

Data Acquisition & Intelligent Robot Motion Control System for Industrial Monitoring Using Image Processing

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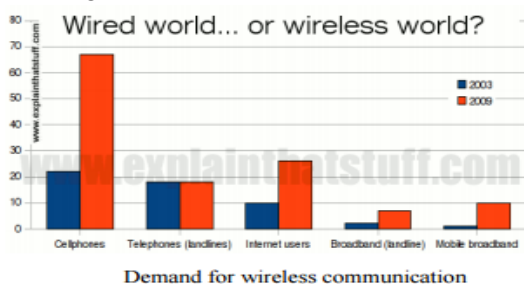
Abstract

With the advancement in science and technology, there has been an exponential increase in the demand in the field of wireless communication. The drawback of wired communication is high cost of materials which can be overcome by wireless communication. In this paper an idea of communication between PC and ARM7 board is presented. A high performance application is developed and integrated with the robot.



Introduction

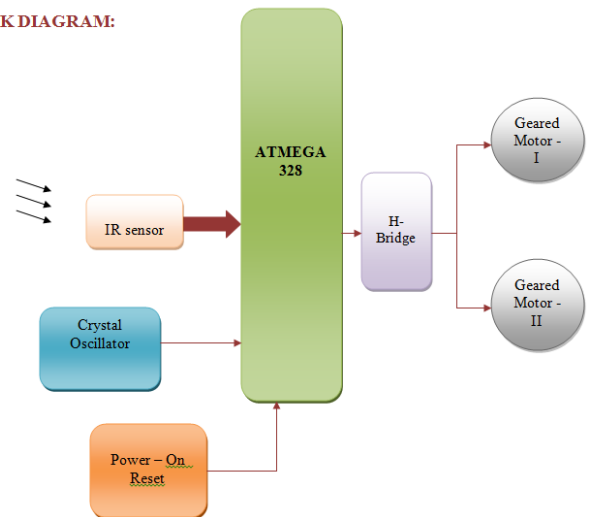
The demand for the wireless communication is increasing exponentially with the time. The figure depicts the usage of different means of communications where telephones and wired broadband are wired type of communication and the rest are wireless. Examining the figure will give a picture of how the demand in different wireless communications has been increased within a short span i.e. in 6 years which indirectly supports the above said advantage in abstract.



Existing system

Autonomous Guided Vehicle is new and innovative concept. These vehicles are used for multi purpose. This robot works with IR transmission – reception principle. This vehicle can be moved using geared motors without anybody’s control. Also this robot can take sharp turnings whenever an obstacle is detected. This project uses ATMEGA328 MCU as its controller. This project has an IR transmitter and a receiver. Whenever an obstacle is detected, the IR light will be reflected, and received by the IR receiver. This sends a signal to microcontroller and the direction of the robot will be changed to avoid collision with the obstacle.

BLOCK DIAGRAM:



Drawback- This robot does not recognize signs given. It takes own decision about the movement.

Proposed system

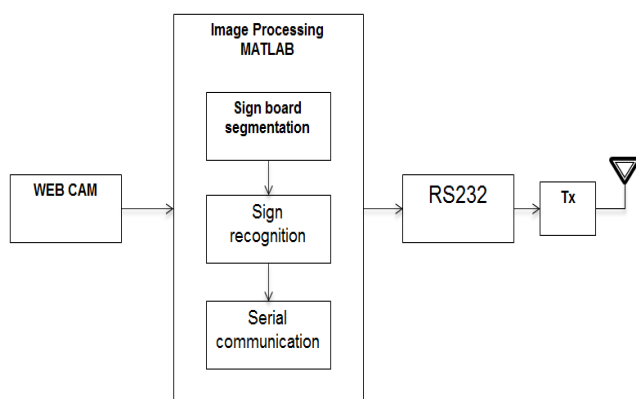
The purpose of this project is to design an intelligent wheel robot, which can recognize and follow a predefined forward sign while automatically bypassing any encountered obstacle. By distributing those

forward signs, the path of the robot is determined. With this concept, an image based auto pilot system with immunity against electromagnetic interference is constructed. The rotation of the robot for automatic target detecting is achieved by using image processing. The experimental results showed that the robot could successfully detect forward sign and response properly. Simply redistributing the recognizable signs by the robot, a new path for robot is constructed. The robot will take different signs like left, right, forward, back ward & stop according to an image. Therefore, it has great flexibility for applications.

