1.0 INTRODUCTION

1.1 PROJECT FUNCTIONALITY

The goal of this project is to control the speed of a vehicle based on its position. The project uses a GPS locator to find the position of a vehicle and relate that location to a map stored in memory on the micro-controller. This map contains information about the speed limit in each specific zone. Using the speed limit, the maximum speed of the car is restricted to equal to the speed limit.

1.2 PROJECT OVERVIEW

The design of our project consists of four major sub-systems: GPS receiver, RC vehicle, Hall sensor, and Atmega 8 micro-controller. The GPS receiver will transmit, via serial cable, the position of the RC vehicle. This position will be used to determine the current speed limit. After the speed limit is set, the micro-controller will determine the duty cycle of the output signal from the RC vehicle’s receiver. The duty cycle of this signal corresponds to the speed desired by the driver of the RC vehicle. The program compares the desired speed against the speed limit and outputs the lesser of the two to the control system portion of the program. Using interrupts, the program calculates the current speed of the vehicle. This current speed is used as feedback to the control system, which outputs a control effort to the external electronic speed controller (ESC) until the difference between the current speed and the decided speed is zero. Section 1.4 details the overall block diagram, showing the interactions of the various systems.

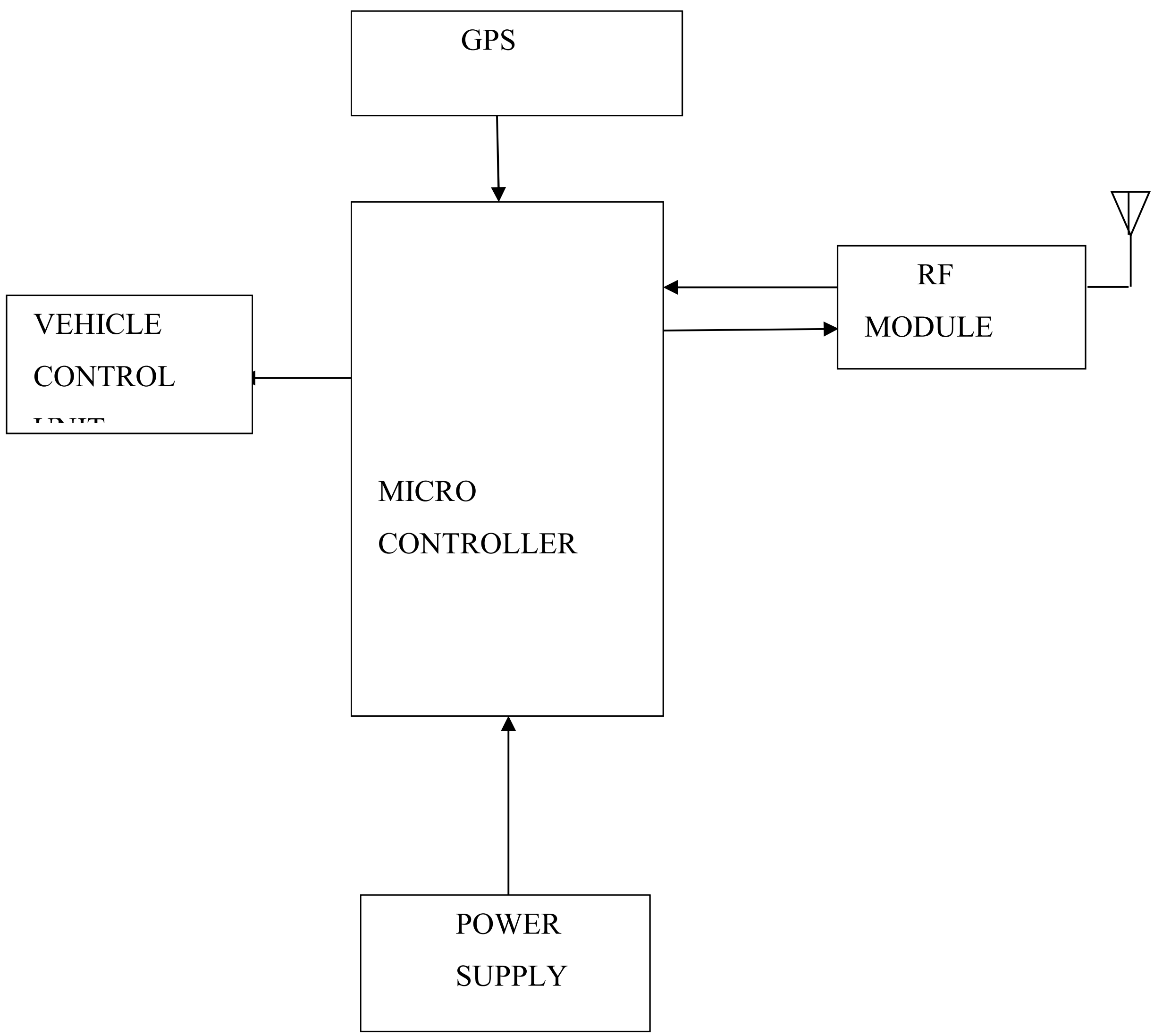
1.3 PROJECT APPLICATION

Speed is an important issue in construction zones, school zones, and general speed limit zones. It is difficult to enforce speed limit regulations since police cannot monitor every driver. Our solution to this problem is to introduce electronic control that prevents the driver from driving faster than the speed permitted. This would ease the burden placed on law enforcement officials, allowing them to attend to crimes that call for more involved attention. It would also increase the safety for drivers, police, and construction workers.

This system is used to avoid accidents and to alert the drivers to control the speed at appropriate place. Smart display and control is custom designed to fit into a vehicle dashboard, and displays information of the vehicle to be traveled in different zones and it automatically control the speed in particular zones with the help of gps and speed control unit. The system composed of two separate units: zone status unit (gps) and speed display and control unit. The wireless gps module can intimate the zone with a beep sound before 300 meters in the led display fitted at vehicle dash board. The specific zone is taken as a square using gps and that unique code is stored in the controller. While reaching the zone the speed control unit which automatically raises and lowers the speed of the car when the driver does not reduces the speed even when intimated. Using gem when an accident occurs in one place it sends message to rescue center with the accurate place of accident with help of gps.

2. ARCHITECTURE

2.1BLOCKDIAGRAM



2.2 BLOCK DIAGRAM DESCRIPSTION

GPS

The GTPA006 was used to implement GPS part of the project. This specific GPS was chosen because of ease of connectivity to the HC12 micro-controller. The GTPA006 receiver outputs data serially at the rate of 4800bps or 9600bps. It uses RS-232 protocol for serial data output, and it has resolution of 15-18 ft. Some of the data that GPS provides is time, speed, latitude and longitude. We only used latitude and longitude data because speed measurement was not adequate for a small scale RC car.

RC Vehicle

Two components of RC vehicle that were used are the receiver and the ESC. Output of the receiver is a PWM signal, and knowing this enabled us to create our own speed controller, which is applied in cases when actual speed of the RC vehicle exceeds the speed limit. The ESC acts to convert the duty cycle of a signal to pulses of current to control the speed of the RC vehicle's motor.

Atmega 8

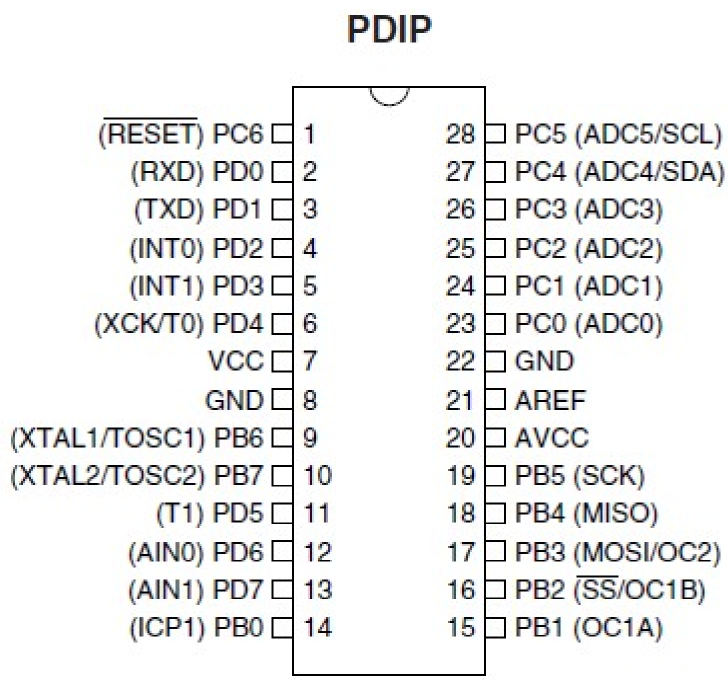
The AVR core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in one single instruction executed in one clock Cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontrollers.

