Gesture Control Car Driving System toAssist the Physically Challenged

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Abstract: **This paper presents a model for gesture controlled user interface (GCUI), and identifies trends in technology, application and usability. We present an integrated approach is real time detections, gesturebased data which control vehicle movement and manipulation on gesture of the user using hand movements. A three axis accelerometer is adaption. As the person moves their hand, the accelerometer also moves accordingly. The gesture is capture by accelerometer and processed by gesture. Today human machine interactions is moving away from mouse and pen and is becoming pervasive and much mouse compatible with thephysical world. With each passing day the gap between machines and human is being reduced with the introduction of new technology is easy the standard of living. Its having future scope of advanced roboticarms that are designed like the human hand itself can easily controlled using handgesture only. It also having proposed utility in field of construction, medical science, hazardous waste disposal.**

Key Words: Accelerometer, Gesture.

1.INTRODUCTION

Humans interact in the physical world by the means of the five senses. However, gestures have been an important means of communication in the physical world from ancient times, even before the invention of any language. In this era of machines taking control of every complex works, interactions with machines have become more important than ever[1]. Since this paper deals with gesture controlled laptop, the primary focus will be on the use of hand gestures for specific applications only[5]. There are several ways to capture a human gesture thata computer would be able to recognize. The gesture can be captured using distance measurement, camera, or a data glove. Gestures can also be captured via Bluetooth or infrared waves, Acoustic, Tactile, optical or motion technological means. Theembedded systems designed for specific control functions can be optimized to reduce the size and cost of the device and increase the reliability and performance. This project consists of mainly three components – Arduino Uno, Ultrasonic sensors, and a laptop. The ultrasonic sensors hooked to the Arduino are used to determine the gestures and the distance of the hand from theultrasonic sensors[]. The code loaded in Arduino finds the respective keyword for the distance found and sends it to Windows OS.

21st century, the era of technology has flooded us with various fascinating and commendable gadgets, smartphones, new generation PC's and much more. It has brought us the era of Automation. The century introduced us with domains such as Artificial Intelligence, Machine Learning, Virtual and Augmented Reality, Gesture control and what not. The aim of every developing or developed country is to makethe most of technology and make everyone's life easier[11]. This aim can be achieved through Automation. With that said this paper primarily focuses on how the gesture controlled systems assist in technological developments. The basic idea of gesture controlled system is to bridge an interface between human and computers or robots. There are various types of gestures which can be speech, actions or certain sound effects. Gesture control usually needs a physical device that will recognize gestures using some sensors and laterfollow the body language or movements. A processing device like a computer can interpret them [2]. As mentioned in [4], gestures are classified into two types which are dynamic and static. Static gestures are recognized by their geometric configuration, with identification occurring when the hand motion is stopped. These gestures are represented as hand position coordinates and the geometric relationship between fingers. Dynamic gestures aremodeled as a dynamic system. They allow real time gesture recognition using a small amount of processing time and memory. Most of the gesture controlled devices used for human-computer interaction are handcontrolled [2]. With the support of these devices the use of mouse and keyboard can be eliminated. The next section will describe about the evolution of different gesture controlled devices.

1.1 EMBEDDED SYSTEM

A general definition of embedded systems is: embedded systems are computing systems with tightly coupled hardware and software integration, which are designed to perform a dedicated function. In some cases, embedded systems can function as standalone systems.

One class of embedded processors focuses on size, power consumption, and price. Therefore, some embedded processors are limited in functionality, i.e., a processor is good enough for the class of applications for which it was designed but is likely inadequate for other classes of applications.

Real-time systems are defined as those systems in which the overall correctness of the system depends on both the functional correctness and the timing correctness. The timing correctness is at least as importantas the functional correctness.

1.1 APPLICATION OF EMBEDDED SYSTEM

In real life we are using so many embeddedsystems for example, Home application (micro oven, washing machine, security system DVD, Mp3 player etc,)Air craft, missiles, automotive, nuclear research, personal use (mobile phone, I pod)

1.2 TYPES OF EMBEDDED SYSTEM

Embedded System is broadly categorized as Standalone embedded system

Example: Washing Machine, Networking embedded system

1.3 EMBEDDED SYSTEM NETWORK APPLICATIONS

Embedded systems are designed to do somespecific task, rather than be a general- purpose computer for multiple tasks. Some also have real-time performance constraintsthat must be met, for reason such as safety and usability; others may have low or no performance requirements, allowing the system hardware to be simplified to reduce costs.

Embedded systems are not always separate devices. Most often they are physically built-in to the devices they control.

The software written for embedded systemsis often called firmware, and is stored in read-only memory or Flash memory chips rather than a disk drive. It often runs with limited computer hardware resources: small or no keyboard, screen, and little memory.