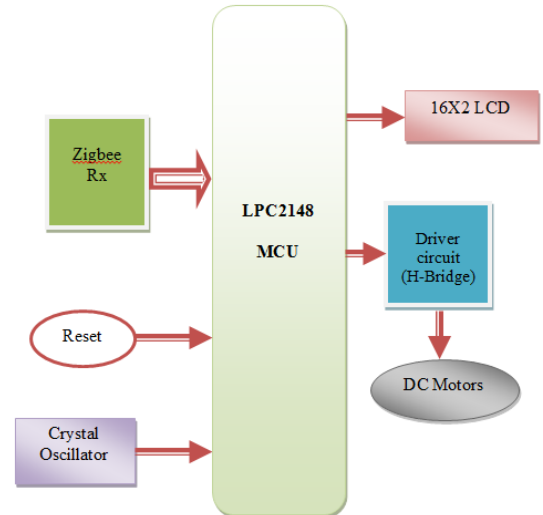
The control system of the robot is integrated with programs of computer vision motion control. The image process program compares with the webcam image inputs with the forward signs features from training program to detect the forward sign. Once a forward sign is detected by image processing program image motion control program will rotate the robot to aim the forward sign and then move towards it. Similarly for remaining signs also the image process program compares with the webcam inputs and the controller will move the robot in different directions (like left, right, backward, stop) based on image.

Data acquisition is the basic property of the weather monitoring /logging systems, as the name implies, are used to collect information from some sensors to document or analyze the phenomenon of our climate.

Transmitter



Receiver

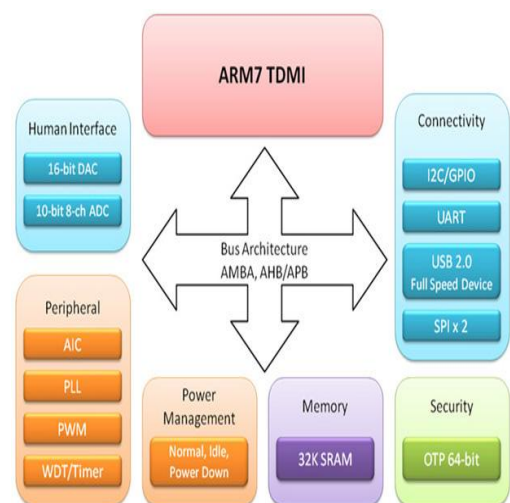


Recognition methods in image processing

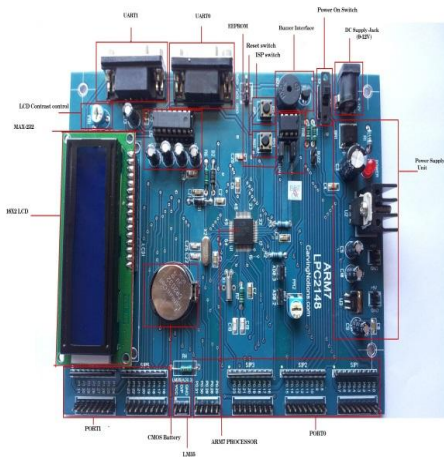
Image recognition is the process of identifying and detecting an object or a feature in a digital image or video. This concept is used in many applications like systems for factory automation, toll booth monitoring, and security surveillance. Typical image recognition algorithms include:

- Optical character recognition
- Pattern and gradient matching
- Face recognition
- License plate matching
- Scene change detection

