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Autonomous Movement in Car with The Base of RFID

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***Abstract*—**Radio Frequency Identification (RFID) system is looked upon as one of the top ten important technologies in the 20th century and find its applications in many fields such as car industry. The intelligent cars are one important part of this industry and always try to find new and satisfied intelligent cars. The purpose of this paper is to introduce an intelligent car with the based of RFID. By storing the moving control commands such as turn right, turn left, speed up and speed down etc. into the RFID tags beforehand and sticking the tags on the tracks Car can read the moving control commands from the tags and accomplish the proper actions.

***Keywords*—**RFID, Intelligent car, Application of RFID in cars

I. Introduction

THE Intelligent Car initiative is an attempt to move towards a new paradigm, one where cars don't crash anymore, and traffic congestion is drastically reduced. They can support drivers to avoid accidents, and even call the emergency services automatically in the event of a crash. They can also be used in electronic traffic management systems or the optimizing of engine performance, thus improving energy efficiency and reducing pollution.

Motivation of creating intelligent cars:

- Traffic accidents.
- Military operations.
- Improve efficiency.
- Technical challenge.
- The LAW.

We make intelligent a car by many factors and many aspects such as:

- Speed Control: (ignition, accelerates, cruise, decelerate, stop, backup)
- Direction: (turn left / right, goes straight)
- Signals: (signal turns, turn lights on / off, sound horn)
- Climate :(activates wipers, open / close windows, open / close vents, activate heater / fan)
- Maintenance :(refuel, wash, service)
- Abnormal Conditions: (breakdown, accident, theft)
- Vision:(night, bad weather, corners / up hill)

  We can consider many solving method for this problem such as machine vision, GPS with digital maps, sensors, RFID and radar.

In this paper we intelligent car with the base of RFID technology. [1]

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II. RFID Technology

RFID is only one of numerous technologies grouped under the term Automatic Identification (Auto ID), such as bar code, magnetic inks, optical character recognition, voice recognition, touch memory, smart cards, biometrics etc. Auto ID technologies are a new way of controlling information and material flow, especially suitable for large production networks.

The RFID technology is a means of gathering data about a certain item without the need of touching or seeing the data carrier, through the use of inductive coupling or electromagnetic waves. The data carrier is a microchip attached to an antenna (together called transponder or tag), the latter enabling the chip to transmit information to a reader (or transceiver) within a given range, which can forward the information to a host computer. The middleware (software for reading and writing tags) and the tag can be enhanced by data encryption for security-critical application at an extra cost, and anti-collision algorithms may be implemented for the tags if several of them are to be read simultaneously.[2]

They are categorized according to there frequency ranges. Some of the most commonly used RFID kits are as follows:

1) Low-frequency (30 KHz to 500 KHz)
2) Mid-Frequency (900KHz to 1500MHz)
3) High Frequency (2.4GHz to 2.5GHz)

These frequency ranges mostly tell the RF ranges of the tags from low frequency tag ranging from 3m to 5m, mid-frequency ranging from 5m to 17m and high frequency ranging from 5ft to 90ft.

A basic RFID system consists of three components:

1- An antenna or coil
2- A transceiver (with decoder)
3- A transponder (RF tag)

A. Antenna or Reader or coil

The antenna emits radio signals to activate the tag and read and write data to it. Antennas are the conduits between the tag and the transceiver, which controls the system's data acquisition and communication. Antennas are available in a variety of shapes and sizes; they can be built into a door frame to receive tag data from persons or things passing through the door, or mounted on an interstate tollbooth to monitor traffic passing by on a freeway. The electromagnetic field produced by an antenna can be constantly present when multiple tags are expected continually. If constant interrogation is not required, a sensor device can activate the field.Often the antenna is packaged with the transceiver and decoder to become a reader (a.k.a. interrogator), which can be configured either as a handheld or a fixed-mount device. The reader emits

radio waves in ranges of anywhere from one inch to 100 feet or more, depending upon its power output and the radio frequency used. When an RFID tag passes through the electromagnetic zone, it detects the reader's activation signal. The reader decodes the data encoded in the tag's integrated circuit (silicon chip) and the data is passed to the host computer for processing.

B. RF Transceiver

The RF transceiver is the source of the RF energy used to activate and power the passive RFID tags. The RF transceiver may be enclosed in the same cabinet as the reader or it may be a separate piece of equipment. When provided as a separate piece of equipment, the transceiver is commonly referred to as an RF module. The RF transceiver controls and modulates the radio frequencies that the antenna transmits and receives. The transceiver filters and amplifies the backscatter signal from a passive RFID tag.

