Smart Car Remote Starter

Project by

Mohammed Al-Shehri
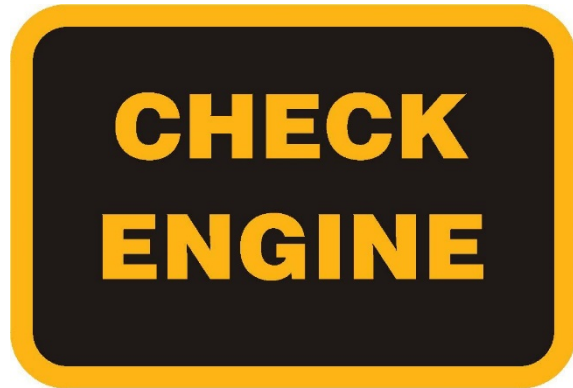
Introduction

Problem Statement

Introduction

Negative Impact

User Requirements

- Ability to start the engine using phone from long & short ranges.
- Preventing thieves from stealing a car after remotely starting it
- Locating the car location accurately from anywhere in the world
- Minimum car modifications

Technical Requirements

- GSM communication will be used as a long range connection
- Bluetooth communication as a reliable short range connection
- GPS module for accurate car locating
- External antennas for the GSM and GPS modules
- Minimizing cutting wires or performing modifications to the car
  The car must operate normally without the system
- Using the car key to identify the owner
- Android mobile application as a user interface for the user

Choosing Components

- Controller
  - Microcontroller, FPGA, ..

- Bluetooth

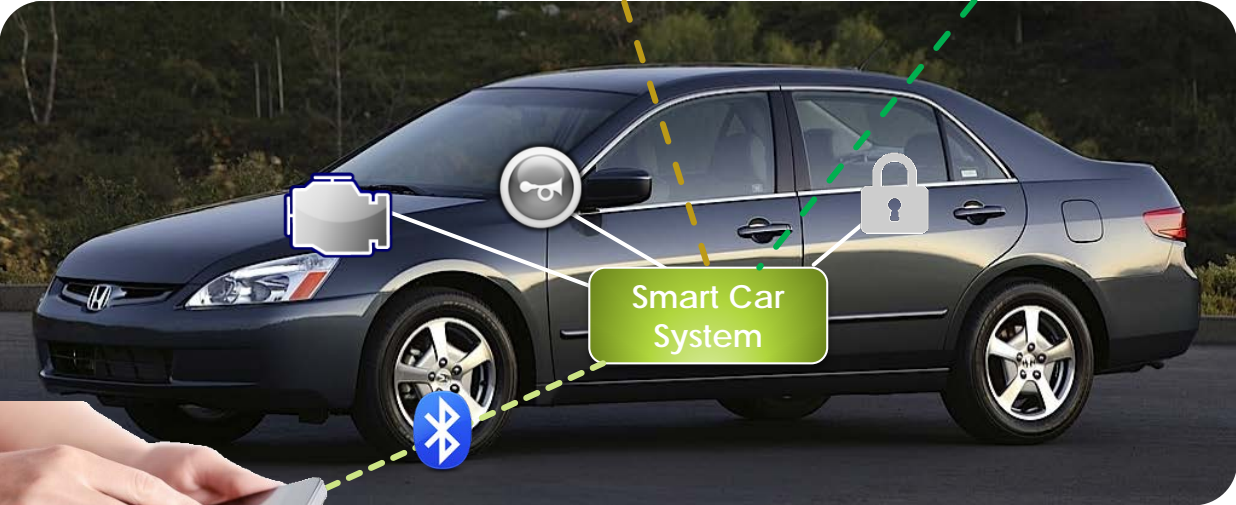- GSM Modem

- GPS Module

- Relays
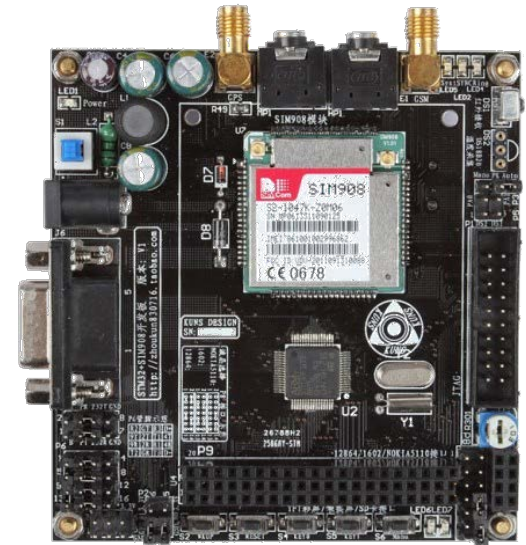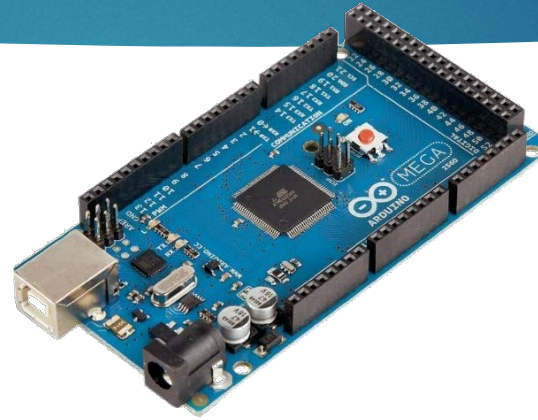
Concept Picture
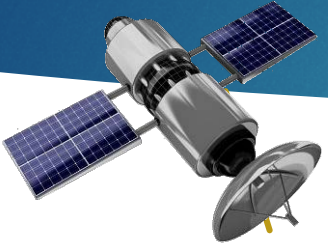
GPS Signal

