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Traffic Sign Recognition for Advanced Driver Assistance using Digital Image Processing

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ABSTRACT

Automatic road-signs recognition is becoming a part of advanced river assistance systems which role is to increase safety and driving comfort. The purpose of this paper 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 robot will take different signs like left, right, forward, back ward & stop according to an image. If the speed sign is detected the robot moves accordingly. 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 toward 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. When an obstacle is detected by the IR sensors, image motion control program will launch a bypass process that means automatically the robot will take either left or right. The robot is driven with the processor ARM7, where all the instructions are given through c coding and emulating in the processor. Zigbee is used as wireless communication device for the robot to act for the instructions given.

Introduction

Many a times the warning sign on the road sides becomes difficult to watch for the drivers and the driver may sometimes miss the warning notes. These warning notes may be speed breaker ahead or narrow bridge or even accident zone etc. This becomes tedious during many times and at nights. Sometimes because of the traffic or the road condition driver may not read anything and even if he tries to read it with a wide eye there is a chance for the drive to lose concentration on the road.

Existing method

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In the existing method only human eye will recognize the traffic sign. Detection of road signs is based on shape detection, which is more robust to changes in illumination conditions as it detects shapes based on edges or boundary. Several approaches for shape-based detection of road signs are recurrent in literature. Probably the most Common approach is the use of the Hough transform. This method has been applied in RSR by Kehtarnavaz to identify stop signs. This technique, however, is not suitable for a real-time implementation due to being computationally expensive and memory demanding. There is a new technique similar to Hough transform called fast radial transform for detecting triangular, square and octagonal road signs efficiently and robustly.

Proposed method

Microcontroller based hardware is placed inside the vehicle. The microcontroller at all times receives the information and displays the information using the dedicated LCD display. Further the same is used to announce to the driver about the hurdles such as speed breakers. This voice alerting system helps the drivers to concentrate on the road without even worrying about the sign boards near the road. The sign detection is one by using Hough transform. The sign recognition is done using image processing tools on a MATLB. The result of the recognition can be used for the application. Thus the project can be highly helpful to drivers.

As this project uses image processing no additional components are necessary to be placed on the sign boards and the existing sign boards can be kept as it is. Only the vehicle need to be fitted with this system but this can be left to the vehicle manufacturers and owners and they can use it as an extra feature for safety and to prevent accidents.

Image acquisition tool box:

Acquiring Image Data Image Acquisition Toolbox supports several modes, including background acquisition and continuous acquisition, while processing the acquired data. The toolbox automatically buffers data into memory, handles memory and buffer management, and enables acquisition from an ROI. The image acquisition engine is designed to acquire imagery as fast as your camera and computer can support, enabling analysis and processing of high-speed imaging applications. Data can be acquired in a wide range of data types, including signed or unsigned 8-, 16-, and 32-bit integers and single- or double-precision floating point. The toolbox supports any color space provided by the image acquisition device including RGB, YUV, or grayscale. Raw sensor data in a Bayer pattern can be automatically converted into RGB data.

IMAGE ACQUISITION

Traffic sign Recognition

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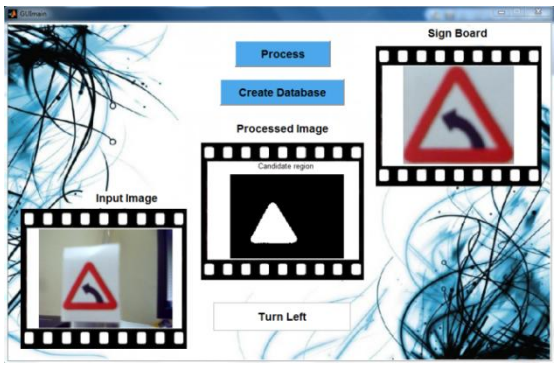
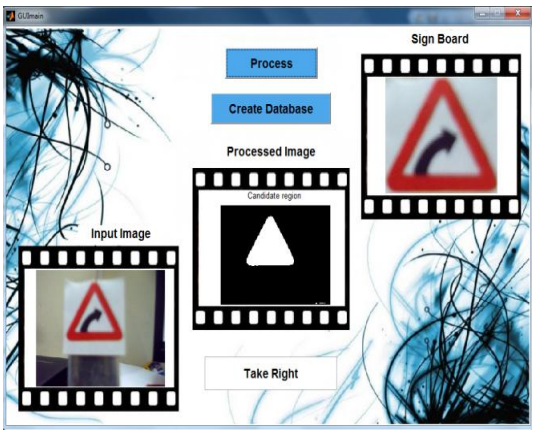
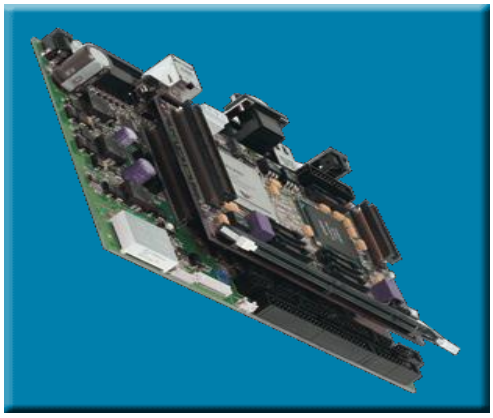


