

Anti-Theft Control of Vehicle Using CAN Protocol

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Abstract - Automobiles, invariably comprises of digital control systems in order to avoid Vehicle Thefts the minute changes can be done with low cost that protects vehicle from burglary. The paper presents two Electronic locking Systems. First system uses Radio Frequency (RF) module to unlock the door from remote control. Where in if user presses the remote key to unlock the door of car signal transmitter in the Remote transmits the signals to the RF Receiver which is at the door of the car. The Signal sent by the RF Transmitter to the RF Receiver is unique code so the door cannot be either locked or unlocked without this remote. Hence the System provides the authentication at the door with the remote. For the authentication purpose user has to enter a unique password to know whether the owner is accessing the car or an intruder. The electrical ignition of vehicle can be unlocked only if correct password is entered and sends message to the owner .If the user fails to enter the correct password in three trials, an Short Message Service (SMS) will be sent to the Owner and Police with the vehicle number and the location be tracked using a Global Positioning System (GPS) Module through Global System for Mobile communication (GSM) Module about the unauthorized usage and also buzzer be triggered. If the burglar takes away the car then the owner can control the car through GSM and all these subsystems are communicated through Control Area Network (CAN) BUS interfaced with Nuvoton Micro controller.

Index Terms - CAN BUS, GPS Module, GSM Module, RF Module

I. INTRODUCTION

Today Cars, invariably consist of digital control systems as a consequence of constant growth in technology. Recent Vehicles contains large number of Electronic Control Systems and already there are large numbers of Electronic Control Units present [1]. Electronic Control Units (ECUs) are increasingly being deployed in automobiles to control one or more electronic subsystems to realize various functions. When someone drives a car there are many signals that are passed between the various Electronic Control Units embedded inside the car. Output signals from an Electronic Control Unit contain information about the current state of the car as the driver interacts continuously with the car.

In recent years, vehicle thefts are increasing at a faster rate around the world so people have started to use the theft control systems installed in their vehicles. The commercially available anti-theft vehicular systems are very expensive. Here, we make a modest attempt to design & develop a simple, low cost vehicle theft control scheme using an inbuilt Nuvoton Micro Controller and system also involves Global System for Mobile Communication (GSM) module, Global Positioning System (GPS) Module and Radio Frequency (RF) Module.

II. BLOCK DIAGRAM

The Fig. 1 shows the block diagram of the Proposed System in which it contains three NUC140VE3AN Micro Controllers interfaced with different communication peripherals and Input output Devices. Different communication peripherals used in the system are GSM Module, GPS Module, RF Module and CAN BUS. The I/O devices used are a 3X3 Key Matrix for input and LCD Display, Buzzer for Output.

The working of the Block Diagram can be explained as when the user presses the remote key to unlock the door of the car, the RF Transmitter in the Remote transmits the signals to the RF Receiver which is at the door of the car. The Signal sent by the RF Transmitter to the RF Receiver is unique code so the door cannot be either locked or unlocked without this remote.

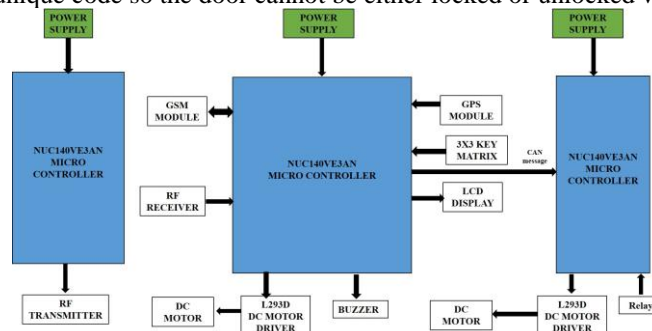


Fig. 1 Block Diagram of Anti-Theft Control of Car

Hence the System provides the authentication at the door with the remote. This system not only provides the authentication to unlock the door it will also provide authentication to unlock the Electrical ignition of the car to enter the unique four digit Password