The ATmega8 provides the following features: 8K bytes of In-System Programmable Flash with Read-While-Write capabilities, 512 bytes of EEPROM, 1K byte of SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible Timer/Counters with compare modes, internal and external interrupt, a serial programmable USART, a byte oriented Two-wire Serial Interface, a 6-channel ADC (eight channels in TQFP and QFN/MLF packages) with 10-bit accuracy, a programmable Watchdog Timer with Internal Oscillator, an SPI serial port, and five software selectable power saving modes. The Idle mode stops the CPU while allowing the SRAM, Timer/Counters, SPI port, and interrupt system to continue functioning. The Power down mode saves the register contents but freezes the Oscillator, disabling all other chip functions until the next Interrupt or Hardware Reset. In Power-save mode, the asynchronous timer continues to run, allowing the user to maintain a timer base while the rest of the device is sleeping. The ADC Noise Reduction mode stops the CPU and all I/O modules except asynchronous timer and ADC, to minimize switching noise during ADC conversions. In Standby mode, the crystal/resonator Oscillator is running while the rest of the device is sleeping. This allows very fast start-up combined with low-power consumption.

The device is manufactured using Atmel's high density non-volatile memory technology. The Flash Program memory can be reprogrammed In-System through an SPI serial interface, by a conventional non-volatile memory programmer, or by an On-chip boot program running on the AVR core. The boot program can use any interface to download the application program in the Application Flash memory. Software in the Boot Flash Section will continue to run while the Application Flash Section is updated, providing true Read-While-Write operation. By combining an 8-bit RISC CPU with In-System Self-Programmable Flash on a monolithic chip, the Atmel ATmega8 is a powerful microcontroller that provides a highly-flexible and cost-effective solution too many embedded control applications.

The ATmega8 AVR is supported with a full suite of program and system development tools, including C compilers, macro assemblers, program debugger/simulators, In-Circuit

Emulators, and evaluation



kits.

• High-performance, Low-power AVR® 8-bit Microcontroller

• Advanced RISC Architecture

– 130 Powerful Instructions – Most Single-clock Cycle Execution

– 32 x 8 General Purpose Working Registers

– Fully Static Operation

– Up to 16 MIPS Throughput at 16 MHz

– On-chip 2-cycle Multiplier

• High Endurance Non-volatile Memory segments

– 8K Bytes of In-System Self-programmable Flash program memory

– 512 Bytes EEPROM

– 1K Byte Internal SRAM

– Write/Erase Cycles: 10,000 Flash/100,000 EEPROM (1)(3)

– Data retention: 20 years at 85°C/100 years at 25°C (2)(3)

– Optional Boot Code Section with Independent Lock Bits

In-System Programming by On-chip Boot Program

True Read-While-Write Operation

– Programming Lock for Software Security

• Peripheral Features

– Two 8-bit Timer/Counters with Separate Presale, one Compare Mode

– One 16-bit Timer/Counter with Separate Presale, Compare Mode, and Capture Mode

– Real Time Counter with Separate Oscillator

– Three PWM Channels

– 8-channel ADC in TQFP and QFN/MLF package

Eight Channels 10-bit Accuracy

– 6-channel ADC in PDIP package

Six Channels 10-bit Accuracy

– Byte-oriented Two-wire Serial Interface

– Programmable Serial USART

– Master/Slave SPI Serial Interface

– Programmable Watchdog Timer with Separate On-chip Oscillator

– On-chip Analog Comparator

• Special Microcontroller Features

– Power-on Reset and Programmable Brown-out Detection

– Internal Calibrated RC Oscillator

– External and Internal Interrupt Sources

– Five Sleep Modes: Idle, ADC Noise Reduction, Power-save, Power-down, and Standby

• I/O and Packages

– 23 Programmable I/O Lines

– 28-lead PDIP, 32-lead TQFP, and 32-pad QFN/MLF

• Operating Voltages

– 2.7 - 5.5V (ATmega8L)

– 4.5 - 5.5V (ATmega8)

• Speed Grades

– 0 - 8 MHz (ATmega8L)

– 0 - 16 MHz (ATmega8)

• Power Consumption at 4 MHz, 3V, 25°C

– Active: 3.6 mA

– Idle Mode: 1.0 mA

– Power-down Mode: 0.5 a

HT **12 D**

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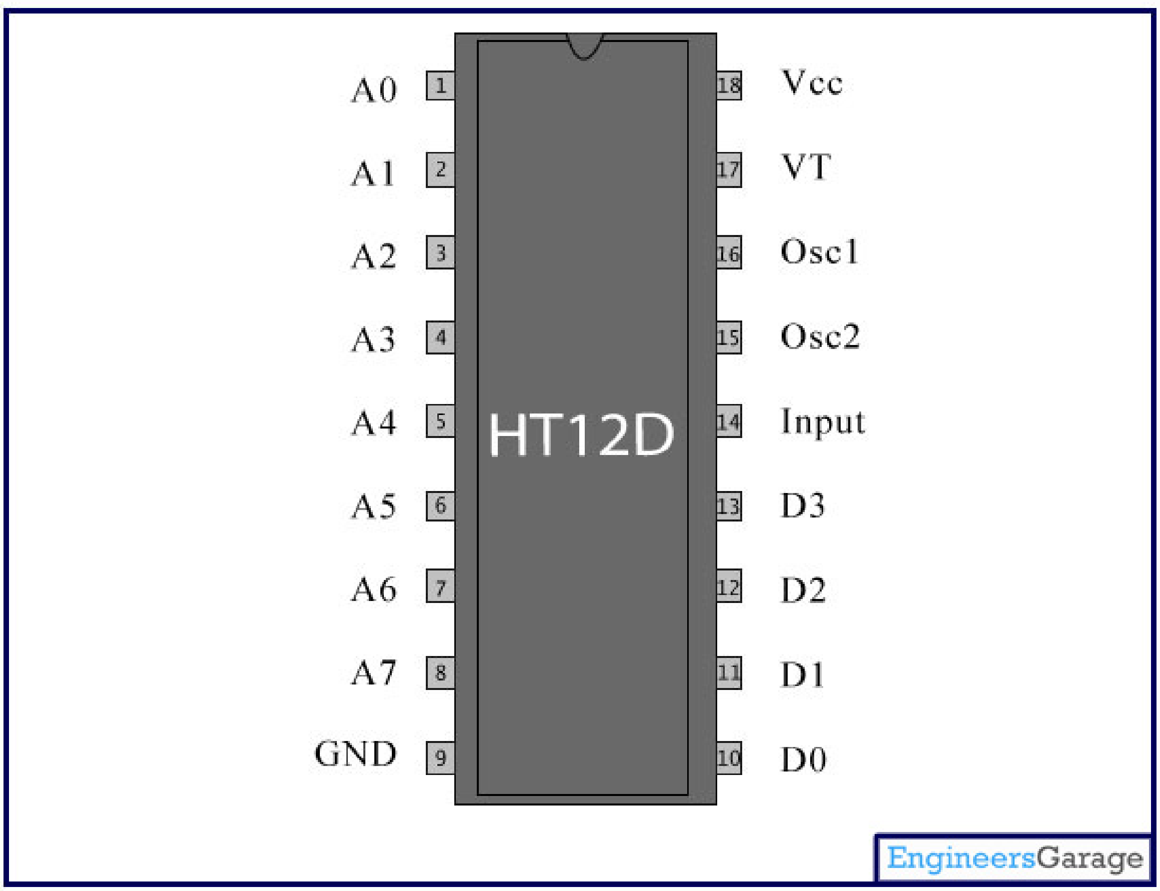


General Description

The 212 decoders are a series of CMOS LSIs for remote control system applications. They are paired with Holtek_s 212 series of encoders (refer to the encoder/decoder cross reference table). For proper operation, a pair of encoder/decoder with the same number of addresses and data format should be chosen. The decoders receive serial addresses and data from a programmed 212 series of encoders that are transmitted by a carrier using an RF or an IR transmission medium. They compare the serial input data three times continuously with their local addresses. If no error or unmatched codes are found, the input data codes are decoded and then transferred to the output pins. The VT pin also goes high to indicate a valid transmission. The 212 series of decoders are capable of decoding information's that consist of N bits of address and 12_N bits of data. Of this series, the HT12D is arranged to provide 8 address bits and 4 data bits, and HT12F is used to decode 12 bit of address information.