C. Tag

An RFID tag is comprised of a microchip containing identifying information and an antenna that transmits this data wirelessly to a reader. At its most basic, the chip will contain a serialized identifier, or license plate number, that uniquely identifies that item, similar to the way many bar codes are used today. A key difference, however is that RFID tags have a higher data capacity than their bar code counterparts. This increases the options for the type of information that can be encoded on the tag, including the manufacturer, batch or lot number, weight, ownership, destination and history (such as the temperature range to which an item has been exposed). In fact, an unlimited list of other types of information can be stored on RFID tags, depending on application needs.

RFID tags and readers can be grouped under a number of categories.

Passive

- Also called ‘pure passive’, ‘reflective’ or ‘beam powered’
- Obtains operating power from the reader
- The reader sends electromagnetic waves that induce current in the tag’s antenna, the tag reflects the RF signal transmitted and adds information by modulating the reflected signal

Semi-passive

- Uses a battery to maintain memory in the tag or power the electronics that enable the tag to modulate the reflected signal
- Communicates in the same method, as the other passive tags

Active

- Powered by an internal battery, used to run the microchip’s circuitry and to broadcast a signal to the reader
- Generally ensures a longer read range than passive tags
- More expensive than passive tags (especial because usually are read/write)
- The batteries must be replaced periodically

We can Classification of RFID Tags by Memory Type

- Read-only
- The memory is factory programmed, can not be modified after its manufacture
- Its data is static
- A very limited quantity of data can be stored, usually 96 bits of information
- Can be easily integrated with data collection systems
- Typically are cheaper than read-write tags

Read-write

- Can be as well read as written into
- Its data can be dynamically altered
- Can store a larger amount of data, typically ranging from 32 Kbytes to 128 Kbytes
- Being more expensive than read-only chips, is impractical for tracking inexpensive items[3]

III. The recent Application of Rfid in Cars

The potential for usage of RFID tags in cars is vast. Such as: We indicated some of them in briefly.

A. Parking Management

RFID technology is rapidly gaining ground in the access control industry. One area where it can provide significant advantages is in vehicle access control. Cars, trucks, or other vehicles even forklifts in warehouse environments can be tagged with passive RFID transmitters. When a restricted area, or a parking lot entrance, is approached, a reader at the site accesses the tag. If the vehicle is authorized, the gate opens and it is allowed to pass. In the very simplest systems, the mechanism works in pass/fail mode access granted or access denied. However, if the data from the tag can be connected with a database, functionality of the system is greatly enhanced. Clearly it is not practical or cost effective to locate a PC at each entry point where an RFID reader and the gate control mechanism are located.[4]

Fig. 1 Parking Management with RFID

B. RFID Security Systems for Cars

RFID security systems installed in new vehicles by car manufacturers have succeeded in reducing car thefts, according to statistics gathered by immobilizer manufacturers. These RFID security systems work by fitting a car's ignition key with a passive RFID transponder containing a unique ID code. Whenever the key is inserted into the ignition switch, it activates an RFID reader connected to a control module in the engine's central computer (which controls such things as the car's ignition and fuel systems) and is wired to an antenna built into the vehicle's steering column. The RFID reader

generates a random number, which is transmitted to the key. The key's transponder combines the random number with its own unique serial number, encrypts the new number and transmits it back to the car's RFID reader. If the numbers don't match, the car won't start. [5]

C.Car Number Plate

These embedded active RFID tags will allow the tracking of vehicles in real time, and help law enforcement determine the cars license numbers. Whether the car is moving or stationary, plate numbers can be hard to see at sharp angles, in heavy weather, or when there is thick fog. This technology could be incorporated into vehicles around the world to simplify car rental transactions, improve service quality and deter theft. Some similar systems are also coming equipped with two-way radio or cellular connectivity that can allow an owner or law enforcement to locate and track a cars travel.

D.Toll Payment System

RFID Toll Road Payment systems have really helped a lot in reducing the heavy congestion caused in the metropolitan cities of today. It is one of the easiest methods used to organize the heavy flow of traffic. When the car moves through the toll gate on any road, it is indicated on the RFID reader that it has crossed the clearing. The need for manual toll based systems is completely reduced in this methods and the tolling system works through RFID. The system thus installed is quite expedient reducing the time and cost of travelers since the tag can be deciphered from a distance. The people traveling through this transport medium do not need anything else to get on a highway; instead the RFID tag carried by their vehicle does every thing. A commuter traveling through this medium gets to know how much amount has been paid and how much money is left in the tag. It does not require the person to carry cash with him to pay the toll tax all the time. The long queue waiting for their turn is reduced, which in-turn reduces the consumption of fuel. The RFID toll payment systems are really used in preventing trespassing on borders. The software solution developed can ensure a smooth running of vehicles without any need for further development. The software controlling these RFID tags and readers is easy to implement.[6]

