Raspberry Pi based automotive infotainment system – an introduction to the concept of protecting personal finances at the pump

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*Abstract*—Infotainment systems in automobiles are one of the many selling points when it comes to consumers. They provide many features that interact with drivers, such as hands-free calling, streaming media, and even sending information to a cell phone regarding the location of where they parked. However, there are many people who fall victim to predatory technologies such as credit card skimmers, and these protections are not provided by the modern infotainment system. With Bluetooth technologies and ability to determine whether there is a Bluetooth device nearby that can be a skimmer, this infotainment system is able to alert the user in a way that warns them about the potential of such device in their vicinity.

Keywords—***Infotainment, Bluetooth, WiFi, Skimmer, A2DP, Traffic, Retrieval***

# Introduction

The modern automotive infotainment system consists of a suite of applications that enables the consumption of media and the displaying of information that is relevant to the commute. Some of these systems show the user useful information such as the nearest gas stations, shopping centers, and points of interest such as parks or nature reserves. After time, new features are created and implemented in these systems so that they’re available for consumers to purchase in newer cars. Of course, the possibilities are endless when it comes to introducing unique features that were previously unheard of thanks to the abundance of technologies that can be stuffed in an embedded system. The functional proof of concept proposed in this paper is an infotainment system that has the ability to scan for bluetooth skimmers by scanning the area around the vehicle, checking each MAC Address prefix against a list that contains prefixes that are suspected of being one. This system is composed of a Raspberry Pi connected to the official Raspberry Pi Foundation touchscreen, a real time DS3231 clock, a generic USB Bluetooth dongle, a generic USB Sound Card, powered by an added in-vehicle inverter to convert dirty signals and varying voltage into a more useable power source. The sound system composes of a 1200W 4 channel amplifier, which will be connected to a 3.5mm to 4 channel RCA splitter to the USB Sound Card on the Raspberry Pi. Internet connectivity will be provided in a Personal Area Network by the host cell phone connected via Bluetooth, requested via Dbus on Linux.

# Concepts of a Vehicle’s Entertainment System

## *The Basics*

At a bare minimum, the entertainment system in a vehicle is composed of a head unit (this usually includes the amplifier), an amplifier (if none exists in the head unit), and speakers. The main object that is used to interface with multimedia is the head unit, which allows for the selection of an audio source, volume level, an equalizer (if equipped), and even antitheft features. Various signals of sound are controlled by the amplifier, be it a low signal like a subwoofer, and/or higher ones such as smaller speakers called tweeters.

## *Additional Features*

Newer vehicles contain infotainment systems that are heavily integrated with an internal network that links up to 500ECUs, some of which control creature comforts such as the Air Conditioning System, the interior lights, and even the OBDII interface. Many systems these days contain bluetooth connectivity to enable rich features such as media playback, upvoting or downvoting songs, internet connectivity, and more. As mentioned in the introduction, they even have information relevent to travel, such as gas stations and grocery stores. Some of these systems also allows passengers or the driver (if parked) to access the internet through a web browser.

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These infotainment systems also have the option of including software created by IT companies such as Apple or Google called Apple Carplay or Android Auto, respectively. They enable even more rich content to be delivered to the driver or passenger if connected to a phone. More features are added on the more apps are installed on the system or cell phone.

# Proposed System

The proposed system is an infotainment system that is composed of a Raspberry Pi, powered by a software composed of Python and Kivy for the UI. This combination of software enables the use of python scripts to handle system requests and features that would otherwise be available on a modern infotainment system, such as Bluetooth media playback. The current features being implemented are Bluetooth Audio, Traffic Retrieval, and a Credit Card Skimmer Scanner.

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