

Automation Assisted Car Parking System

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Abstract — Car parking is becoming very difficult due to increase in number of cars at very rapid pace while the availability of parking space is limited. Certain amount of time is spent by people on searching for parking space & thus traffic slows down resulting in congestion. The parking space availability information is not available for the people who are looking for the space to park their vehicle. As a solution to this problem, the present work made an effort to develop an automation assisted car parking system with the capabilities like finding the empty space along the path, detecting the obstacle & avoiding collision and parking itself into the parking space effectively. This system enhances the comfort & safety of driving in constrained environment. The proposed system makes use of ATmega32 microcontroller which acts as brain of this project for monitoring and controlling various hardware components. Hardware components such as infra Red (IR) proximity sensor, magnet door sensor & MAX sonar sensor are utilized as controlling elements of this automation assisted car parking system.

Index Terms — ATmega32, Automation, IR Proximity, MAX sonar, Microcontroller, Parking, Sensor.

1 INTRODUCTION

IN In this era of advanced technology, engineers & scientists are trying to replace human workers with smart devices, machines & systems in our daily life. The main idea is to accelerate the rate of at which work is being done & to improve the existing process flow & production techniques. In recent years, many innovative & intelligent technologies are being adapted in engineering field like automobile to improve the driving comfort, safety, luxury etc of the vehicles. One among the new intelligent technology in automobiles is automatic self car parking system. There are 2 main reasons for the use of this technology in automobiles; first one is that the mobile robots have better potential to replace the human beings with their good mobility & manipulatability. A mobile robot can perform the specified task repeatedly with high degree of precision when compared to human beings. Second reason is that advancements in sensor technology have contributed immensely to the development of mobile robots to perform the task of self parking. The most common problem faced by majority of the beginners or inexperienced drivers is the parking of cars in a very less space. Self-parking cars can also help to solve some of the parking and traffic problems in dense urban areas. A self-parking car can fit into smaller spaces than most drivers can manage on their own. This allows peoples to accommodate more number of cars in particular amount of space or same number of cars can be parked in less space.

In this paper, a system which makes driving task safer and more comfortable with the help of technology & automation has been put forward. Considerable amount of resources & technology tools are being utilized to develop a perfect system for communication, information & data handling and automatic controls involved in development of the whole system.

2 AVR ARCHITECTURE

The AVR microcontroller was developed by Atmel Corporation in the year 1996. This microcontroller executes most of the instructions given to it in a single execution cycle or at a time which is very advantageous. AVR microcontrollers are 4 times faster than PIC type microcontrollers & additional advantage is that they consumes less power, hence they are utilized in different power saving modes. There are 3 types of AVR microcontrollers namely Tiny AVR, Mega AVR & XMega AVR. This system makes use of Mega AVR (ATMega32) microcontroller for its working.

The ATmega32 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. The chip ISP (In System Programming) Flash allows the program memory to be reprogrammed in-system through an SPI serial interface. This reprogramming is being done by a conventional non-volatile memory programmer or by an On-chip Boot system program running in the AVR core. By combining the 8-bit RISC CPU with In-system self programmable flash on a monolithic chip, the Atmel's ATmega32 Microcontroller is one of the most powerful device which gives high flexibility & cost effective solutions to many of the real world embedded controlled applications.