Features

_ Operating voltage: 2.4V~12V

_ Low power and high noise immunity CMOS technology

_ Low standby current

_ Capable of decoding 12 bits of information

_ Pair with Whole s 212series of encoders

_ Binary address setting

_ Received codes are checked 3 times

_ Address/Data number combination

_ HT12D: 8 address bits and 4 data bits

_ HT12F: 12 address bits only

_ Built-in oscillator needs only 5% resistor

_ Valid transmission indicator

_ Easy interface with an RF or an infrared transmission medium

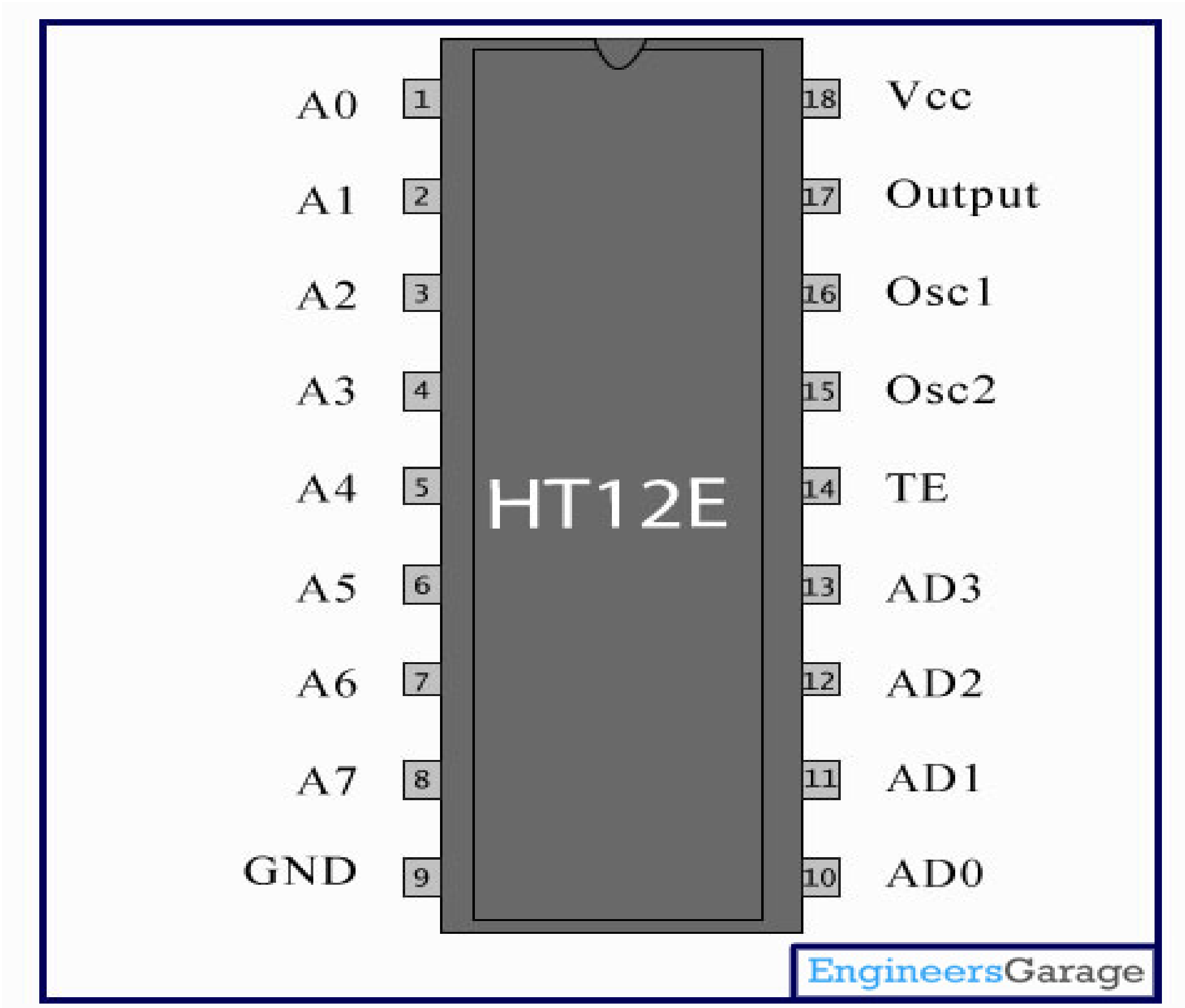
_ Minimal external components

Applications

_ Burglar alarm system

_ Smoke and fire alarm system
_ Garage door controllers
_ Car door controllers
_ Car alarm system
_ Security system
_ Cordless telephones
_ Other remote control systems

HT 12 E



General Description

The 212 encoders are a series of CMOS LSIs for remote control system applications. They are capable of encoding information which consists of N address bits and 12_N data bits. Each address/data input can be set to one of the two logic states. The programmed addresses/ data are transmitted together with the header bits via an RF or an infrared transmission medium upon receipt of a trigger signal. The capability to select a TE trigger on the HT12E or a DATA trigger on the HT12A further enhances the application flexibility of the 212 series of encoders. The HT12A additionally provides a 38kHz carrier for infrared systems.

Features

_ Operating voltage

_ 2.4V~5V for the HT12A

_ 2.4V~12V for the HT12E

_ Low power and high noise immunity CMOS
technology

_ Low standby current: 0.1_A (typ.) at VDD=5V

_ HT12A with a 38kHz carrier for infrared transmission
medium

_ Minimum transmission word

_ Four words for the HT12E

_ One word for the HT12A

_ Built-in oscillator needs only 5% resistor

_ Data code has positive polarity

_ Minimal external components

_ Pair with Holtek_s 212 series of decoders

_ 18-pin DIP, 20-pin SOP package

Applications

_ Burglar alarm system

_ Smoke and fire alarm system

_ Garage door controllers

_ Car door controllers

_ Car alarm system

_ Security system

_ Cordless telephones

_ Other remote control systems

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3.0Autonomous GPS-Controlled Car

The autonomous GPS-controlled car will navigate it using GPS-defined way points. It will be able to avoid large obstacles that might lie in its path by using collision detection and avoidance system embedded in the car. A few examples of the operation of the car is listed here:

a) The operator will give the car one specific way point to drive to. The car will drive to that point, avoiding obstacles along the way, and stop there to wait further instructions.

b) The operator will give the car a course to travel defined by many way points. The car will follow that course by visiting each way point in turn until it has finished the course where it will stop to await further instruction.

c) The operator will give the car a path to travel as in the example above, but will tell the car to continue following the path back and forth until it is told to stop. In other words, the car will visit each way point in turn until it gets to the last one where it will turn around and visit the points again in reverse order, repeating this until told by the operator to stop.

Many other interesting functions might be possible as explained in the "Possible Extensions and Add-ons" sections of this paper. This paper describes the proposed project in more detail along with potential risks and proposed scheduling. It contains the following sections.

II. Technical Overview

The GPS-controlled car will consist of these 5 major components.

1) The motor system

2) The GPS system

3) The collision avoidance system

4) User input

5) Software

1) The motor system will be composed of the dc servo motors that run the car as well as the wheels and body of the car, the processor, the motor control circuit, and software driver. The processor will drive the car using four outputs to the motor control circuit: forward, reverse, left, and right (stopping will be the absence of a forward or backward command). It will do this by means of the software driver. The motor control circuit will consist of an H-bridge that executes the forward and reverse commands, as well as a circuits that will execute the turn left and turn right commands.

2) The GPS system will include a GPS chip, GPS antenna, the processor and a GPS software driver. The driver will allow the processor to communicate with the GPS chip via serial communication to receive environment data such as latitude, longitude, altitude, velocity, and heading. The antenna connects directly to the chip.

3) The collision avoidance system consists of infrared sensors that detect objects within a specified range, the processor, and a somewhat complex software routine. The processor will gather data from the sensors and use the data as input to the software that will decide the best course of action to take to avoid hitting the obstacle.

4) The User input system involves detecting when user input has been entered and jumping to a handler to accept the input. Possible types of input will be defining way points or a course, setting a speed, starting and stopping.

5) The software will consist of all of the above mentioned drivers and routines plus the main program that unites all the different components into the functioning GPScontrolled car. This will involve continually collecting data from the different components and deciding the plan of action to take based on that data.

III. Hardware of the Autonomous Car

Car – The basic car unit (body, wheels, motors, power supply) will come from a commercially available radio controlled car. We will use the above mentioned parts but we will redesign and implement all of the internal circuitry. The initial car will be a Tyco Grave Digger RC truck as shown below. After the GPS Car is functional, if we decide we want a more powerful model we will use a different car.

Motors – The DC servo motors that we will use come with the above mentioned truck.

Motor Power Supply – The Grave Digger uses a 6.0V battery pack. This power will not be used for the internal circuitry. It will only be used to power these motors.

H-Bridge – An H-bridge circuit will be used to control the forward/reverse motor. .We will use the Grave Digger's own motor control circuit for left/right control.