through 3X3 Key matrix of NUC140VE3AN Micro Controller. The password should be entered in three attempts to unlock the electrical ignition. If the password entered is wrong then the system notifies the owner by SMS through GSM Module as “UNAUTHORIZED USAGE OF CAR” and an SMS will be sent to the Owner and Police with the vehicle number and the location be tracked using a GPS Module through GSM Module and there turns on the Alarm to threaten the intruder else if Password entered is correct then the owner will be notified by the SMS through GSM Module as “AUTHORIZED USAGE OF CAR” and the Electrical Ignition will be ON. However, the owner can control the ignition through his mobile phone by sending certain message to the GSM Module and he can even track vehicle using GPS Module even after the vehicle has been theft through his Mobile.

III. HARDWARE COMPONENTS

A. Control Unit

The NUC140VE3AN Micro Controller uses ARM Cortex-M0 core embedded microcontroller for industrial control and the applications which needed Rich communication functions. The Cortex-M0 is the newest ARM embedded processor with 32-bit performance and at a cost equivalent traditional 8-bit microcontroller.

The NUC140VE3AN Micro Controller with

- Cortex-M0 core
- Runs up to 50MHz,
- 32K/64K/128K-byte embedded flash
- 4K/8K/16K-byte
- Embedded SRAM PDMA, UART, SPI/SSP, I2C, PWM Timer, GPIO, LIN and CAN.

The Fig. 2 shows the Nuc140VE3AN Learning Board with above all features Mentioned.



Fig. 2 Nuvoton Learning board

B. GSM Module

Over billion people use GSM service across the world. GSM SIM900A, works on frequencies 900/ 1800 MHz the Modem is coming with RS232 interface, provides serial Transistor Transistor Logic (TTL) interface for easy and direct interface to microcontrollers, it is suitable for SMS as well as Voice. The onboard Regulated Power supply allows you to connect wide range unregulated power supply. Using this modem, one can make audio calls, SMS Read, SMS Send, Attend the incoming calls etc. through simple AT commands.



Fig. 3 GSM SIM 900A Module

C. GPS Module

A vehicle tracking system combines the installation of an electronic device in a vehicle, or fleet of vehicles, with purposed designed computer software at least at one operational base to enable the owner to track the vehicle's location. Modern vehicle tracking systems commonly use GPS technology for locating the vehicle. Vehicle information can be viewed on electronic maps via the

Internet or specialized software. Fig.4 Shows the GPS SIM28M Receiver Module used. SIM28 SIM Com presents a high performance and reliable assisted GPS module-SIM28. This is a standalone L1 frequency GPS module in a SMT type with MTK high sensitivity navigation engine, which allows you to achieve the industry’s highest levels of sensitivity, accuracy and Time-to-First-Fix (TTFF) with lowest power consumption.



Fig. 4 GPS SIM28M Receiver Module

D. RF Module

In many situations a communication link between to devices becomes essential. This communication can be wired or wireless. If two devices are close to each other (like a MCU and a Memory) a wired link is preferred. However in many situations two devices are reasonably far apart. In that case a wireless link is preferred. RF Modules are easy to use boards that include encoders, decoders, addressing, RF data processing and even the antenna, in a simple fully range tested board that is ready to plug right into your project. Just apply +5VDC, ground, and the communication pins you require and enjoy hassle free wireless communications. Fig. 5 shows the RF Communication between two Micro Controllers. RF Communication widely used, including Bluetooth, Radios, Cell phones, Satellite etc. RF Communication is of wide range, from few meters to millions of kilometers (Can be used to control Robots in Mars). Does not requires two devices to be in line of sight. RF Communication Can cross many obstacles.