EMBEDDED SYSTEM DESIGN AND DEVELOPMENT LIFE CYCLE

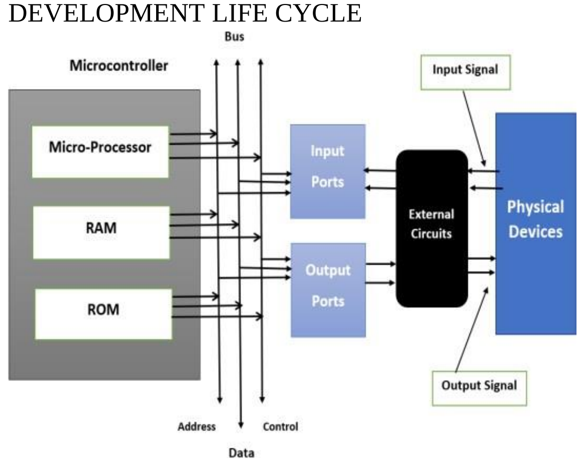
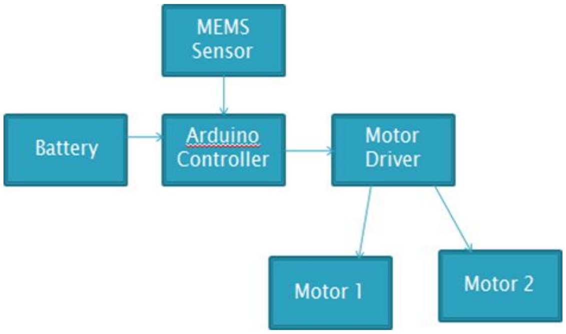


Figure: Embedded System Design

2 METHODOLOGY

- The readings (movement of the hand) are taken from the accelerometer attach on the hand. These readings are sent to Arduino uno.
- Through Arduino the readings are encoded by HT12E.
- The Encoder sends these readings through RF transmitter to the receiver attached on the car.
- These readings are sent to the receiver and are decoded by HT12D.
- After the readings are decoded they are send to L298N motor driver due to which the motors are moved.
- Thus the movement of car is achieved. There are three hand gestures which can be recognized by the car. They are RIGHT, LEFT, FORNT and BACK.

3.PROPOSED SYSTEM



MEMS Based Driving Model:

The human computer interaction can be carried out with the use of a camera, an Accelerometer device, couple of Arduino microcontrollers and Ultrasonic Distance Sensors. The Distance Sensors are mounted on the lid of the computer or laptop screen and connected using an Arduino-UNO to the computer system. The basic idea of this interface is to use the Ultrasonic Distance Sensors for capturing the gestures. The gestures are recorded by measuring the distance between the hand and the distance sensor. This gesture has 2 components – distance of the hand from the sensor and movement of the hand. This data is recorded and analyzed by the Arduino device. On the basis of this analysis, the Arduino device carries on further computation based on the measured distance and the hand gesture, which further determines the keys or combination of keys to be activated. These keys primarily are the hotkeys and other special keys or combination of keys that can perform simple tasks in the computersystem.

Advantages of Proposed System:

- Fully automatic.
- Monitoring of fire is up to date.
- Can be implemented in all places.
- Less human work.

4 HARDWARE DESCRIPTION

ARDUINO MICROCONTROLLER-

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/outputpins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHzceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connectit to a computer with a USB cable or power it with a AC-to-DC adapter or battery to getstarted.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to- serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

Revision 2 of the Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode.

Revision 3 of the board has the following new features:

1.0 pinout: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, theIOREF that allow the shields to adapt to thevoltage provided from the board. In future, shields will be compatible both with theboard that use the AVR, which operate with5V and with the Arduino Due that operate with 3.3V. The second one is a not connected pin, that is reserved for future purposes.

Stronger RESET circuit. Atmega 16U2 replace the 8U2.

"Uno" means one in Italian and is named tomark the upcoming release of Ardunio

The Uno and version 1.0 will be the reference versions of Arduino, movingforward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

Summary

Microcontroller ATmega 328

Operating Voltage 5V Input Voltage (recommended) 7-12V

Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC urrent per I/O Pin	40 Ma
DC current for 3.3V Pin	50 Ma
Flash Memory	32 KB (ATmega328) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328)
EEPROM	1 KB (ATmega328)
Clock Speed	16 MHz

Note: The Arduino reference design can use an Atmega8, 168, or 328, Current models use an ATmega328, but an Atmega8 is shown in the schematic for reference. The pin configuration is identicalon all three processors.

Power

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically.

External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector.

The board can operate on an external supply of 6 to 20 volts. If supplied with lessthan 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

The power pins are as follows:

VIN. The input voltage to the Arduino board when it's using an external powersource (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage throughthis pin, or, if supplying voltage via thepower jack, access it through this pin. 5V.This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 12V), the USB connector (5V), or the VIN pin of the board (7-12V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage your board. We don't advise it.

