Smart Key

Car central locking system using Android application as a key

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Abstract— **Today, in the era of smart phones which can act as your ATM card, camera, newspaper, GPS navigator, locate you exactly without a compass, its desirable that they even replace your car keys and make the pockets lighter at the same time remote control your car. Smart key, a vehicle security that is controlled by an Android application is aimed to abolish the burden of carrying keys by replacing it with a virtual key, A Smartphone Application. This paper deals with the design and implementation of Smart key system. It consists of two parts, hardware and the software. Hardware includes the interfacing of the AUBTM-20 Bluetooth module and an electronic lock with the 8051 microcontroller to receive and process the commands sent by the Android application. Software includes an Android application which requires the Bluetooth services of the phone to establish a connection with the hardware module, The Android application basically controls the hardware placed in the vehicle through the signals sent over Bluetooth, to perform operations such as lock, unlock, panic, find car. Smart key successfully replaces the traditional usage of keys and makes it a whole-lot easier to just carry single equipment, a smart phone instead of a bunch of keys. Smart key extends the field of automotive electronics to a new level.**

This system can also be used in other places like the home security system, bank lockers etc. where security is the prime objective.

Keywords-AUBTM-20 Bluetooth module, Android app, SPP, 8051 micro-controller.

I. INTRODUCTION

We are living in an era where Smart phones rule the community of mobile devices. Smartphone, a mobile phone built on a mobile computing platform with more advanced computing ability, does much more than simple texting and calling. They can send and receive email miles away from the computer. They can transfer funds or pay bills all without a bank teller. They can view the latest groundbreaking news. They are able to video chat with people across the globe. They can play music and video games. They can show movies and weather. They can do all of this and so much more, and yet, they fit comfortably in a pocket or purse.

When smartphone can replace a number of devices that we daily use, into simple applications that are installed in it; why not replace the bunch of keys that we carry in our pocket, into a virtual key, an application in the smartphone. This thought led the design of Smart Key - a system that can replace the vehicle keys with an android application.

Comfort, Safety and Luxury are the main goals which the car makers strive to achieve. Smart key is one such system which inculcates all the three characters. Smart Key is fully customized, integrated, vehicle security system, controlled by a smartphone application. The system is aimed to abolish the burden of carrying keys by replacing it with a virtual key, a smartphone application. It is fascinating to know that a simple touch on the smartphone app can actually lock/unlock the vehicle providing more security, comfort and luxury.

The system consists of two parts. The software part includes the design of android application and the Hardware part includes the design of circuit that can receive signals sent by smartphone via Bluetooth and perform appropriate functions.

II. FEATURES OF THE SYSTEM

Keeping in mind the three goals comfort, safety and luxury, the following features are provided in the Smart Key system.

- A tap on the Lock button should lock the vehicle.
- A tap on the Unlock button should unlock the vehicle.
- A tap on Find-Car button should sound the horn.
- A tap on the Panic button should sound the alarm.
- Parking meter is provided to record the time interval for which vehicle was parked.

The first four operations require the car to be in the Bluetooth range of smartphone and both should be connected.

III. MATERIALS AND METHODOLOGY

A. *Materials Required*
1) Design of the hardware module requires the following components:
- Intel 8051 micro-controller.
- AUBTM-20 Bluetooth module with UART.
- Electronic Lock.
- Speaker.

- PCB.
- Kiel micro vision software.
- SPI burner software.

2) Design of software (the application) requires:
   - An Android Smartphone.
   - Eclipse IDE.
   - Android SDK.
   - VM-ware workstation.
   - Adobe Photoshop.