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3 METHODOLOGY

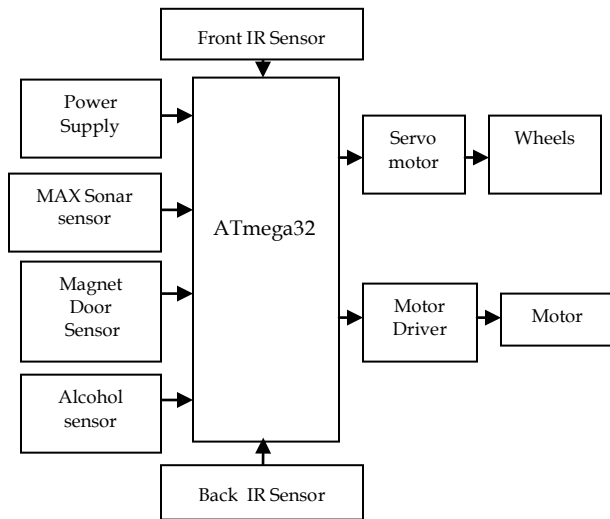


Fig. 1. Block Diagram

In this system, the power supply activates the circuit by supplying the power to the ATmega32 microcontroller board using battery, then the microcontroller initializes the general purpose input output. The microcontroller continuously monitors all the sensor parameters. This system performs the intended task of parking the car by assigning various functions to different sensors & hardware with the help of software programs. Here magnet door sensor checks for the door closing condition whereas alcohol sensor (MQ-2 gas sensor) checks the presence of alcoholic content in the system. Then space availability for the parking will be detected by using MAX Sonar sensor and IR proximity sensor detects the presence of obstacle in the vehicle's path of travel. Servomotor is being utilized in the system for precise angular rotation as well as positioning when vehicle is reversing for the sake of parking.

4 FLOWCHART

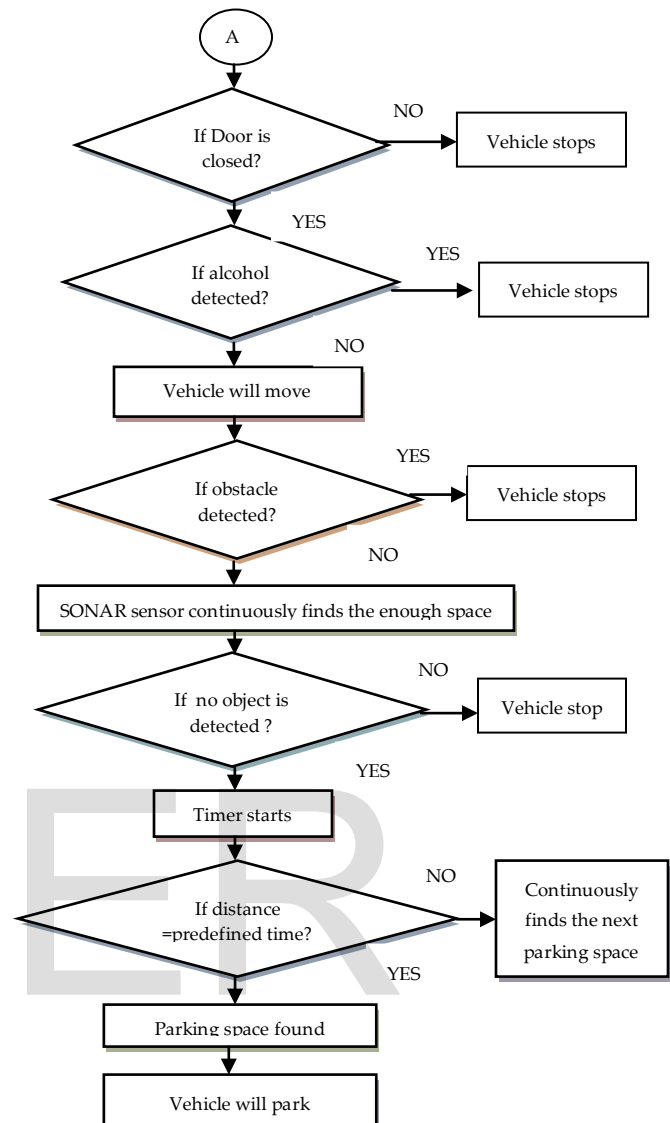
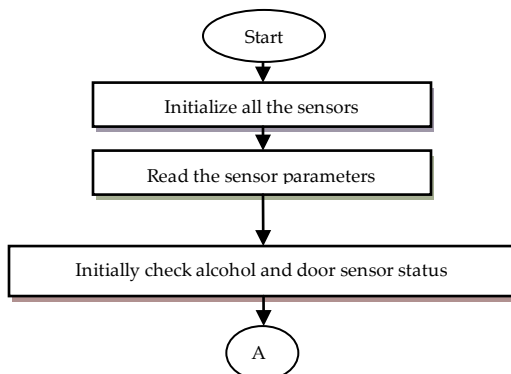