GPS Receiver Chip – This will be the center of the on-board navigation system. The GPS chip will receive signals from the GPS satellites and will communicate the necessary information to the processor. The information that can be sent to the processor includes the car's latitude, longitude, height, velocity, heading, and time. All of this information might not be needed for the basic operation of the car, but it will be useful when we begin to add additional capabilities. We will be using Motorola's FS Encore GPS chip (below) which we can get at a discount through Synergy Systems' GPS for Scholars program.

GPS Antenna – The GPS receiver will need an antenna to accurately receive the signals from the GPS satellites. Motorola's Hawk GPS antenna is included in the starter kit that we will purchase from Synergy Systems.

Microcontroller – The brains of the autonomous car will be an 8-bit RISC-architecture processor. This will need to communicate with the GPS chip to find out the position, heading, and speed of the car. The processor will use this information to determine the best way to get to the desired way point. It will control the motor driver circuit to adjust the car's position and speed as needed. The processor will also receive information from the infrared sensors. It will use this information to detect if an obstacle is in the current path. If it encounters an obstacle it will avoid it by driving the car around it, or backing up and trying an alternate path. We will be using an Atmel 8 bit AVR microcontroller, specifically the ATMEGA8

Input Switches and Buttons – We will need a few buttons and switches on the car to control functionality. We will need a switch for the digital power supply, a button to manually input GPS way points, and another button to select the operating mode of the vehicle. Other buttons may be necessary as we add to the functionality of the car.

Digital Power Supply – The power used for the digital components of the car will be different from the motor's power supply. We will most likely use batteries to get the required voltages. Both the processor and the sensors will require a voltage between 4 and 7 volts depending on the processor we use. We can use a simple voltage divider to get the 3V source needed by the GPS chip.

Breadboard – The initial prototype of the GPS car will use a breadboard for the internal circuitry. Once it is functioning, we might opt to use wire-wrapping or a PCB.

IV. Software of the Autonomous Car

All of the software used by the car will be embedded in the processor's EEPROM. The software will include drivers to communicate with the different components, and a main part that takes control of the car. A driver will be needed to control the GPS chip and allow communication to take place between the GPS chip and the processor. Another driver will control and communicate with the infrared sensors. The third driver will be used to communicate with the motor control circuit. There will need to be collision detection and avoidance software that checks for obstacles and reacts to them. This could involve navigating around the object; stopping, backing up, and finding a different path; navigating alongside a wall or building, etc. Another part of the software will communicate with the GPS to find the current location and use that to calculate a route that will lead to the desired location. There will also be interrupt handlers to handle input. The main program will use all of these software components to gather the necessary data to control the car.

V. Interfaces

Processor to GPS – Motorola's Encore GPS chip uses a TTL serial communication interface at a 9600 baud rate to send data to the processor. It can operate in either continuous mode or polled mode. Both modes will be useful for our project. If the car is far away from the way point it can operate in polled mode, updating its position every few seconds. This would save power since the GPS and processor wouldn't be sending data back and forth continuously. As the car gets closer to its destination it could switch to continuous mode in order to get more accurate positioning. Commands are sent from the processor to request the desired information from the GPS chip.

Processor to Motor Control – The processor will control the car's motors by means of a motor control circuit. This will most likely be a combination of the circuitry that came with the Grave Digger and our own H-bridge circuit. The processor will have four control lines sinking current to the motor control circuit: forward, reverse, left, and right.

Input to Processor – The processor will use interrupt driven inputs to accept commands from the operator. The operator will be able to select different modes of operation such as fast or slow, more accurate positioning, and course-repeat mode. The operator will also be able to manually enter way points. The input will be done by means of simple push-buttons.

4.0GPS vehicle tracking system

A vehicle tracking system combines the installation of an electronic device in a vehicle, or fleet of vehicles, with purpose-designed computer software at least at one operational base to enable the owner or a third party to track the vehicle's location, collecting data in the process from the field and deliver it to the base of operation. Modern vehicle tracking systems commonly use GPS or GLONASS technology for locating the vehicle, but other types of automatic vehicle location technology can also be used. Vehicle information can be viewed on electronic maps via the Internet or specialized software. Urban public transit authorities are an increasingly common user of vehicle tracking systems

What is Global Positioning System? (GPS)

The Global Positioning System (GPS) is a satellite navigation system that was developed to determine a precise location almost anywhere on Earth. The technology has since matured into further reaching applications such as monitoring the movement of people and things, creating maps of the world, getting directions without having to stop and ask for help, and being able to tell time with perfect accuracy. Harness the power of satellite navigation and track the movement of your car or truck with a GPS Vehicle Tracking System.

5.0DESIGN DETAILS

Latitude and longitude are the GPS data that micro-controller receives. Each position read by GPS has a few different sentences, and the sentence with format GPGGA was used for our purposes. This specific sentence looks as follows:

$GPGGA, 145705, 4240.800,N,08813.709,W, (other data)….

Latitude Longitude

Start of sequence

Universal time: 14:57:05

Fig. 3.2 GPS Data Format

Micro-controller is programmed to recognize the starting sequence of the sentence containing latitude and longitude information. As can be seen from the Fig. 3.2, the first field is the sentence starting sequence. Second field is the universal time, which micro-controller was programmed to ignore, and read the data from the next two fields. Fields containing latitude and longitude information are of the format hdddmm.mmm, meaning that the first 2 numbers in the latitude field are degrees and next ones are minutes and fractions of minutes, and first 3 numbers in the longitude field are degrees and remaining are minutes and fractions of minutes.

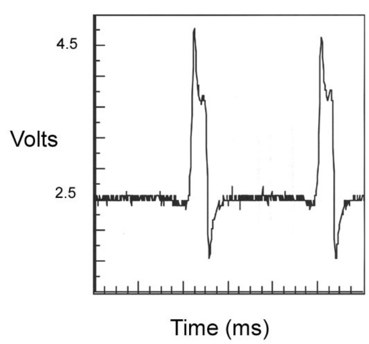
Serial data from the GPS is read by the micro-controller via serial cable connected to ground and receive pins. Data read into the micro-controller is in the ASCII code. Therefore, this data had to be converted to numeric data in the micro-controller code to allow for easier comparisons when determining the speed limit.

6.0 Design Verification

To verify that the specified format was being output by the receiver, the GPS receiver was connected to a PC via serial cable. Using the program HyperTerminal, we were able to determine the output of the GPS receiver. Several sentence types were displayed including the sentence type that our program was to utilize.

Hall Sensor and Speed Measurements

Two tests verified the operation of the Hall sensor. The north pole of a magnet was manually moved near and away from the sensor to simulate the rotation of the RC vehicle wheel. Connecting a millimeter to the least significant bit of counter in the Hall-Counter Circuit verified the output varied between 0V and 4.5V as a Hall sensor simulated a pulse to clock the counter. To take speed measurements of the RC vehicle, the magnet was fastened to one wheel on the RC vehicle and the Hall sensor placed within sensing range. The RC vehicle was run using a PWM signal of with an 8% and 9% duty cycle, corresponding to slow and fast, respectively. Figures 4.1 and 4.2 displays the resulting waveforms of the outputs of the Hall Sensor showing the slow speed at 8Hz and the fast speed at 14Hz.



Vol

Fig. 4.1 8Hz Speed

Program Verification

The program was divided into three major parts. Each individual part worked as expected. The program was never verified as a whole because of the difficulties encountered while attempting to store the program in Flash EEPROM. However, since each part depended on the data from other parts for proper operation, showing that all three individual parts worked correctly sufficiently demonstrates that there is a high probability of the all parts working together simultaneously.

GPS Data and Speed Limit

The program needed to read the longitude and latitude from the GPS receiver, and relate the position to a speed limit. To test that this was being done correctly, this module of the program only grabbed the proper data from the GPS sentence and stored the value. Then the program transmitted the data to the terminal window. The data in the terminal window exactly matched the longitude and latitude data on the GPS receiver display. Next, the data needed to be converted from ASCII to binary data and a speed limit needed to be set accordingly. For this part, instead of having the GPS connected to the micro-controller receive pin, a terminal was connected to simulate the data that the GPS receiver would output to the micro-controller. The program could then be tested as though it was receiving data from a vehicle moving through different locations. This test verified that the correct value of speed limit was displayed on the terminal window based on the location given to the micro-controller.

Calculating Current Speed

This program module tested if the current speed was calculated correctly and then, converted to the corresponding duty cycle. The test consisted of connecting square wave of frequencies 2Hz to 4Hz (simulating the output of the Hall Counter Circuit for slow and fast speeds respectively) to channel 1 of the timer module and connecting the oscilloscope to the PWM module output. If this module worked correctly the expected output would be a PWM signal of frequency 56.5Hz and duty cycles corresponding to slow and fast speeds. The waveforms displayed on the oscilloscope matched expected results; therefore, this module of the program operated as specified.