ARM7TDMI Processor Core

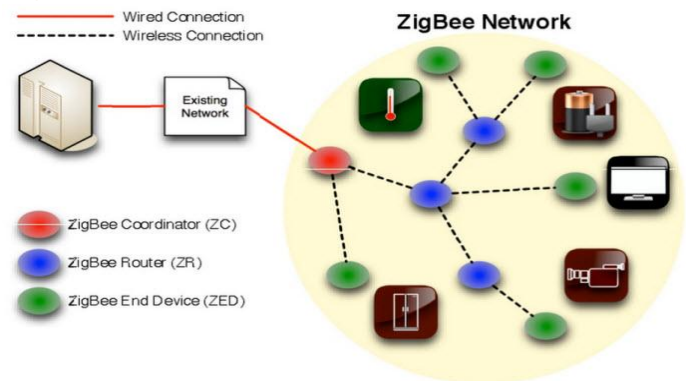


- Current low-end ARM core for applications like digital mobile phones
- TDMI
 - T: Thumb, 16-bit compressed instruction set
 - D: on-chip Debug support, enabling the processor to halt in response to a debug request
 - M: enhanced Multiplier, yield a full 64-bit result, high performance
 - I: Embedded ICE hardware
- Von Neumann architecture



strength of the external magnetic field. As you are well aware of from playing with magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal configuration of a DC motor is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion.

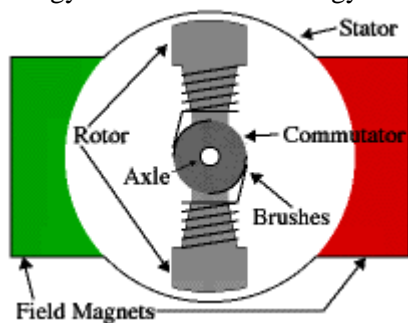
Zigbee



It is the wireless device for transmitting and receiving purpose or simply it called as Transceiver. Zigbee is based on the IEEE802.15.4 protocol. The range of the Zigbee is covered as 100m. Its range is 10 times better than bluetooth device so it can be more preferable one in wireless device. The data rate is very low for transmission while using this device.

DC motor

An electric motor is a machine which converts electrical energy into mechanical energy.



Principles of operation

In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the



Zigbee is a PAN technology based on the IEEE 802.15.4 standard.

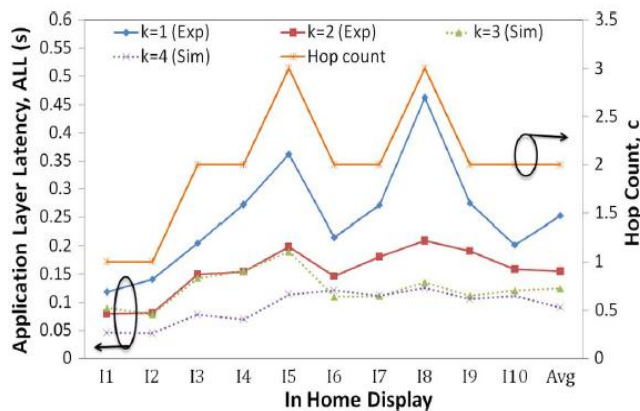
Unlike Bluetooth or wireless USB devices, ZigBee devices have the ability to form a mesh network between nodes. Meshing is a type of daisy chaining from one device to another. This technique allows the short range of an individual node to be expanded and multiplied, covering a much larger area.

