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Matlab Based Traffic Sign Reconition for Autonomous Driving Robot

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Abstract:
This project aims at developing a solution for this problem using image processing technique. By placing a camera in front of the vehicle, it can pick road signs and give it to a system that processes the image. The image is de-noised and edge detection and shape parameters are used to identify the nature of the signs displayed. The MATLAB program identifies the signs and informs about the signs to the hardware below.

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:

In the existing method only human eye will recognize the traffic sign.

Drawback:
Autonomous vehicle is not possible in the above system

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 toward it.

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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 BCM2836, 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.

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.

Traffic sign Recognition:

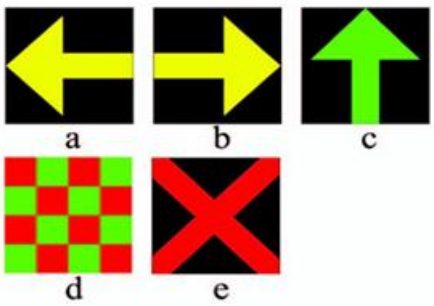
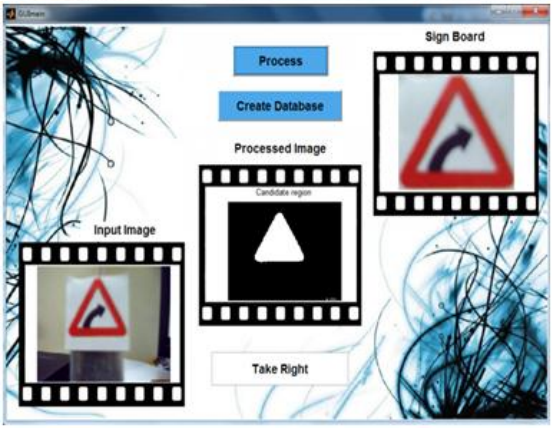


Fig. 2. Traffic lights, a) turn left, b) parking, c) follow straight ahead, d) end of trial, and e) STOP.

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.



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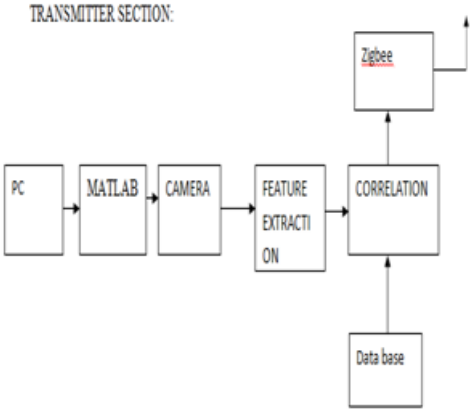
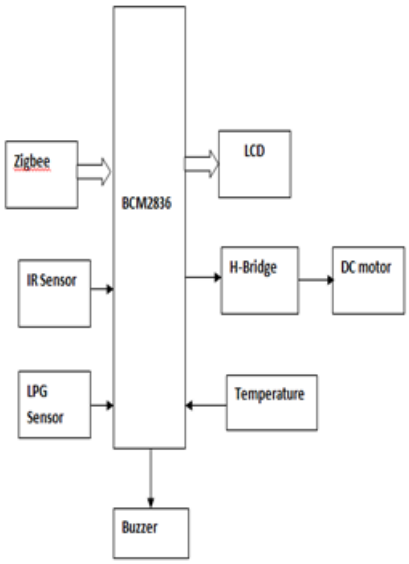
BLOCK DIAGRAM

TRANSMITTER SECTION:



RECEIVER SECTION



RASPBERRY-PI:

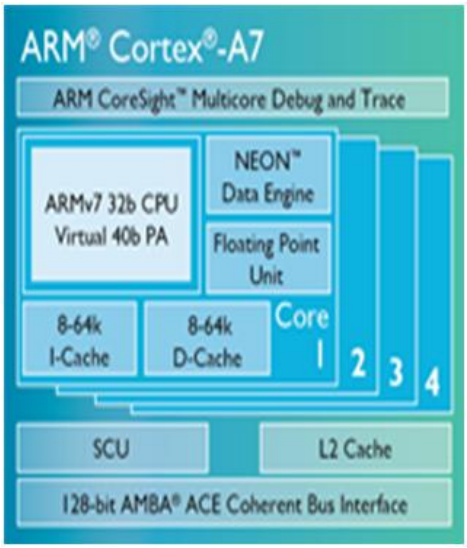
The Raspberry Pi has a Broadcom BCM2836 system on a chip (SoC), which includes an a quad-core Cortex-A7 cluster. The Cortex-A7 MPCore processor is a high-performance, low-power processor that implements the ARMv7-A architecture. The Cortex-A7 MPCore processor has one to four processors in a single multiprocessor device with a L1 cache subsystem, an optional integrated GIC, and an optional L2 cache controller.

Pin diagram

NAME		NAME
3.3v DC Power		DC Power 5v
GPIO02 (SDA1 , I2C)		DC Power 5v
GPIO03 (SCL1 , I2C)		Ground
GPIO04 (GPIO_GCLK)		(TXD0) GPIO14
Ground		(RXD0) GPIO15
GPIO17 (GPIO_GEN0)		(GPIO_GEN1) GPIO18
GPIO27 (GPIO_GEN2)		Ground
GPIO22 (GPIO_GEN3)		(GPIO_GEN4) GPIO23
3.3v DC Power		(GPIO_GEN5) GPIO24
GPIO10 (SPI_MOSI)		Ground
GPIO09 (SPI_MISO)		(GPIO_GEN6) GPIO25
GPIO11 (SPI_CLK)		(SPI_CE0_N) GPIO08
Ground		(SPI_CE1_N) GPIO07
ID_SD (I2C ID EEPROM)		(I2C ID EEPROM) ID_SC
GPIO05		Ground
GPIO06		GPIO12
GPIO13		Ground
GPIO19		GPIO16
GPIO26		GPIO20
Ground		GPIO21

SD card inserted here

Cortex-A7 Processor



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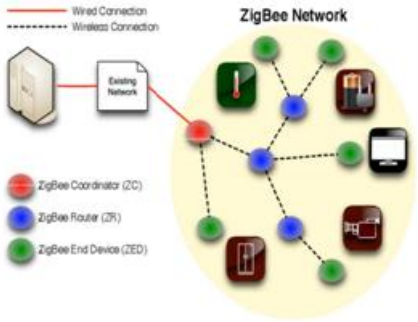
Recognition Methods in Image Processing:

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

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. It 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.

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 band2.400 — 2.483 GHz
- Number of channels16
- Data rate250 kbps
- Supply voltage1.8 – 3.6 V
- Flash memory128 kB
- RAM8 kB
- EEPROM4 kBOperating
- Temperature-40 — +85 °C

Advantages:

Low cost implementation
Efficient
Human effort is reduced

Applications:

Trains
Buses
Cars

References:

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Dr. D Subba Rao

Is a proficient Ph.D person in the research area of Image Processing from Vel-Tech University, Chennai along with initial degrees of Bachelor of Technology in Electronics and Communication Engineering (ECE) from Dr. S G I E T, Markapur and Master of Technology in Embedded Systems from SRM University, Chennai. He has 13 years of teaching experience and has published 12 Papers in International Journals, 2 Papers in National Journals and has been noted under 4 International Conferences. He has a fellowship of The Institution of Electronics and Telecommunication Engineers (IETE) along with a Life time membership of Indian Society for Technical Education (ISTE). He is currently bounded as an Associate Professor and is being chaired as Head of the Department for Electronics and Communication Engineering discipline at Siddhartha Institute of Engineering and Technology, Ibrahimpatnam, Hyderabad. Technology and Design, communication systems and Digital electronics.