Fig. 2. Flowchart of the system

The flowchart shown in Fig. 2 gives the flow of working in the automation assisted car parking system. The microcontroller activates all the sensors & also reads all the parameters of them. Initially it checks the door locking condition & presence of alcoholic content in the system, if both the conditions are satisfied then it allows the movement of the vehicle. Then IR sensor detects the presence of obstacles, if obstacle not is found; system moves to the next step of finding the space availability with the help of MAX Sonar sensor. The availability of required space is calculated by setting the Timer, if the time period is equal to the predefined value, then the system proceeds for parking with the use of Servomotor for precise angular rotation & positioning.

5 HARDWARE IMPLEMENTATION

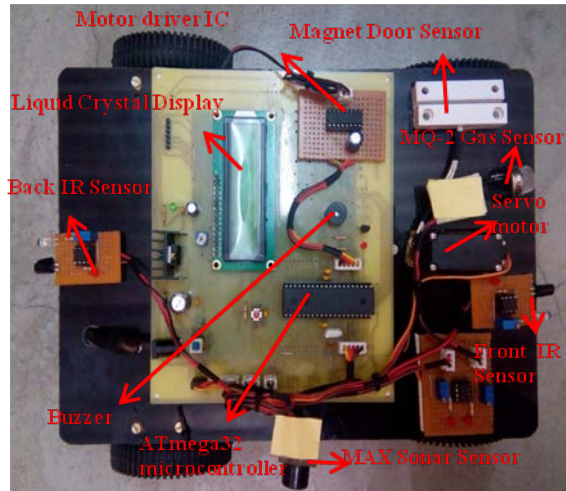


Fig.3. Hardware implementation of the system

As shown in the Fig. 3, ATmega32 microcontroller which is brain of the whole system is connected a power source. Microcontroller monitors & controls the all sensors & hardware components which are used in the system. All the input sensors which are used in the system connected to microcontroller. The microcontroller output data will be fed to servomotor as well as motor driver movement of the vehicle.

Battery provides the power to the whole system, this power actuates the microcontroller & all the hardware components. Initially sensing data of door locking condition as well as alcoholic content presence will be given to microcontroller by magnet door sensor & MQ-2 gas sensors respectively. Vehicle starts moving in a straight line when these 2 initial conditions are satisfied. At this time the IR proximity sensor detects the presence of obstacle in the path of vehicle's travel & MAX Sonar sensor finds the availability of empty space in the parking area. When no obstacle is detected & enough space is available, vehicle will be reversed by a Servomotor for precise angular rotation & positioning. Finally vehicle will be parked by combinational working of all sensors & hardware devices.

6 APPLICATION

- Solves the problem of parking in shopping complex, public place or apartments.
- It can be used in automobile servicing centers.
- It can also be used in automobile manufacturing industry.
- The parked cars and their contents are more secure since there is no public access to parked cars.
- Minor parking lot damages such as scratches and dents are eliminated.
- driving around in search of a parking space is eliminated, thereby reducing time and fuel consumption.

7 CONCLUSION

Intelligent Automation Assisted Car parking system have been implemented by using the ATmega32 microcontroller. The ATmega32 microcontroller is capable of parking the vehicle in an appropriate parking space effectively by integrating the sensor data. The system has the ability to make the vehicle to avoid collisions to ensure the safe parking. The system is successfully performing the desired task of car parking with the help of various hardware devices like MAX sonar sensor, IR proximity sensor, magnet door sensor, MQ-2 gas sensor, which are activated by AVR Studio 6. The system helps us to park the vehicle in the available parking space on its own with less human intervention.

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