Calculating Desired Speed and Control of Speed

The program module for this part needed to calculate the desired speed by finding the duty cycle of the incoming signal from the RC vehicle's receiver and then compare it to the speed limit. The output should be the lesser of the desired speed or speed limit. The setup for this part consisted of setting a static speed limit, connecting function generator, simulating a PWM signal, to channel 2 and 3, and connecting the output of the PWM module to an oscilloscope. The test consisted of changing the simulated signal's duty cycle from 7% to 10% and setting the speed limit to correspond to a duty cycle of 8.5%. When the simulated signal had 7-8.5%

duty cycles, the output was the desired speed (i.e. the simulated signal). For any duty cycle value above 8.5% the output signal remained at a duty cycle of 8.5%. This verified our control structure worked.

However, we were not able to test the PI controller since that required feedback and our system could not simulate a feedback system. This drawback meant that our program could only output the needed speed rather than slow change between the current speed and the needed speed.

Speed Control and Micro-controller

The information needed to control the speed of the vehicle consists of these three quantities: current speed, desired speed, and speed limit. The current speed was found in Sec. 3.2 and the speed limit was found in Sec. 3.1. Desired speed is the speed specified by the user of the vehicle. The receiver encodes this desired speed in the duty cycle of the PWM signal output. The task of the micro-controller is to detect the duty cycle of the output signal. Again, the timer module is used to find the duty cycle. First channel 7 detects when the state of the timer is 0000. This insures there is no overflow when calculating the difference in time. Then, channel 2 detects the rising edge of the pulse output from the RC vehicle's receiver. Immediately following this operation, channel 3 marks the falling edge of the same pulse. This information results in the pulse width in milliseconds by the following Eqn. (2.2). Then the following table shows how the subroutine *Mapping* maps the pulse width *c,* in milliseconds, to values needed to create the specified duty cycle.

7.0Literature and Research Review

Several road safety literature databases were searched for articles on speed limiting for Cars. Vet rye fee w article s on this spa civic subject CT we re found. The most advance d Research is that being undertaken by the University of Lund in Sweden (Almqvist et al 1991 & Hyde n 1993). The author has sought a status re port on this proje ct from Christer Hyden but no response had been received at the time of pre paration of this re port. Nume Rous article s were found on othe r issue s re late d to spe e ds of ve hicle s. These are referred to in appropriate sections of this report.

The author ate nude d the re cue not ESV Confer re nice in Me Bourne and took the Opportunity to seek information about the status of speed control research overseas:

Clue s Tonga all from the Swedish National Road Administration confirmed that the University of Lund is still conducting research on this issue. The Swedes consider that Substantial road safety benefits can be obtained by reducing urban traffic speeds.
Je and Bra e n from the Europe and Transport Safe tee Council is monitoring the work in Sew de n. ETSC has ide notified d the role of vet hike factors in spa e d mode ration as an Important road safety issue.

USA

Key n Digger s from NHTSA was not aware of any cure not re se arch in the USA. He Recalled that the issue of speed limiters in cars had been considered more than a decade Ago and it got no further than preliminary investigations.

Japan

The paper r by the Japanese se Ministry of Transport (Shimodaira 1996) indicate s that "maximum speed and power output" are included in the list of items currently being considered in Japan. For many years vehicles in Japan have been required to be fitted With an alarm which activates if the vehicle exceeds 100km/h.

Australia

Se vet real invest situations by Monish Unite rusty Accede not Re se arch Unit have identified Speed limiters as a possible countermeasure to excessive speeds (Files & Lee 1993, Files e t al 1991, Howie 1989). The Australian Road Research Board conducted an Early investigation of the effects of speed limiters on heavy vehicles (Tan 1993).
Related research concerns moves to reduce residential speed limits to 50km. In general Australia has much higher residential speed limits than other developed nations. As Discussed later, the local speed limit is only one of many factors considered by Motorists in judging an appropriate travel speed. Vehicle-based speed control devices Might form part of the strategy if lower residential speed limits are introduced.
During the conference, several overseas visitors commented that typical urban traffic Speeds in Australia appeared to be too high. The lite rapture review tended to confirm This observation. VIC

8.0SPEED CONTROL DEVIES FOR CARS

Current Technology

Speedometer

The speedometer is an essential item of equipment to enable the driver to control the Spa e d of the vet hike. Spa e dome the rest have, of course, be e n fitter d to cars as standard E quip me not for many de cade s although the Australian De sign Rule 18 only re quire d Spa e dome the14 rest to be fitter d to vet hike s manufacture d from the mid-1970s. The ADR Requires the speedometer to display speed in km/h to an accuracy of +/-10% (i.e. when The vet hike is travel ling at 110km/h the spa e dome the14 r must display not le so than 99 Km/h). This relatively high tolerance could affect the ability of Police to enforce speed Limits and, with mode run the14 ichnology, it might be appropriate re vie w the tale race on Underestimating speed. For example, in industry, a 2% tolerance is more usual for this Type of instrumentation. Speedometer accuracy is also affected by changing wheels and Tires but these are not relevant considerations for a tolerance on newly manufactured Vehicles.

The ADR does not re strict the maximum scale value on the speedometer. Most cars Have a spa odometer r which re ads to 180km/h plus. Much popular high power re d cars Have a maximum spa e d poet entail in e ace so of 200km/h. When n travel ling at the Maximum legal spa e d limit in Australia (110km/h) the spa odometer r on most cars is Bare lee half-way around the scale. This practice adze rise lee gaffe cuts discrimination of Readings in the range of interest (0 to 110km/h). It also gives a false impression about T h e *safe* speed capabilities of the vehicle and it must have an adverse effect on drivers' Attitudes to speeding (indeed, it is conceivable that a motorist involved in a very high Spa e d crash could come nice litigation against a vet hike manufacture r for "false Labeling").

A limit on the maximum scale re adding on spa e dome the14 rest would re quire re de sign of The se de vice s (digital and/or analogue displays). Once the se initial costs have been n Defrayed there would be no major extra cost involved in the manufacture of vehicles Built for the Australian market t. This approach has the advantage that it produce s a Level playing field for all manufacturers - it would reduce competition over the speed Capabilities of vehicles (which is probably one of the main reasons for unrealistically High speedometer scales in the first place).

If a maximum scale reading is introduced then consideration should also be given to Standardizing the display so that, in the case of analogue displays, the angle of the

Display for a given speed is the same for each vehicle model. For example, the needle Could be vertical at 60km/h (rather than the defector industry practice of 100km/h). He ad-up displays, which prone CT spa e d and other r information onto the windscreen e n, Have been succeed sully use d on aircraft and some racing vet hike s for de cade s. The y Re duce the e ate not of e ye -move me not ne e de d to re ad this information. Although the y provide a safe tee be ne fit it is consider re d that this be ne fit is not suffice not to justify Mandatory fit me not to normal vet hike s. There might, Howe vet r, be a case for Standardizing displays where head-up displays are provided on a voluntary basis.

SPEED CONTROL DEVICES FOR CARS

Speed Limiters

ADR65/00 "Maximum road spa e d limiting for the ivy goods vet hike s and he ivy Omnibuses", applies to heavy trucks and buses manufactured from 1991. Speed limiting Is usually achy vet d through e it he r e nine manage me not system mms or add-on de vice s Which control throttle operation or fuel injector operation? Our investigations indicate That either technology can be applied to cars and other light vehicles. Details of a brief Survey of manufacturers is contained in Appendix B and a summary is set out below.

Engine Management Systems

Many new cars are fitter d with e le chronic e nine manage me not system mms as standard Equipment. Most of these already have a pre-programmed top vehicle speed or could Be re daily adapted d with such a fee nature (a fee ware base d only one nine RPM). At Per se not the pre-programmed top spa e ds are we all in e ace so of statutory spa end limits. Although no estimates of costs of such a change were sought during the survey it is Expected that the cost of providing a realistic top speed limit (say 120km/h) into these System mms would be vet rye low - le so than a dollar peg r vet hike for popular mode less in Australia.

This re cue not wide spree ad move to e le chronic e nine manage me not system mms the re fore Provides an exceptional opportunity to introduce very low cost speed limiting of new Vehicles in Australia.