SMS Message
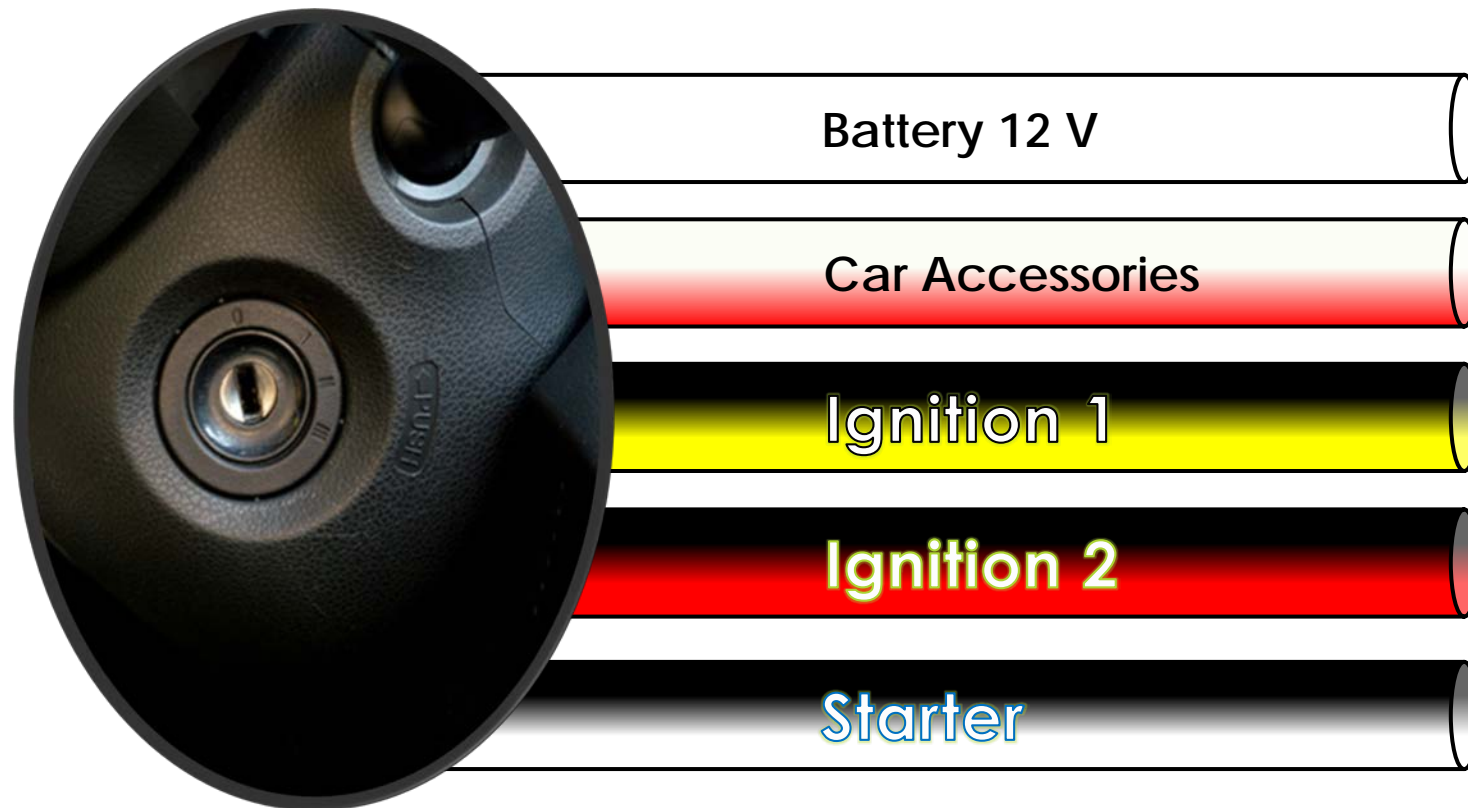
Smart Car System

Car Interfacing & Hardware Design

System Prototyping

- Prototyping will be done on my 2003 Accord.