At the present time, many studies are being conducted working toward the implementation of an Intelligent Traffic System (ITS). One field of this research is driving support systems, and many studies are being conducted to develop systems which identify and recognize road signs in front of the vehicle, and then use this information to notify the driver or to control the vehicle. Development of a system which can provide road information to the driver at any time is already underway. This system uses wireless communication with special narrowband signal transmitters installed on the roadside, a technology which has already been commercialized with ETC. With the construction of this type of infrastructure, it is believed that there will be a change in the method of providing road sign information from the current method of providing visual information. However, much time will be required before this infrastructure covers all roads in local areas, and it is likely that as long as vehicles are driven by human drivers, road signs will never disappear as a means of providing traffic information.



ARM PROCESSOR

The LPC2148 are based on a 16/32 bit ARM7TDMI-S™ CPU with real-time emulation and embedded trace support, together with 128/512 kilobytes of embedded high speed flash memory. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at maximum clock rate.



ARM7TDMI Processor Core

For critical code size applications, the alternative 16-bit Thumb Mode reduces code by more than 30% with minimal performance penalty. With their compact 64 pin package, low power consumption, various 32-bit timers, 4- channel 10-bit ADC, USB The LPC2148 are based on a 16/32 bit ARM7TDMI-S™ CPU with real-time emulation and embedded trace support, together with 128/512 kilobytes of embedded high speed flash memory. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at maximum clock rate. For critical code size

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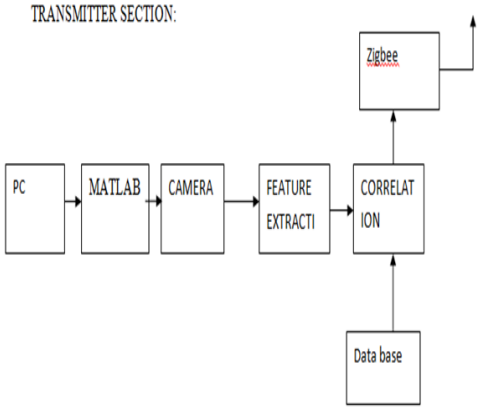
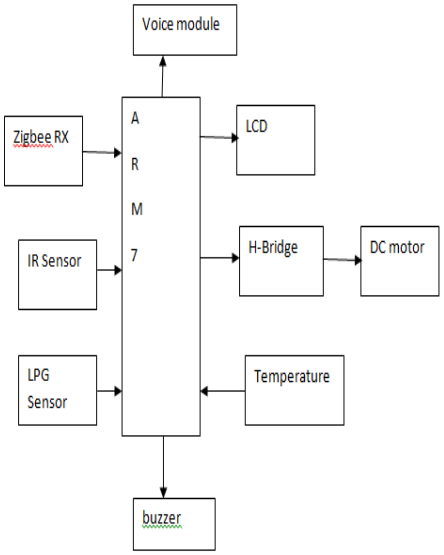
applications, the alternative 16-bit Thumb Mode reduces code by more than 30% with minimal performance penalty. With their compact 64 pin package, low power consumption, various 32-bit timers, 4- channel 10-bit ADC, USB PORT,PWM channels and 46 GPIO lines with up to 9 external interrupt pins these microcontrollers are particularly suitable for industrial control, medical systems, access control and point-of-sale. With a wide range of serial communications interfaces, they are also very well suited for communication gateways, protocol converters and embedded soft modems as well as many other general-purpose applications.

