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

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ABSTRACT:

In the development of 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.

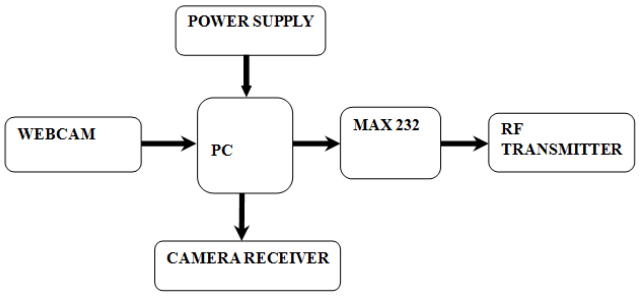
The image process program compares with the webcam image inputs with the forward signs features from training program to detect the forward sign[7]. Once a forward sign is detected by image processing program image motion control program will rotate the robot to aim the forward sign and then move toward it[5]. 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[13].

When an obstacle is detected by the ultrasonic sensors, image motion control program will launch a bypass process that means automatically the robot will take either left or right. Wireless camera will send real time video and audio signals which could be seen on a remote monitor and action can be taken accordingly.

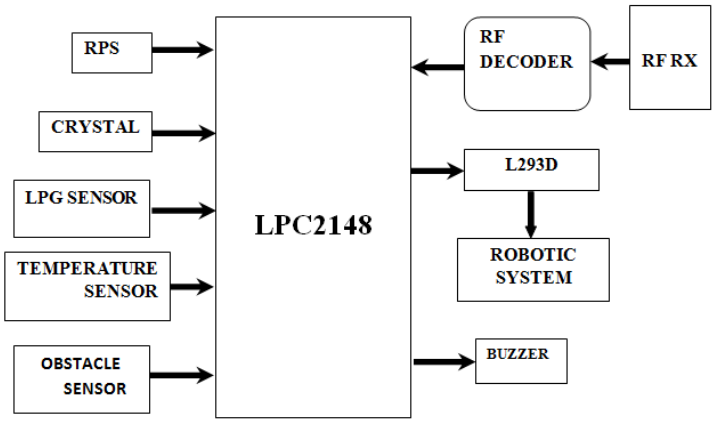
If any gas/smoke and high temperature detected by using sensors, then robot will give buzzer to indicate, otherwise the buzzer will be calm[8]. Data Acquisition is the basic property of the Weather monitoring /Logging systems, as the name implies, are used to collect information from some sensors to document or analyze the phenomenon of our climate.

BLOCK DIAGRAMS:

TRANSMITTER SECTION:



RECEIVER SECTION:



POWER SUPPLY:

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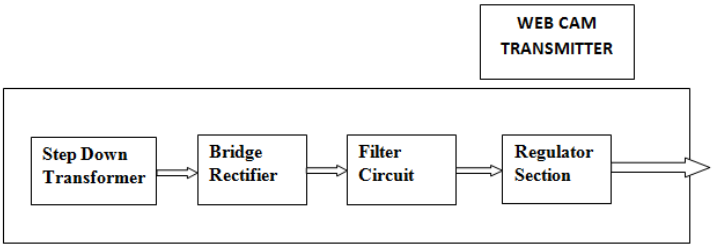


HARDWARE REQUIRMENTS:

Controller:

The ARM7TDMI-S is a general purpose 32-bit microprocessor, which offers high performance and very low power consumption. The ARM architecture is based on Reduced Instruction Set Computer (RISC) principles, and the instruction set and related decode mechanism are much simpler than those of microprogrammed Complex Instruction Set Computers (CISC).

This simplicity results in a high instruction throughput and impressive real-time interrupt response from a small and cost-effective processor core.(1) Pipeline techniques are employed so that all parts of the processing and memory systems can operate continuously. Typically, while one instruction is being executed, its successor is being decoded, and a third instruction is being fetched from memory.[10]

The ARM7TDMI-S processor also employs a unique architectural strategy known as Thumb, which makes it ideally suited to high-volume applications with memory restrictions, or applications where code density is an issue[4]. The key idea behind Thumb is that of a super-reduced instruction set. Essentially, the ARM7TDMI-S processor has two instruction sets:

- The standard 32-bit ARM set.
- A 16-bit Thumb set.

SENSORS:

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature[3]. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling.

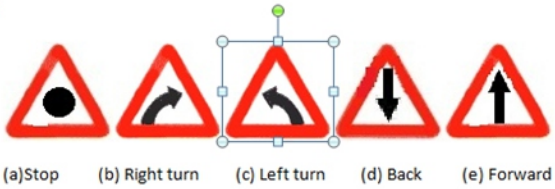
The LM35 does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full −55 to +150°C temperature range The obstacle sensor, senses any obstacle , gives the ouput as in buzzer indication. The obstacle sensor is the IR sensor, with a LED and Photo Transistor in it and a 555 Timer. It has a LOS,which strikes the signals indicated to a obstacle detection.

LPG gas sensor is a sensor which sense the Gas evolved, which protects from the harmness. The wireless camera is attached for survelliance, if any sensors are activated,or the movement of the robot is observed through it.

Traffic Signs:

Road and traffic signs, traffic lights and other traffic devices are used to regulate, warn, guide or inform road users. They help achieve an acceptable level of road traffic quality and increase safety with orderly and predictable movement of all traffic, both vehicular and pedestrians .

Example signs:



3.SOFTWARE ARCHITECTURE AND IMPLEMENTATION:

3.1.Orcad:

OrCAD is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly to create electronic prints for manufacturing of printed circuit boards, by electronic design engineers and electronic technicians to manufacture electronic schematics.

The name OrCAD is a portmanteau, reflecting the software's origins: Oregon + CAD.

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3.2.Keil Micro vision 3 IDE:

The µVision development platform is easy-to-use and it helps you quickly create embedded programs that work. The µVision IDE (Integrated Development Environment) from Keil combines project management, source code editing, program debugging, and complete simulation in one powerful environment. Code written in 'EMBEDDED C'The µVision3 IDE and Debugger is the central part of the Keil development tool chain. µVision3 offers a Build Mode and a Debug Mode.

CONCLUSION:

In this paper, an efficient approach for the detection andrecognition of road sign have been proposed, and tested onreal life video. The detection stage utilizes a robust method ofcolour segmentation by employing the YCBCR colour space.A template matching technique has been proposed for shapeclassification of all possible potential road sign. Finally, theperformance of the developed road sign recognition systemhas been evaluated extensively through various tests on reallife-video captured with a vehicle-mounted camera. Theexperimental results have shown that the proposed method isfast and accurate.

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