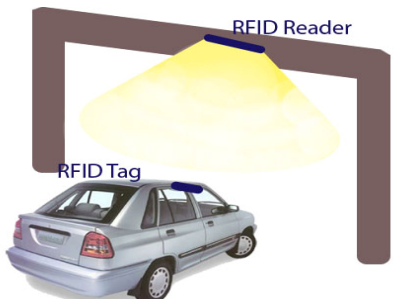

Fig. 2 RFID Toll Road Payment systems

IV.RFID BASED AUTONOMOUS MOBILE CAR

In this section we introduce a RFID-based autonomous mobile car for more extensively application of RFID systems. We need al least one microcontroller for controlling the autonomous mobile car and to communicate with RFID reader. By storing the moving control commands such as turn right, turn left, speed up and speed down etc. into the RFID tags beforehand and sticking the tags on the tracks, the autonomous mobile car can then read the moving control commands from the tags and accomplish the proper actions. Due to the convenience and non-contact characteristic of RFID systems, the proposed mobile car has great potential to be used for intelligent cars.

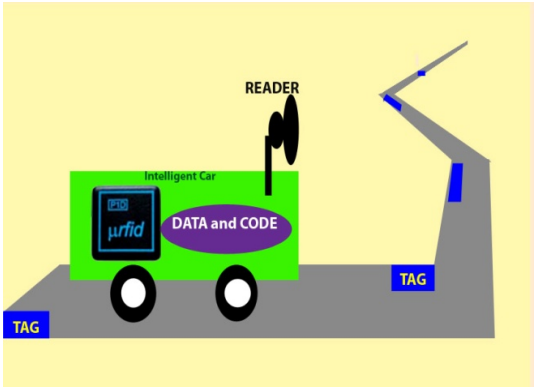

Fig. 3 RFID-based Autonomous Mobile Car

The system uses a UF-band active tag that is excited by LF electromagnetic induction waves to transmit an ID. The semi passive tag that pre-store the direction and necessary information of track are embedded in the street surface especially near the intersection. The reader on the car reads the direction data and takes the proper actions. The system use semi passive tag to optimize costing. [7], [8]

V.CONCLUSION

In this paper try to introduce and intelligent car in movement with the base of RFID and two major component of it Tag and reader. We store moving control commands in tags and inserted them in track. Reader in RFID reads the information and sends to micro controller for moving and accomplished the proper actions.

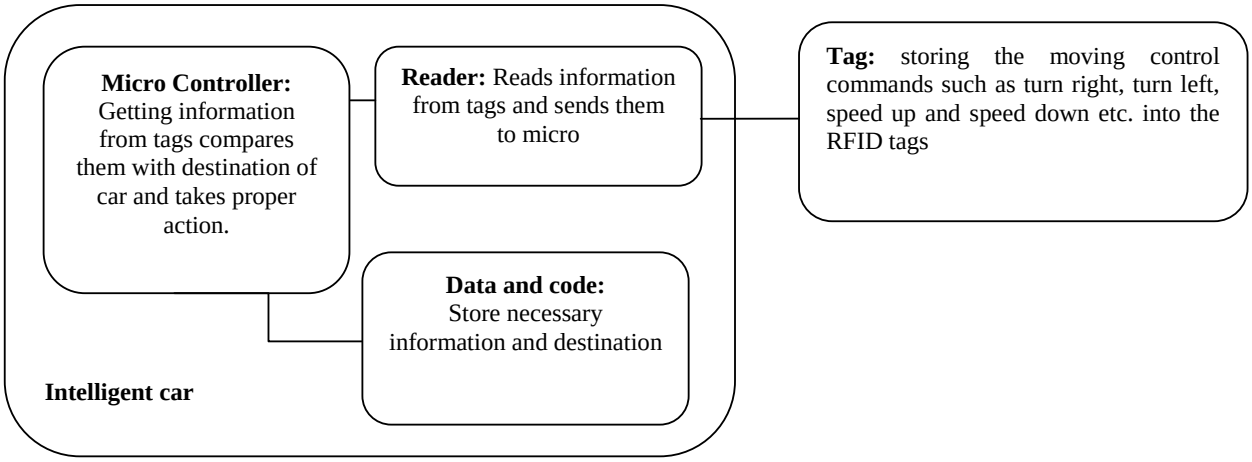

Fig. 4 Block Diagram of System

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