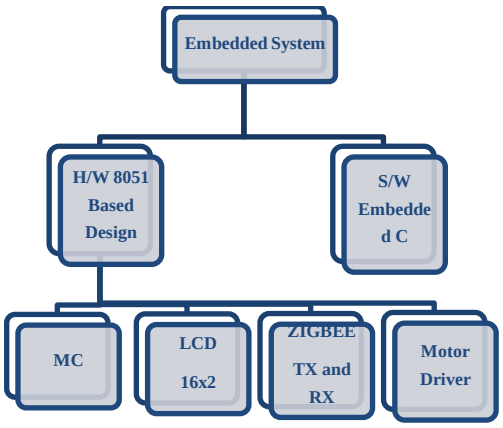
III. THE PROPOSED SYSTEM

A. *System Overview*

The above proposed system will be divided into the following sub modules or sections.

B. *Robot Architecture Design*

In the design of robot body, it aims to allow the robot to move around all positions.



The movements of the robot is shown in Fig. 2, the arrow inside the indicates the moving direction;

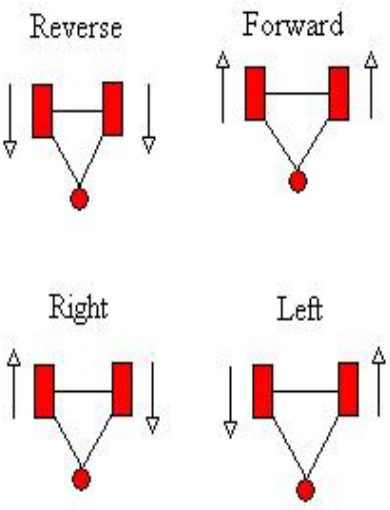
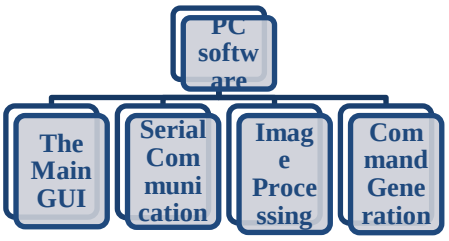


Fig 1. Movement of the Robot



C. *Pc side serial communication integration*

The CP2102 is a highly-integrated USB-to-UART Bridge Controller providing a simple solution for updating RS-232 designs to USB using a minimum of components and PCB space. The CP2102 includes a USB 2.0 full-speed function controller, USB transceiver, oscillator, EEPROM, and asynchronous serialdata bus (UART).

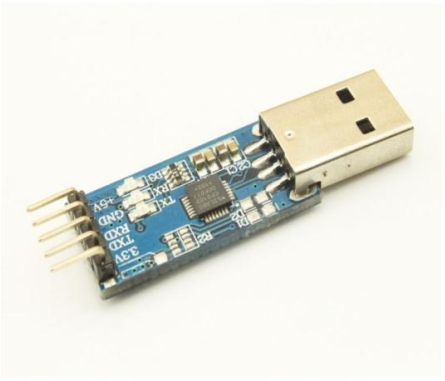


Fig 2. CP2102 USB

D. *Features*

The Following are the prominent features of the above discussed system.

- Zigbee Wireless Link at 1200 bps,
- Up to 100 m. range
- Visual studio based GUI,
- Finger movement based ROBOT controlling.

TABLE 1
WIRELESS TECHNOLOGY COMPARISON

	Bluetooth	ZigBee	WLAN
Speed	3 Mbps	20~250 kbps	54 Mbps
Price	3 US$	2 US$	5~10 US$
Power Consumption	medium	Lowest	Highest
Distance	10~100 m	30~300 m	30~70 m
frequency range	2.4GHz	868 MHz 915 MHz 2.4 GHz	2.4/5 GHz
IEEE Standard	802.15.1	802.15.4	802.11

E. *Technology & Programming Languages*

As microcontrollers are the core of these days digital circuit design in industry, this system uses it for the centralized operation and digital processing. The technology used here is embedded technology which is the future of today's modern electronics.

The followings are the various Programming Languages & Technologies that are going to be used in the proposed system.

1) *For Embedded System:*

- Embedded Technology
- 8051 Family Based Controller
- Embedded C - Keil Compiler and universal programmer
- Eagle Software for PCB Designing

2) *For PC System*

- Visual Studio 2010 ultimate
- Serial Communication Protocol

IV. SCOPE & APPLICATIONS

Only the imagination can limit the applications of the above proposed system

Though the following are some examples.

- Robotic vision development,
- Exploration robots,
- Can be used for spy robot,
- Fire fighting robot,
- Various military applications
- Gaming….etc

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