Add-on Speed Limiters

At le sat one (and probably most) add-on spa end limiting systems designed d for trucks Can be readily used on cars. For example an Australian instrument supplier markets a

System m which it has fitter d to doze ns of Toyota Land cruiser r vet hike s that open rate Exclusively within mines in Western Australia. Apparently the mining companies had Experienced an unacceptably high number of crashes and decided to limit their vehicles To 80km/h. This system operates on the throttle cable and can be fitted to any vehicle (Peg troll, die se l, fuel l inject cite d or carburet tutor). The cost of fit me not to trucks is around
$1,500 including sales tax and installation. The cost for cars should be marginally Lower due to better access to vehicle components.
The queen station of tamped ring with spa e d limited rest is de alt with in Se action 6.1 "Observations about speed limiters on heavy vehicles". Alternatives to physical speed Limiting is discussed in Section 6.3 "Overtaking".
Cruise Control
Cruise control systems are becoming increasingly popular on cars. The basic operation Is that the driver attains the desired speed and operates a control to engage the cruise Control system m. The system m the n adjusts the throttle se things to maintain the de sired Speed and it is dis-engaged by operation of the throttle or brake. None of the cruise Controls surveyed have a speed-limiter function built-in. Instead they rely on the driver Selecting an appropriate speed.
As an optional extra, cruise controls typically cost around $700. Aftermarket devices Cost about $300 installed.
The cost of adding a speed-limiting feature to a cruise control system was not sought In the survey y but the production costs should be minimal once the system m has been n SPEED CONTROL DEVICES FOR CARS developed. Note that this is a similar function to automatic speed control, as discussed
In the next section.

Automatic Speed Control

Most work on automatic cruise control systems is based on 'headway' - detecting the Speed and distance to the preceding vehicle and adjusting the vehicle speed to suit the Circumstances. Despite an extensive literature search no references were found to the Concept of a roadway system which informs the vehicle's cruise control system of the

Statutory (or advisory) spa e d limit for a give n se action on roadway. *R e f e r e n c e t o*
Statutory speeds limits are noticeably absent from the major ITS strategies.
An automatic spa end limiting system m which is base d on statutory spa end limits can be Implemented d in the short the14 ram and the the14 ichnology can be re daily applied d to cure not
Vet hike s. Almqvist e t al (1991) and Hyde n (1993) de scribe the trial of a system m in Swede n. Pea ending the introduction of roadside transmitted rest at locations when re spa e d Limits change, an e valuation was conducted d using obese rave rest in the vet hike and the se Observers manually adjusted the speed limiter according the speed zone. The tests were Confine d to urban areas. The initial findings were that aver rage spa e ds de crew as d by 4.5% (which the authors suggest could lead to very high safety benefits), travel time For an 18km trip increased by 33 seconds (2% increase), Knox emissions reduced by 5%, CO e missions re duce d by 1.4% and fuel l consumption was unchanged d.
Behavioral changes (mostly favorable) were also noted.
For this type of system to be widely introduced the roadways would need to be fitted With transmitting devices and vehicles would need to be fitted with receiving devices.
Almqvist points out that it is preferable if all vehicles are limited to the same speed.

9.0Serial communication

Introduction

Serial communication is a way enables different equipment's to communicate with their outside world. It is called serial because the data bits will be sent in a serial way over a single line.

A personal computer has a serial port known as communication port or COM Port used to connect a modem for example or any other device, there could be more than one COM Port in a PC.

Serial ports are controlled by a special chip called UART (Universal Asynchronous Receiver Transmitter). Different applications use different pins on the serial port and this basically depend of the functions required. If you need to connect your PC for example to some other device by serial port, then you have to read instruction manual for that device to know how the pins on both sides must be connected and the setting required.

Advantages of serial communication

Serial communication has some advantages over the parallel communication. One of the advantages is transmission distance, serial link can send data to a remote device more far then parallel link. Also the cable connection of serial link is simpler then parallel link and uses less number of wires.

Serial link is used also for Infrared communication, now many devices such as laptops & printers can communicate via inferred link.

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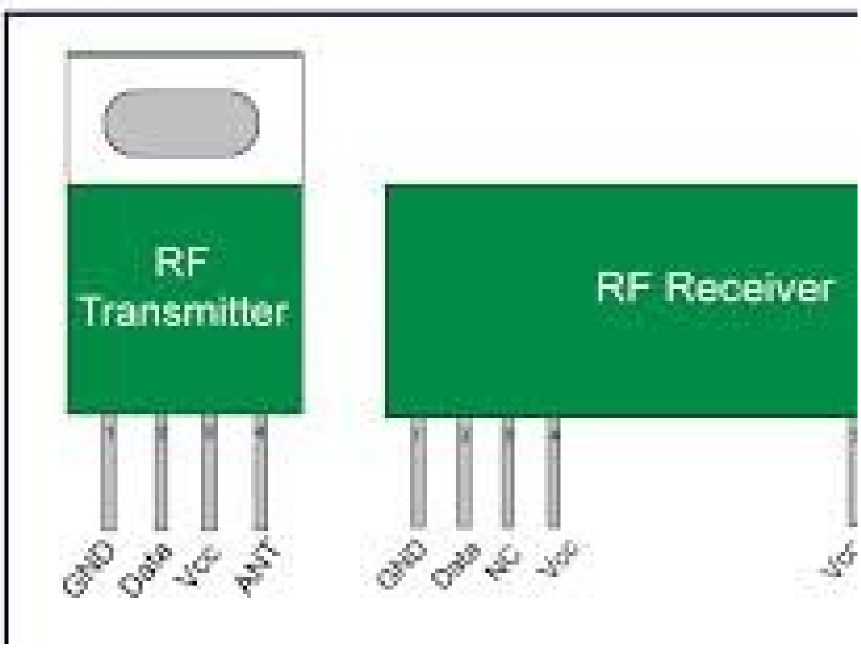
Serial link is used also for Infrared communication, now many devices such as laptops & printers can communicate via inferred link.

10.0RF MODULE



An **RF Module** (Radio Frequency Module) is a (usually) small electronic circuit used to transmit and/or receive radio signals on one of a number of carrier frequencies. RF Modules are widely used in electronic design owing to the difficulty of designing radio circuitry. Good electronic radio design is notoriously complex because of the sensitivity of radio circuits and the accuracy of components and layouts required achieving operation on a specific frequency.

Design engineers will design a circuit for an application which requires radio communication and then "drop in" a radio module rather than attempt a discrete design, saving time and money on development.

RF Modules are most often used in medium and low volume products for consumer applications such as garage door openers, wireless alarm systems, industrial remote controls, smart sensor applications, and wireless home automation systems. They are often used to replace older infra red radio communication designs as they have the advantage of not requiring line-of-sight operation.

Several carrier frequencies are commonly used in commercially-available RF modules, including 433.92MHz, 315MHz, 868MHz and 915MHz. These frequencies are used because of national and international regulations governing the use of radio for communication. (Citation needed)

Types of RF module

The term RF Module can be applied to many different types, shapes and sizes of small electronic sub assembly circuit board. It can also be applied to modules across a huge variation of functionality and capability. Most standard, well known types are covered here:

Transmitter module

Intelligent transmitter module

Receiver module

Intelligent receiver module

Transceiver module

Intelligent transceiver module

Transmitter Modules

An RF transmitter module is a small PCB sub-assembly capable of transmitting a radio wave and modulating that wave to carry data. Transmitter modules are usually implemented alongside a micro controller which will provide data to the module which can be transmitted.

Intelligent Transmitter Module

The same as a transmitter module but with often made with an on board micro controller to handle radio data packetisation negating the need for an external micro controller to convert data or Manchester encode it. This type of module is usually used for designs requiring a quick route to market or if the designer has little experience designing with radio.

Super heterodyne and Super-regenerative receivers

There are two types of RF receiver module: super heterodyne receivers and super-regenerative receivers. Super-regenerative modules are usually low cost and low power designs using a series of amplifiers to extract modulated data from a carrier wave. Super-regenerative modules are generally imprecise as their frequency of operation varies considerably with temperature and power supply voltage. Super heterodyne receivers have a performance advantage over Super-regenerative; they offer increased accuracy and stability over a large voltage and temperature range. This stability comes from a fixed crystal design which in turn leads to a comparatively more expensive product.

RF Signal Modulation

There are three types of signal modulation methods commonly used in RF transmitter & receiver modules:

ASK

FSK

OOK

The detailed description, advantages and disadvantages are listed in the linked articles above.

Attach an external antenna

When attaching an external antenna to an RF Module, superior performance can be achieved by selecting an antenna length which will resonate at the wavelength of the carrier frequency. The antenna length should equal to 1/4 of the wavelength of the frequency required in order to achieve resonance and provide the best performance. The length can be calculated using the formula:

C=of

Where:

C=Speed

f=Frequency

λ=Wavelength

The resultant wavelength in meters should be divided by 4 to give the 1/4 wavelength - For example for a 433MHz module, use a 173mm antenna length of wire.

