Interfacing Automobiles with Smartphones

Using Arduino Uno and Bluetooth Module

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***Abstract*— Usage of embedded systems in automobiles enhances a car's safety, security and usability. Controlling a Car using a smartphone enables the user to access various features of a Car that reduces the tedious task of manual control that is currently in use. In this work, a microcontroller such as an Arduino Uno R3 is embedded onto a scaled model of car. A Bluetooth module such as (BT0417C) is interfaced with the Arduino board to establish a communication medium between the mobile and the car. An Android application is developed and connected to the Bluetooth module for interfacing various features of the Car. The final work showed promising results on flexible control of the Car.**

Keywords*— Arduino, Smart Phone Control, Android, Automobile Interfacing

I. INTRODUCTION

Mobile devices offer a unique opportunity for integration with daily life functions on a unified platform. Lack of unifying hardware/software platforms and barriers that exists between popular mobile ecosystems have been the reason for lack in a revolutionary impact on interfacing with mobile ecosystems. Even with the advent of basic interfaces in high-end automobile companies, there have been security flaws in them that lead to life risks.

In order to address these issues, this work proposes a unifying platform such as an Arduino that has the potential to combine Bluetooth connectivity, reconfigurable and personalized user interface on a mobile platform such as an Android and a Microcontroller chip such as RX2/TX2 for interaction with the automobile.

The major objective of this work is to develop an application that could control a remote control car with an android smart phone. The basic movement, speed and directions of the car should be manipulated by the user on touching the various controls provided through the application. The user will be able to click pictures and transfer them to the mobile. The headlights can be toggled as per user's command request through the android application.

II. RELATED WORK

Mohamad Taib Miskon et al. developed a Steering Control Method based on TSL1401 Linear Sensor Array [1]. This work developed a prototype of an intelligent car that has the capability to navigate automatically without human interference. Various problems noticed are no easy control on the automobile and no security framework noticed in the automobile. Vidhya V et al. developed an Android-ARM Based Switch Control Using Smart Phone [2]. The main purpose of this concept is to conserve energy just by means of using his/her Android Smart phone and to provide an easy access in the process to the user. The main disadvantage in this work was there was no auto-scaling or security layer. Petr Doležel et al. proposed a Possibility of Smart car speed control using Soft computing [3]. This method replaces the classical cruise control by a Non Linear Neural Car Model, as a result it becomes difficult to interact with the car. Akshay Kokate et al. developed an Android Based Remote Game Controller User Datagram Protocol socket programming making it slow and low on efficiency with respect to response time [4]. Claudia Campolo et al. An Integrated Smart phone based platform to support Traffic Management Applications [5]. This works is a smartphone-based platform is designed that exploits low-cost dedicated hardware to interact with sensors on board and in the vehicle surroundings. Disadvantages with this system was the open access to collected data on phone for intruders and it was not completely practically as it is expensive to embed with other platforms. Md. Nazmul Hasan et al. developed Intelligent Car Control for a Smart Car. The major drawbacks of this system are cost and complete practicality.

III. METHODOLOGY

The Arduino board embedded on the car receives the command from the Android Application through the Bluetooth Module. Then, it interprets the command and sends the appropriate signal to the RX2/TX2 chip installed on the Car previously to make the corresponding action on the Car. To make the implementation easier, the whole system is divided into following modules.

A. Basic Movement:

This module involves controlling all the fundamental movements of the car such as forward or backward on the Android application

B. Direction Control:

The direction of the car is controlled by tilting the mobile device that is running the application in the necessary direction

The tyres of the car turn left or right based on the motion sensor present in the mobile and command given from the application.

C. Speed modulation:

This module involves two buttons on the android application that accelerates and decelerates the car based on the command given.

D. Headlights toggle:

The headlights of the car are toggled when a button corresponding to it provided in the application is pressed.

E. User Interface:

An elementary Android User Interface is developed which is interfaced with the Car using Bluetooth module to control the Car's functionalities. The complete circuit corresponding to the whole system as shown in Fig. 1

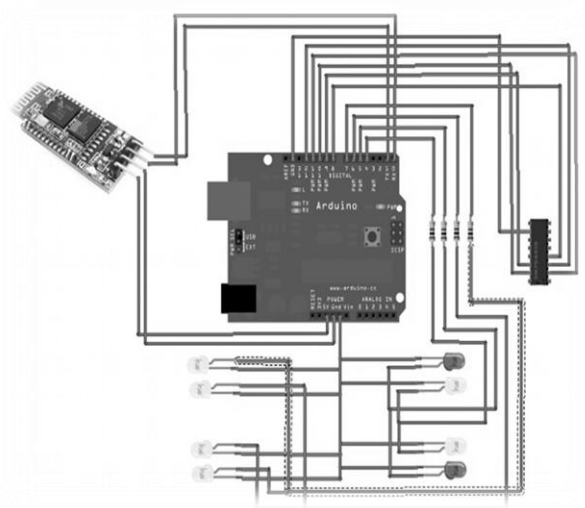

Fig 1. Circuit Diagram

IV. CONCLUSION

A comprehensive review of a smartphone-interfaced with automobile application has been presented. Much work has been done to improve the performance, however, the research always seems tailored to local environments which makes the proposed method only useful in specified environment. This fact reflects from the side the diversity, complexity of real traffic scenes. To deal with more complex traffic scenes, the methods are required to percept and self-adapting to the surroundings, and the robustness of algorithm needs to be improved. Due to the increasing demand of smartphones in the world, the increasing scope of these cars cannot be neglected. In this paper we presented unitized techniques to achieve the goal. The automobile and smartphone when connected enable the collection of a wide and modular set of measurements. Further information is retrieved at no additional expenses. An easy-to-use solution, connecting the smartphone to the automobile using Bluetooth platform, without additional configuration. Further work is required to quantitatively assess the effectiveness of the proposed opportunistic data transfer solution in realistic settings. Incentives to the end- users and a business model should be conceived foreseeing co- operation and agreements between all the involved actors, i.e., end-users. As we use Bluetooth for data transfer, we don't need the help of service providers to support the cost of such equipment and the related communications. The use of arduino chip at commercial level should be encouraged. The concept of driver-less driving is one of the most exciting aspect that can revolutionize the modern vehicles.

V. REFERENCES

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