3V3. A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.

GND. Ground pins.

Memory

The ATmega328 has 32 KB (with 0.5 KB used for the bootloader). It also has 2 KB ofSRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library).

Input and Output

Each of the 14 digital pins on the Uno can be used as an input or output, using pinMode(), digitalWrite(), anddigitalRead() functions. They operate at 5 volts. Each pin can provide or receive amaximum of 40 mA and has an internal pull-up resistor (disconnected by default) of20-50 kOhms. In addition, some pins have specialized functions:

Serial: 0 (RX) and 1 (TX). Used to receive(RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.

External Interrupts: 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the attachInterrupt() function for details.

PWM: 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analogWrite()function.

SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPIcommunication using the SPI library.

LED: 13. There is a built-in LED connected to digital pin 13. When the pin isHIGH value, the LED is on, when the pin isLOW, it's off. is 50 mA.

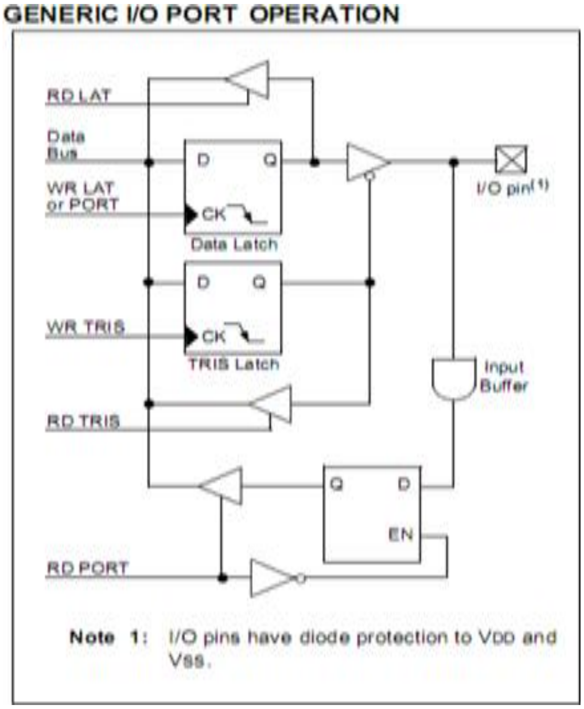
GND. Ground pins.

4.2 DEVICE FEATURES

4.2.1 I/O PORTS:

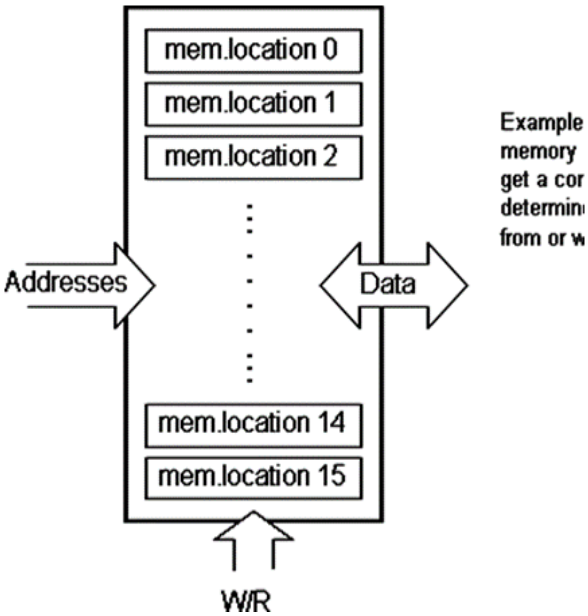
Depending on the device selected and features enabled, there are up to five ports available. Some pins of the I/O ports are multiplexed with an alternate function fromthe peripheral features on the device. In general, when a peripheral is enabled, that pin may not be used as a general purpose I/O pin.

GENERIC I/O PORT OPERATION



4.2.2 PIN OUTPUT DRIVE:

The output pin drive strengths vary for groups of pins intended to meet the needs for a variety of applications. PORTB and PORTC are designed to drive higher loads, such as LEDs. All other ports are designed for small loads, typically indication only. Table9-1 sum- marizes the outputcapabilities. “Electrical Characteristics” for more details



4.2.3 INPUT PINS AND VOLTAGE CONSIDERATIONS

The voltage tolerance of pins used as device inputs is dependent on the pin’s input function. Pins that are used as digital only inputs are able to handle DC voltages up to 5.5V; a level typical for digital logic circuits. In contrast, pins that also have analog input functions of any kind can onlytolerate voltages up to VDD.

4.2.4 PORTA, TRISA AND LATAREGISTERS

PORTA is a 7-bit wide, bidirectional port. It malfunctions as a 5-bit port, depending on the oscillator mode selected. Setting a TRISA bit (= 1) will make the corresponding PORTA pin an input (i.e., put the corresponding output driver in a high-impedance mode). Clearing a TRISA bit (= 0) will make the corresponding PORTA pin an output (i.e., put the contentsof the output latch on the selected pin).