B. Methodology

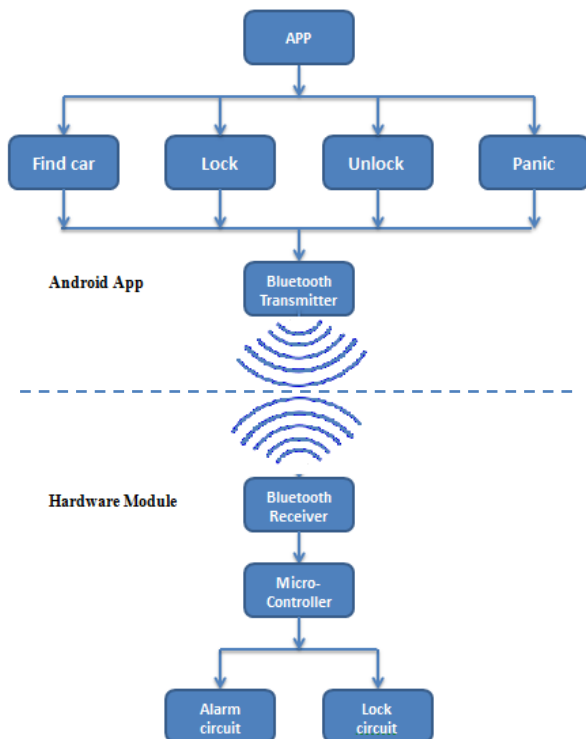The block diagram for the Smart key is as given below.

Figure 1.Block diagram for Smart Key

From the above figure we can infer that the design and development of Smart Key can be divided into two parts

1) The software:

It includes the development of an android application which requires Eclipse IDE with Android SDK installed in it. The Android software development kit (SDK) includes a comprehensive set of development tools. These include a debugger, libraries, a handset emulator based on QEMU, documentation, sample code, and tutorials. The officially supported integrated development environment (IDE) is Eclipse using the Android Development Tools (ADT) Plugin, to create, build and debug Android applications. Both Android SDK and Eclipse IDE are open source software's and hence no cost needed for app development.

The App aims to provide a pictorial graphical interface. It app has 4 screens namely main screen, login screen, log screen, account management screen and log out screen. We use Adobe Photoshop to design the layouts required for the app. Adobe Photoshop is a graphics editing application popular for its extensive amount of features. Photoshop is also, currently, the leading graphics editing application.

The app communicates with the hardware module by establishing a Bluetooth connection with it. The App makes use of the Bluetooth APIs present in the Android SDK to establish the connection with the AUBTM-20 Bluetooth module present in hardware.

2) Hardware :

The hardware part includes interfacing 8051 micro-controller with AUBTM-20 Bluetooth module and an electronic lock.

AUBTM-20 is Bluetooth Core V2.0 compliant module with Serial Port Profile (SPP). SPP defines procedures required for configuring serial cable connections between peer Bluetooth devices using RFCOMM. The module is interfaced with 8051 micro-controller through the UART port.

Intel's 8051 is the micro-controller used in the Smart Key system. One particularly useful feature of the 8051 core is the inclusion of UART, which makes it simple to use the chip as a serial communications interface. The reason for choosing 8051 µc is to demonstrate that the system can be designed with a very trivial µc which helps in lowering the cost of system.

Kiel micro vision and SPI are the software used to develop and burn the program for micro-controller.

IV. WORKING

The app controls the hardware by transmitting signals using Bluetooth. The user has to authenticate himself, to use the app. This is to ensure that the phone is not fallen into hands of unauthorized users. Then he should select the car to which he wants to establish Bluetooth communication with. After selecting car, user can now select any of the 4 operations (lock, unlock, panic or find car) to perform the action.

Figure 2.Screen shots of Smart Key app.