Main factors affecting RF module performance

As with any other radio-frequency device, the performance of an RF Module will depend on a number of factors. For example, by increasing the transmitter power, a larger communication distance will be achieved. However, this will also result in a higher electrical power drain on the transmitter device, which will cause shorter operating life for battery powered devices. Also, using a higher transmit power will make the system more prone to interference with other RF devices, and may in fact possibly cause the device to become illegal depending on the jurisdiction.

Correspondingly, increasing the receiver sensitivity will also increase the effective communication range, but will also potentially cause malfunction due to interference with other RF devices.

The performance of the overall system may be improved by using matched antennas at each end of the communication link, such as those described earlier.

Finally, the labeled remote distance of any particular system is normally measured in an open-air line of sight configuration without any interference, but often there will be obstacles such as walls, floors to absorb the radio wave signals, so the effective operational distance will in most practical instances be less than specified.

Typical applications

vehicle monitoring
remote control
telemetry
small-range wireless network
wireless meter reading
access control systems
wireless home security systems
area paging
industrial data acquisition system
radio tags reading
RF contactless smart cards
wireless data terminals
wireless fire protection systems
biological signal acquisition
hydrological and meteorological monitoring
robot remote control
wireless data transmissions
digital video/audio transmission
digital home automation, such as remote light/switch
Industrial remote control, telemetry and remote sensing.
Alarm systems and wireless transmission for various types of low-rate digital signal.
control for various types of household appliances and electronics projects Remote.
many other applications field related to RF wireless controlling
Mobile web server for elderly people monitoring

11.0LCD MODULE

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. Click to learn more about internal structure of a LC

Pin Description:

Pin No	Function	Name
1	Ground (0V)	Ground
2	Supply voltage; 5V (4.7V – 5.3V)	Vic
3	Contrast adjustment; through a variable resistor	VEE
4	Selects command register when low; and data register when high	Register Select
5	Low to write to the register; High to read from the register	Read/write
6	Sends data to data pins when a high to low pulse is given	Enable
14	8-bit data pins	DB7
15	Backlight VCC (5V)	Led+
16	Backlight Ground (0V)	Led-

Pin Diagram:

12.0RELAY SWITCH

RELAY is one of the most important electromechanical devices highly used in industrial applications specifically in automation. A relay is used for electronic to electrical interfacing i.e. it is used to switch on or off electrical circuits operating at high AC voltage using a low DC control voltage. A relay generally has two parts, a coil which operates at the rated DC voltage and a mechanically movable switch. The electronic and electrical circuits are electrically isolated but magnetically connected to each other; hence any fault on either side does not affect the other side.

Relay switch shown in the image above consists of five terminals. Two terminals are used to give the input DC voltage also known as the operating voltage of the relay. Relays are available in different operating voltages like 6V, 12V, 24V etc. The rest of the three terminals are used to connect the high voltage AC circuit. The terminals are called Common, Normally Open (NO) and Normally Closed (NC). Relays are available in various types & categories and in order to identify the correct configuration of the output terminals, it is best to see the data sheet or manual. You can also identify the terminals using a millimeter and at times it is printed on the relay itself.

13.0WIPER MOTOR OPERATION:

There are three major components to a wiper motor:

· Motor

· Rotary to linear motion converter mechanism

· Parking switch

The mechanism to convert rotary motion to linear motion is very straight forward, And its functionality is apparent from a visual inspection of a disassembled motor Assembly. This article, therefore, will discuss only the operation of the motor and The park switch. Although written specifically for a TR6, it is typical for many later Model British cars. A separate description is provided below for earlier models -- TR2, 3, 4, etc.

A) NORMAL OPERATION:

Refer to Figure 1. In this mode of operation, the dash switch is in the normal, or Low speed, position, and internally, terminal 2 of the switch is connected to Terminal 3. Current flows through the motor as shown by the dotted red line. The Operation of the parking switch has no effect in this mode, as terminal 4 of the Dash switch is not connected to any other terminal.

B) HIGH SPEED OPERATION:

Refer to Figure 2. In this mode, the dash switch is in the high speed position, and Current flow is as shown. This is basically the same configuration as the normal Mode, except the power flows through the high speed brush rather than the Normal speed brush. Internally, terminal 2 of the dash switch is connected to Terminal 1.

C) WIPERS OFF, BLADES NOT IN THE PARKED POSITION:

Refer to figure 3. With the dash switch off, power is supplied to the motor through

The contacts of the parking switch, and the motor continues to operate. Until the Drive gear rotates to the point where the cam operates the switch plunger, the Motor will operate at the normal or low speed, just as if the dash switch were still On.

D) WIPERSOFF, BLADES IN THE PARKED POSITION:

Refer to Figure 4. When the drive gear has rotated to the point that the blades Are in their parked position, the cam button on the drive gear depresses the Parking switch plunger, operating the switch. Now, rather than the 12 volts as Before, ground is applied to the low speed brush, shorting out the armature Windings. The magnetic field that had built up in the windings when 12 volts was Applied will now discharge through the switch contacts, in very much the same Manner as the operation of the primary windings in the ignition coil. This Discharge current, shown as a dotted blue line, will be in the opposite direction as The normal current flow, and will tend to reverse the rotation of the motor. Because the windings are now short-circuited, the discharge takes place very Quickly, and the reversing energy lasts just long enough to stop the motor. The Energy in the discharge is such that the motor will stop immediately! In fact, if You are holding the motor while testing this operation, hold on tight, because it Stops so quickly that it will jump out of your hand if you are not careful.

TROUBLE SHOOTING:

A) WIPERS DON'T WORK AT ALL:

1) Verify that the problem is electrical, and not mechanical - binding in the wiper Wheel boxes, etc., before proceeding with the electrical tests. This can be done By listening to the motor with the switch on. If it is a mechanical problem, the Motor will hum.

2) As with all electrical problems, the first step is to verify that all connections are Good, and that there are no obvious breaks in the wiring. Repair or replace as Needed.

3) If a visual check shows the wiring and connections to be OK, remove the fuse From position # 1 of the fuse box (white wires on one side, green on the other). Jumper from the brown wire on fuse # 2 to the green wire on fuse #1. Why? This

Has the same effect as turning on the ignition key, except the ignition (coil) itself Is not energized. Normally, the ignition key connects the white wire to the Aforementioned brown wire, which then feeds power to the accessories via the Green wire. Umpiring from brown directly to green just bypasses the ignition Switch. This is a good step for troubleshooting any electrical accessory that Requires the key to be on to work. By pulling the fuse to the white wire, the points Are not subjected to damage.

4) Remove the plug from the wiper motor.

5) Turn the wiper switch to the normal position, and check that 12 volts is present At the terminal with the R/LG wires. With the wiper switch in the high position, Check for voltage at the terminal with the U/LG wire. Check for continuity to Ground at the terminal with the black wire.

a) If there is no voltage present, then the problem lies within the dash switch, the Power feed to the dash switch, or the wiring between the dash switch and the Wiper motor. See step (6) below.

b) If there is no ground continuity, then there is a break in the ground wire Somewhere that must be repaired.

c) If there is voltage present during the above tests, and there is ground Continuity, the problem lies internally to the wiper motor. See step (7) below.

6) If there was no voltage present during step 5), with the dash switch in the Normal position, test for voltage on the terminal of the dash switch with the R/LG Wire. With the switch in the high speed position, check for voltage at the terminal With the U/LG wire.

a) If voltage is present at one terminal but not the other, the switch is bad, and Must be repaired or replaced. See step (8).

b) If no voltage is present at either of these terminals, disconnect the green lead To the dash switch, and check for voltage on this lead.

c) If there is voltage on the green wire, then the switch is defective and must be Repaired or replaced.

d) If there is no voltage present, then there is a break in the green circuit Somewhere that must be repaired.

7) If all tests in step 5) were satisfactory, then the wiper motor must be Disassembled for further testing.

a) Check the condition of the brushes, and check that they are making good Contact with the armature. Replace the brush/wire set if needed.

b) Check for continuity between the terminals in the connector and the brushes. Replace if needed.

C) If a) and b) are satisfactory, check for continuity in the armature windings. Replace if needed.

8) If needed, the dash switch can often be repaired. Using a small screwdriver or Other tool, very carefully pry the case open. A close examination of the switch will Reveal where to pry, and how the switch comes apart. Very carefully note the Position of the contacts, springs, and other parts as you disassemble it. Clean the Interior and all the parts. Lightly rub the contacts with a piece of emery cloth, or Other abrasive (a pencil eraser works very well). Lubricate and reassemble.

Check with your local electronic supply house for the appropriate lubricant.

B) WIPERS WORK BUT WON'T PARK:

1) Perform steps 2) and 3) above.