The PORTA register reads the status of the pins, whereas writing to it, will write to the port latch. The Data Latch (LATA) registeris also memory mapped .Read-modify- write operations on the LATA register read and writes the latched output value for PORTA. The other PORTA pins are multiplexed with analog inputs, the analog VREF+ and VREF- inputs and thecomparator voltage reference output.

OUTPUT DRIVE LEVELS

Port	Drive	Description
PORTA	Minimum	Intended for indication.
PORTD		
PORTE		
PORTB	High	Suitable for direct LED drive levels.
PORTC		

4.2.5 DISPLAY UNIT

Cheapest display unit available is LCD. ButPi has an advantage that other display units can be connected to it directly through display port.

5 SOFTWARE DESCRIPTION

MPLAB IDE

MPLAB integrated development environment is a comprehensive editor, project manager and design desktop for application of development of embedded design using Microchip PIC MCU and PIC DSC.

MPLAB is a window operating system software program that runs on a PC to develop application for microchip microcontroller and digital signal controller. It is called an integrated development environment or IDE, itprovides a single integrated environment to develop code for embedded microcontroller.

Embedded C language is used in MPLAB IDE. Embedded C is a set of language extensions for the C programming languageby the C standard committee to address commonality issues that exist between C extensions for different embedded system. Historically, embedded C programming requires nonstandard extensions to the Clanguage in order to support exotic features such as fixed-point arithmetic, multiple distinct memory banks, and basic I/O operations.

- Code speed is governed by the processing power, timing constraints
- Code size is governed by available program memory and use of programming language.

The Embedded software is associated with each processor which acts as a brain in eachembedded systems. If hardware forms the body of an embedded system, embedded processor acts as the brain, and embedded software forms its soul. It is the embedded software which primarily governs the functioning of embedded systems. Goal of embedded software programming is to get maximum features in minimum space and minimum time. Embedded software needs to include all needed device drivers at manufacturing time and the device drivers are written for the specific hardware.

C18 COMPILER

The MPLAB C18 compiler is a free- standing, optimizing ANSI C compiler for the PIC microcontroller unit. The compiler deviates from the ANSI standard X3.159- 1989 only where the standard conflicts withefficient PIC micro MCU support. The compiler is a 32-bit Windows console application and is fully compatible with Microchip's MPLAB IDE, allowing secure level debugging with the MPLAB ICE in circuit emulator, the MPLAB ICD 2 in circuit debugger or the MPLAB SIM simulator.

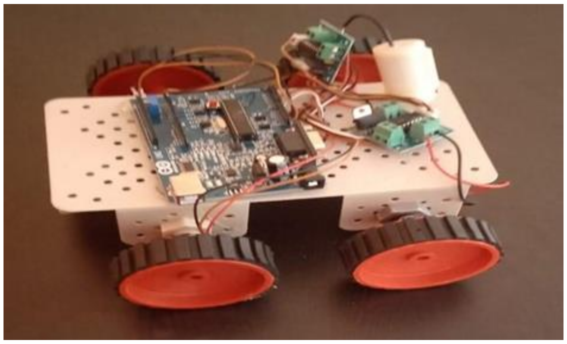
MPLAB C18 has the following features:

- ANSI '89 compatibility.
- Integration with the MPLAB IDE for easy- to-use project management and source leveldebugging.
- Generation of re-alocatable object modules for enhanced code reuse.
- Compatibility with object modules generated by the MPASM assembler, allowing complete freedom in mixing assembly and C programming in a single project.
- Transparent read/write access to external memory.
- Strong support for inline assembly when total control is absolutely necessary.
- Efficient code generator engine with multilevel optimization.
- Extensive library support including PWM, SPI™, I²C ™, UART, USART, string manipulation and math libraries.

6. APPLICATIONS

1. Can be used in heavy vehicles.
2. Can be used in small private vehicles.

RESULT-



Based on the gesture movement the car will be able to move and it will move in directions according to the angle like 45°,90°,180°,360° with respect to with direction movement

6.1 CONCLUSION

In this project we proposed and implement the Car driving system. Using this system handicapped person can drive easily. The system comprises, very low cost components such as MEMS, LCD and LEDs. In future, we are going to reduce thespeed of one vehicle according to the following distance of other vehicle. By this system, we may prevent many accidents and INDIA will become a accident less country

6.2 FUTURE SCOPE

Future scope of this system is to decrease accident numbers and providing useful details about the accidental vehicle, thereby reducing the rate of accidents taking place due to drunken driving. This system brings modernization to the existing technology in the vehicles and also maintains and improves the safety features, hence provingto be an effective development in the automobile industry.

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