BLOCK DIAGRAM

TRANSMITTER SECTION:

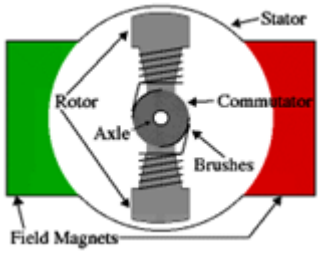


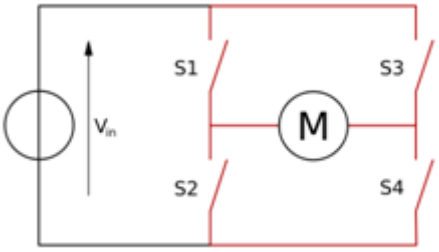
RECEIVER SECTION



DC MOTOR

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





ZIGBEE TECHNOLOGY

ZigBee module. The €1 coin, shown for size reference, is about 23 mm (0.9 inch) in diameter. ZigBee is a specification for a suite of high level communication

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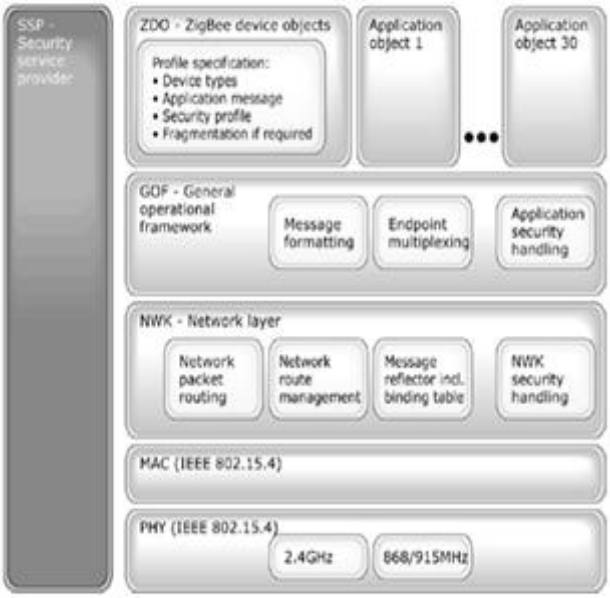
protocols using small, low-power digital radios based on the IEEE 802.15.4-2003standard for wireless personal area networks (WPANs), such as wireless headphones connecting with cell phones via short-range radio. The technology defined by the ZigBee specification is intended to be simpler and less expensive than other WPANs, such as Bluetooth. ZigBee is targeted at radio-frequency (RF) applications that require a low data rate, long battery life, and secure networking. The ZigBee Alliance is a group of companies that maintain and publish the ZigBee standard.

ARCHITECTURE:



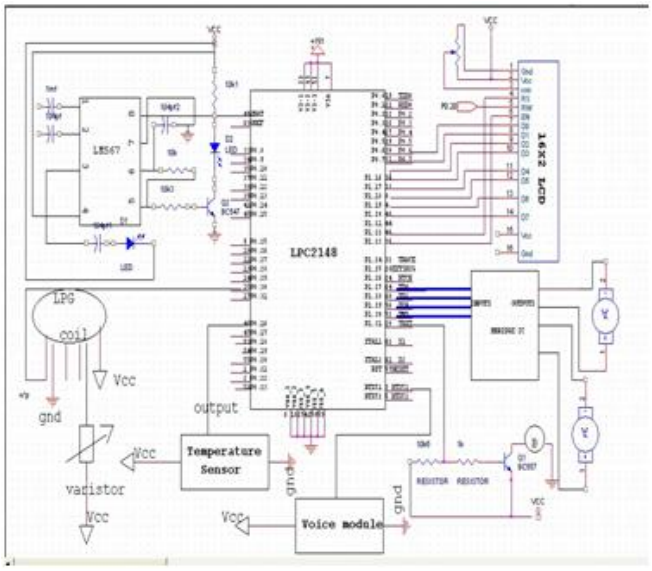
Applications of Zigbee

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

Interfacing diagram



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Advantages:

- Low cost implementation
- Efficient
- Human effort is reduced

Applications

- Buses
- Cars

Conclusion

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 toward 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. In this way efficient control is implemented.

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