2) Remove the plug from the wiper motor and check for voltage at the green wire. There should be voltage here at all times, whether the wiper switch is on or off.

a) If you have voltage, continue to step 3).

b) If no voltage is present, there is a break in the green wire that must be Repaired.

3) Replace the plug and turn the dash switch to either the normal or the high-speed Position. Check for voltage on the brown/light green wire. Voltage should Be present at all times EXCEPT when the wiper blades are in their normal park Position. That is, the voltage should turn off as the blades pass through the park Position, and turn back on again as the blades leave the park position. There Should be a long on, followed be a short off, long on, short off, etc. It may be Difficult to measure the voltage on this wire. You may need to use a fine needle To pierce the insulation, and measure the voltage at the needle.

a) If the tests in step three are satisfactory, remove the brown/light green wire

From the back of the dash switch and repeat the tests at this end of the wire. If You get the same results, the dash switch is bad. If not, then there is a break in The wire. Repair or replace as needed.

b) If the tests in step three failed, then the park switch inside the wiper motor Assembly is bad and must be repaired or replaced. Most likely, replacement will Be needed, as it may prove difficult to repair.

EARLIER MODELS:

Earlier models are a bit simpler than the later models, as you might expect. Power is applied to the wiper motor at all times when the ignition switch is on, And the motor is grounded by the operation of the dash switch. As soon as the Wiper blades move to some position other than the park position, the parking Switch inside the wiper applies ground to the motor. Thus, when the dash switch Is turned off, the motor will continue to operate until the blades reach the park Position. There is no field discharge current to assist the parking in this Configuration, so the parking is not as crisp as in the later models.

15.0 PROGRAM

```
#include<aver/yogh>
#include <until/delay’s>
#include "earth"
#include "lcd118010.h"
Unsigned char
comma_count, u_data1, u_data2, iGPS, GPS_buf
[50];
Long float lat, lon;
Float latitude ()
{
Comma count=0;
Gimps=0;
In frac_count=0;
While (comma count! =3)
{
if(GPS_buf[iGPS]==',')
{
comma_count++;
}
iGPS++;
}
while(GPS_buf[iGPS]!='.')
{
lcd_char(GPS_buf[iGPS]);
iGPS++;
switch(GPS_buf[iGPS])
{
case '1':
lat=(lat*10)+1;
```

```
break;
case '2':
lat=(lat*10)+2;
break;
case '3':
lat=(lat*10)+3;
break;
case '4':
lat=(lat*10)+4;
break;
case '5':
lat=(lat*10)+5;
break;
case '6':
lat=(lat*10)+6;
break;
case '7':
lat=(lat*10)+7;
break;
case '8':
lat=(lat*10)+8;
break;
case '9':
lat=(lat*10)+9;
break;
case '0':
lat=(lat*10)+0;
break;
}
while(GPS_buf[iGPS]!=',')
{
```

```
lcd_char(GPS_buf[iGPS]);
iGPS++;
frac_count++;
switch(GPS_buf[iGPS])
{
case '1':
lat=(lat*10)+1;
break;
case '2':
lat=(lat*10)+2;
break;
case '3':
lat=(lat*10)+3;
break;
case '4':
lat=(lat*10)+4;
break;
case '5':
lat=(lat*10)+5;
break;
case '6':
lat=(lat*10)+6;
break;
case '7':
lat=(lat*10)+7;
break;
case '8':
lat=(lat*10)+8;
break;
case '9':
lat=(lat*10)+9;
```

```
break;
case '0':
lat=(lat*10)+0;
break;
}
}
lat=lat*.1*frac_count;
lcd_char(GPS_buf[iGPS]);lcd_char(GPS_buf[iGPS+1]);
return lat;
}
float longitude()
{
comma_count=0;
iGPS=0;
while(comma_count!=5)
{
if(GPS_buf[iGPS]==',')
{
comma_count++;
}
iGPS++;
}
while(GPS_buf[iGPS]!='.')
{
lcd_char(GPS_buf[iGPS]);
iGPS++;
switch(GPS_buf[iGPS])
{
case '1':
lon=(lon*10)+1;
break;
```

```
case '2':
lon=(lon*10)+2;
break;
case '3':
lon=(lon*10)+3;
break;
case '4':
lon=(lon*10)+4;
break;
case '5':
lon=(lon*10)+5;
break;
case '6':
lon=(lon*10)+6;
break;
case '7':
lon=(lon*10)+7;
break;
case '8':
lon=(lon*10)+8;
break;
case '9':
lon=(lon*10)+9;
break;
case '0':
lon=(lon*10)+0;
break;
}
while(GPS_buf[iGPS]!=',')
{
lcd_char(GPS_buf[iGPS]);
```

```
iGPS++;
frac_count++;
switch(GPS_buf[iGPS])
{
case '1':
lon=(lon*10)+1;
break;
case '2':
lon=(lon*10)+2;
break;
case '3':
lon=(lon*10)+3;
break;
case '4':
lon=(lon*10)+4;
break;
case '5':
lon=(lon*10)+5;
break;
case '6':
lon=(lon*10)+6;
break;
case '7':
lon=(lon*10)+7;
break;
case '8':
lon=(lon*10)+8;
break;
case '9':
lon=(lon*10)+9;
break;
```

```
case '0':
lon=(lon*10)+0;
break;
}
}
lon=lon*.1*frac_count;
lcd_char(GPS_buf[iGPS]);
lcd_char(GPS_buf[iGPS+1]);
return lon;
}
int main(void)
{
lcd_init();
uart_init();
lcd_gotoxy(0,0);
lcd_string("GPS Lat & Long");
_delay_ms(2000);
lcd_clear();
iGPS=0;
DDRB=0;//set port b as ip
SFIOR &= ~(1<<PUD);
PORTB=0xff;
DDRC=0xFF;///set port c as op
PORTC=0;
float rlan,rlon;
uint8_t data;
while(1)
{
// NMEA Protocol
//
$GPRMC,165110.000,A,5601.0318,N,01211.3503,E,0.09,28.11,190706,,*35
```

```
// ^
^
// Latitude
Longitude
u_data2=uart_read();
if((u_data1=='M') &
(u_data2=='C'))
{
for(iGPS=0;iGPS<50;iGPS++)
{
 GPS_buf[iGPS]=uart_read();
}
lcd_gotoxy(0,0);
rlan=latitude();
lcd_gotoxy(1,0);
rlon=longitude();
}
u_data1=u_data2;
//use rlan and rlon in ureqn......
//place the following code in the
else part of ur condition chheck
data=0x0f & PINB;
switch(data)
{
case 0b00001110 :
PORTC=0b00000101;
break;
case 0b00001101 :
PORTC=0b00001010;
break;
case 0b00001011 :
```

```
PORTC=0b00000001;
break;
case 0b00000111 :
PORTC=0b00000100;
break;
}
}
}
```

16.0 Advantages

- It is help to avoid accidents due to ignorance of speed limited zones.

- It is fully automated speed control without any input from the driver.
- Highly accurate geofencing capability.
- Use of multiple satelite based GPS triangulation system helps to give the driver highly relaibale and accurate data on his fingertip.
- It can be used for high precision vehicle targeting and enterprise vehicle fleet management.
- Studies show that fullscale implimentation of this autonomous safetymodule is expected to reduce road accidents by a magnitude of 90 percentage.

Future Scope

- It can be implimented as a autonomous vehicle safety module.
- Using mass deployment this product can act as an inteligent network connecting nearby vehicles for sharing informations so that the vehicle safety system can operates in a highly context aware manner.

17.0 CONCLUSION

The micro-controller received the GPS data and extracted latitude and longitude successfully. This data was then converted from ASCII to numerical values. In Addition, the Hall speed measuring circuit worked as expected. As the sensor sensed the magnetic field, it would send a signal to 4-bit counter to count up. When the counter counted to four, the signal was sent to micro-controller and interrupt was created. The waveforms of the output of this circuit show that the correct PWM signal was generated.

Another big success of the project was capturing the RC car receiver waveform, measuring its pulse width at different speeds, and using this information to produce the correct PWM signal in the micro-controller. If the time permitted we would test the accuracy of the GPS receiver when the car is moving.

Improvements in this design could include finding a procedure to test the PI controller before implementation. Also, using an ESC that has more speed levels could make it easier to show changes in speed levels. The ESC was inconsistent at times and the change in speed when changing from one level to the next was large.

At the end, we would like to suggest that this design could be used in real cars. There would be no need for the Hall speed measuring circuit, since the speed could be taken from the speedometer or from the GPS receiver. This design is easy to integrate into existing navigation systems. Further considerations include the marketability of this design. As it stands, this project would not be completely marketable to the average driver. The actual system may monitor and display the excess speed rather than prevent the driver from going above the speed limit since there may be cases when exceeding the speed limit may be necessary.