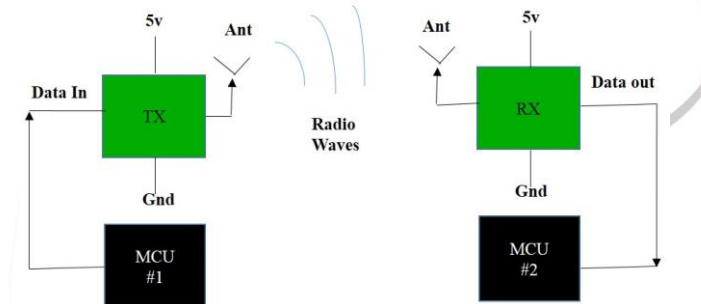


Fig. 5 RF Module Connected to two Micro Controllers

E. CAN Bus

Controller Area Network (CAN) is a serial data communications bus for real-time applications, developed by engineers at Robert Bosch. Evaluated existing serial bus systems regarding their possible use in passenger cars and found that none of the available network protocols were able to fulfill the requirements of the automotive applications in 1980’s. CAN is based on the “Broadcast Communication mechanism”, which is based on a *message-oriented transmission protocol*. The Controller Area Network (CAN) is used in a broad range of embedded as well as automation control systems. Application of CAN includes in the area of CAN in cars & Truck Engine, Maritime Applications, Avionics System Networks, Building Automation etc. Fig.6 Shows the CAN Bus Interfaced with two Nuvoton Learning boards for Turning ON the Motor through Motor Driver.

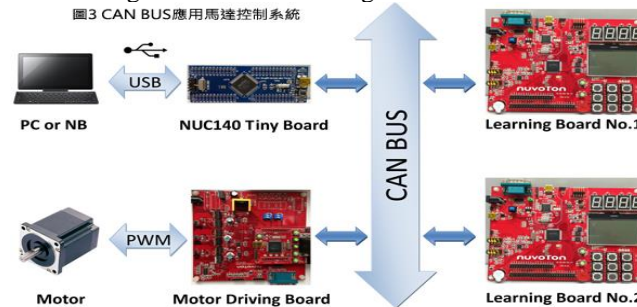


Fig. 6 CAN BUS Connected Between Two Controller Boards

IV. PROTOTYPE FOR THE ANTI-THEFT CONTROL OF VEHICLE USING NUVOTON CONTROLLER

The Fig. 7 Shown below shows prototype model for Anti-Theft control of vehicle using Nuvoton Micro Controller. This is done using KEIL-uvision4 software and the code for this prototype is written in Embedded C language.

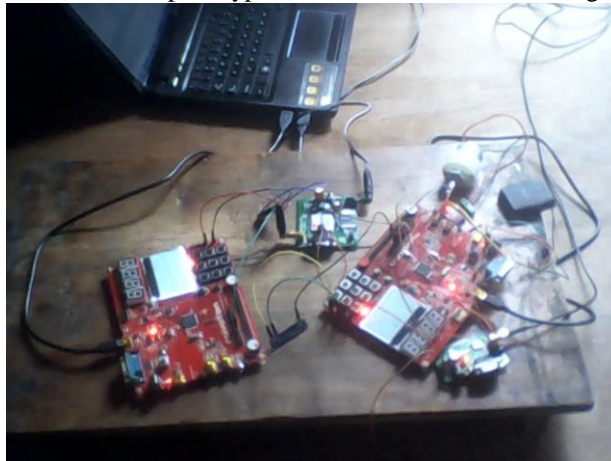


Fig. 7 Anti-Theft Control of Vehicle using Nuvoton Micro Controller

Results for this prototype shown above are notified by SMS using GSM Module and location is determined by GPS Module and Send it by SMS to the Owner.

V. CONCLUSION AND FUTURE SCOPE

This is the Prototype of a Theft Control System which can be practically implemented any automobiles as one of the vehicle's electronic control unit which will be connected to the CAN Bus as one more node. The developed system is less expensive. As we are using GSM and GPS they should be within the range of network else it should store the information and process it to owner when signal is available.

So this Theft control System can be communicated through the CAN BUS to ignite the engine in the future.

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