The app sends appropriate signal via Bluetooth to micro-controller, which in turn recognizes what signal it is and performs the task related to the received signal. An acknowledgement signal is sent to the user. Given below is the circuit diagram for the hardware part.
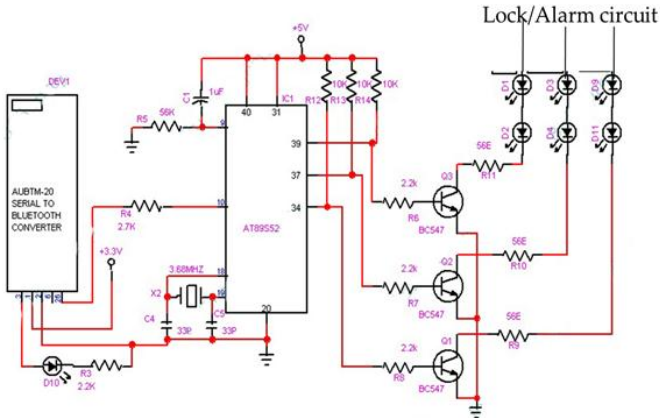

Figure 3. Circuit diagram for Hardware part of Smart Key.

The sequence diagram illustrates the steps involved in using the system as discussed above, and also shows the various interactions that take place between different objects, while using the system.
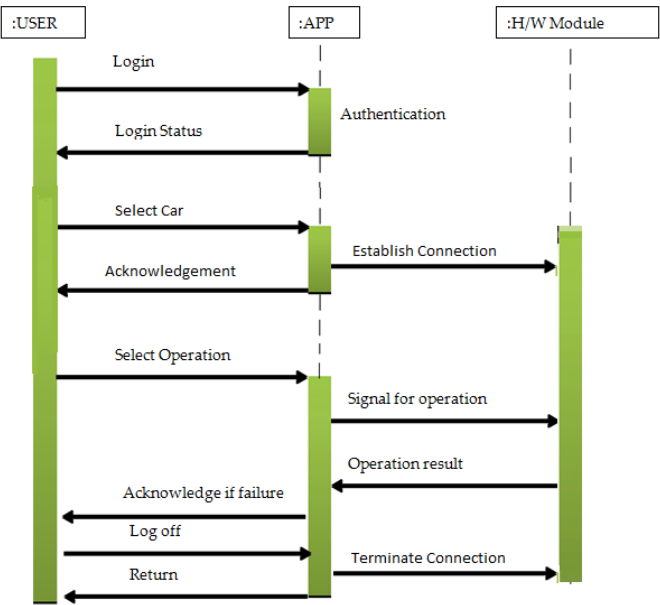

Figure 4. Sequence diagram for Smart Key.

V. ADVANTAGES OF THE SYSTEM

The following are the advantages of the proposed system.

- Now-a-days many cars have Bluetooth facility within them for example the "Chevrolet Beat". In such cars the cost of the system turns out to be almost nil, as, all equipments are already present in car and just functionality is to be provided.

- The system lives up with the projects main objective that is to abolish the burden of carrying keys and provide security, comfort and luxury to vehicle.

- The system can be installed in a wide range of vehicles including cars, jeeps, busses, trucks etc. and can be controlled by the smartphone app.

- The system serves as a Keyless Entry System.

- It can also be used to provide home security where in locking and unlocking of house doors can be done by using App.

- In whole, the app can act as a single key to many locks such as those present in car, doors of house, lockers, drawers, etc. provided the smart key system is installed in each of case.

VI. CONCUSION AND FUTURE WORK.

A. Conclusion

We were able to develop a fully customized, integrated Car central locking system that is controlled by an Android app. During the course of the project, we enriched our knowledge about Bluetooth communication and also the latest technology – Android. The most challenging task was to build the hardware module and make it to communicate with phone via Bluetooth. We passed all the hurdles and successfully implemented the system. We are now capable of converting smaller tasks at work place that need physical work, into virtual by using Smartphone and sending signals via Bluetooth to devices, to get the work done.

B. Future Work

With Bluetooth and Microcontroller present inside the car, we can add numerous features to the app which may include switching on and turning off of various systems inside the car like music system, AC, radio, heater etc.

However there are two major tasks that can be implemented in future

1) Voice recognition : By inclusion of this feature we can eliminate the need to take out the phone and select the operation. Instead user can give command orally with phone being in pocket.

2) Global Positioning System (GPS): Addition of this feature into the app shall provide assistance to the driver in finding path whenever required.

R<small>EFERENCES</small>

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