Technical Specifications of Zigbee

- Frequency band 2.400 — 2.483 GHz
- Number of channels 16
- Data rate 250 kbps
- Supply voltage 1.8 – 3.6 V
- Flash memory 128 kB
- RAM 8 kB
- EEPROM 4 kB
- Operating Temperature -40 — +85 °C

PERFORMANCE EVALUATION

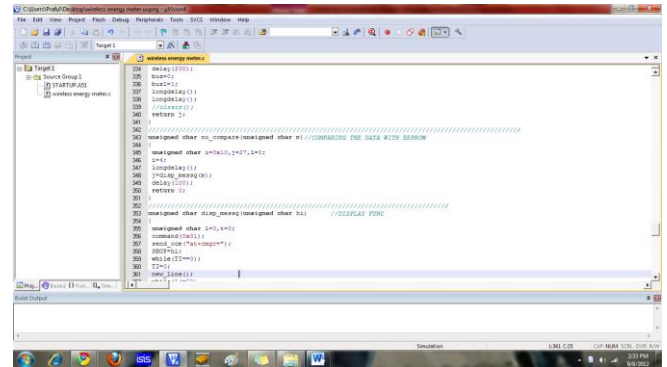
The performance evaluation is divided into two parts: ZigBee mesh floor (horizontal communication) network and BN (vertical communication).



ALL and c of $I_1 - I_{10}$ for $k = 1-4$ and $n = 1$.

Software tools

Keil compiler is a software used where the machine language code is written and compiled. After compilation, the machine source code is converted into hex code which is to be dumped into the microcontroller for further processing. Keil compiler also supports C language code.

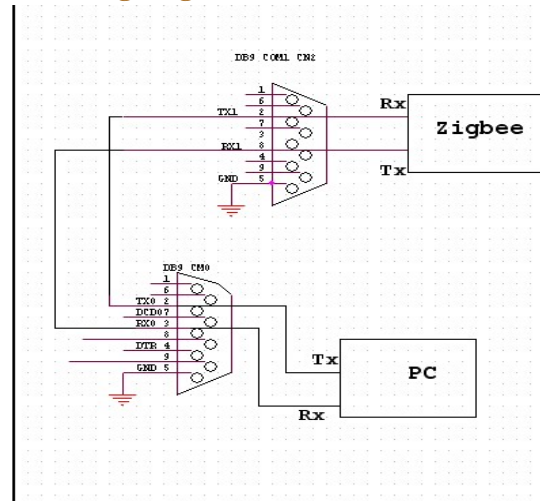


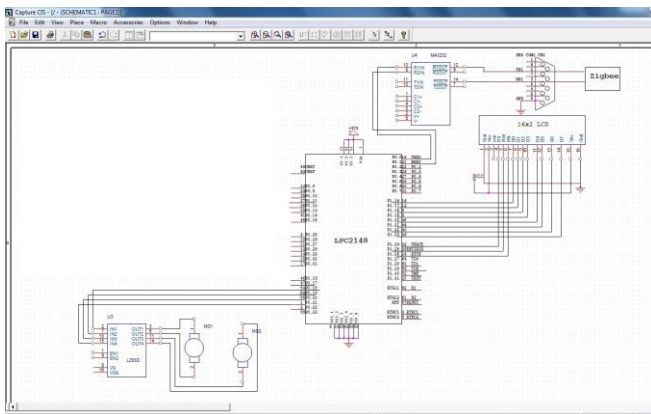
Flash Magic

Flash Magic is a tool which is used to program hex code in EEPROM of micro-controller. It is a freeware tool. It only supports the micro-controller of Philips and NXP. It can burn a hex code into that controller which supports ISP (in system programming) feature. Flash magic supports several chips like ARM Cortex M0, M3, M4, ARM7 and 8051.



Interfacing diagram





[7]Bradley Mitchell, Bluetooth, accessed on January 15, 2010

[8] Bruno siciliano et al, Robotics Modeling, planning and control, August 2008.

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Applications

- Industrial applications such manufacturing, chemical etc.,

Advantages

- Reliable
- Economical
- Eco-Friendly
- Low cost

Conclusion

In this experiment we have integrated a high performance application with robotics and utilized the Zigbee technology as a fast, secure and reliable connection between them. By this project it is found that it is possible to control any hardware via the same hierarchy that is mentioned.

References

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