Ignition Wirings

Battery 12 V

Car Accessories

Ignition 1

Ignition 2

Starter

Car Security System

- The car panics at any attempt such as powering the ignition wires

- The security system must be controlled

- Security System Integrated in the driver door module
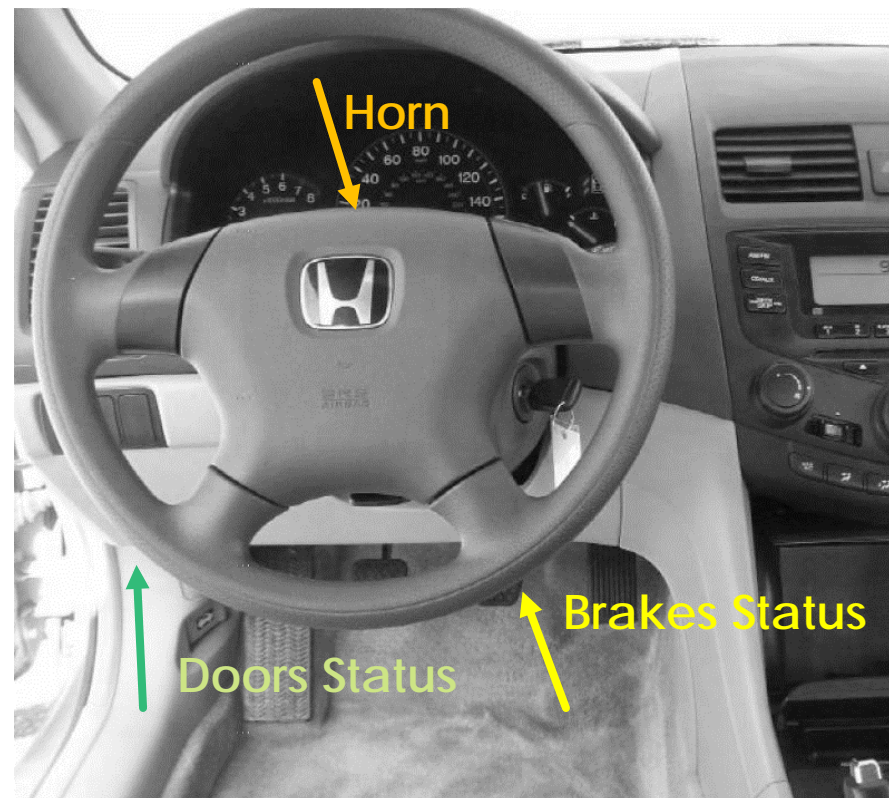
- Security System Controls the door locks as well

Door Locks Control

- Security System Controls the door locks

- Doors will be open after remote starting the car

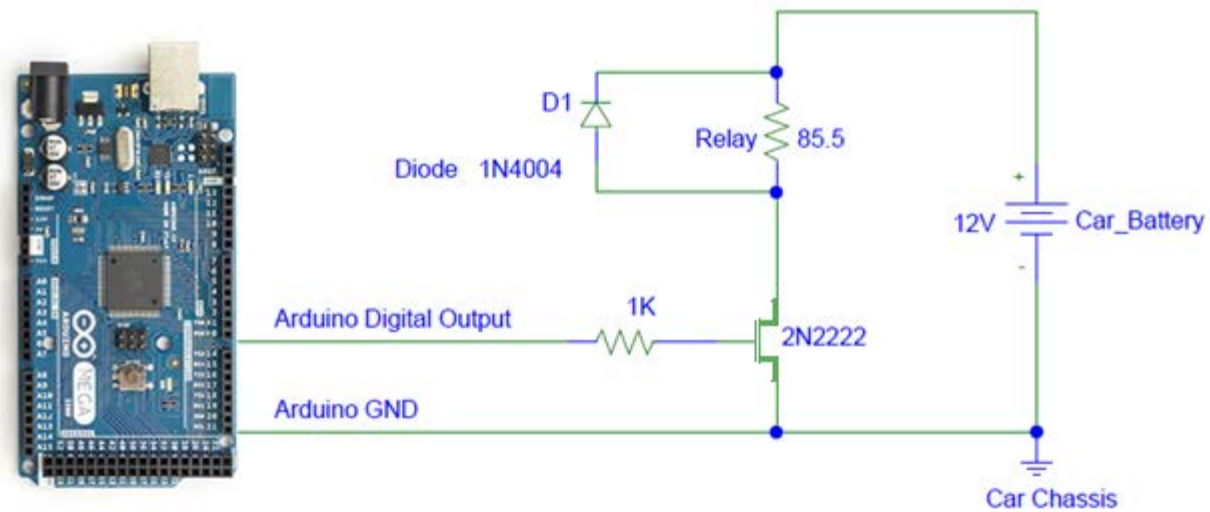- Relocking the doors is necessary

Horn, Doors Status, Brakes

Ignition Control

Mode / Wire	White/Red ACC	Black/Yellow IGN1	White 12V	Black/Red IGN2	Black/White Starter
OFF					
ACC	●————————————●		●		
ON	●————————————●————————————●————————————●				
Start		●————————————●			●

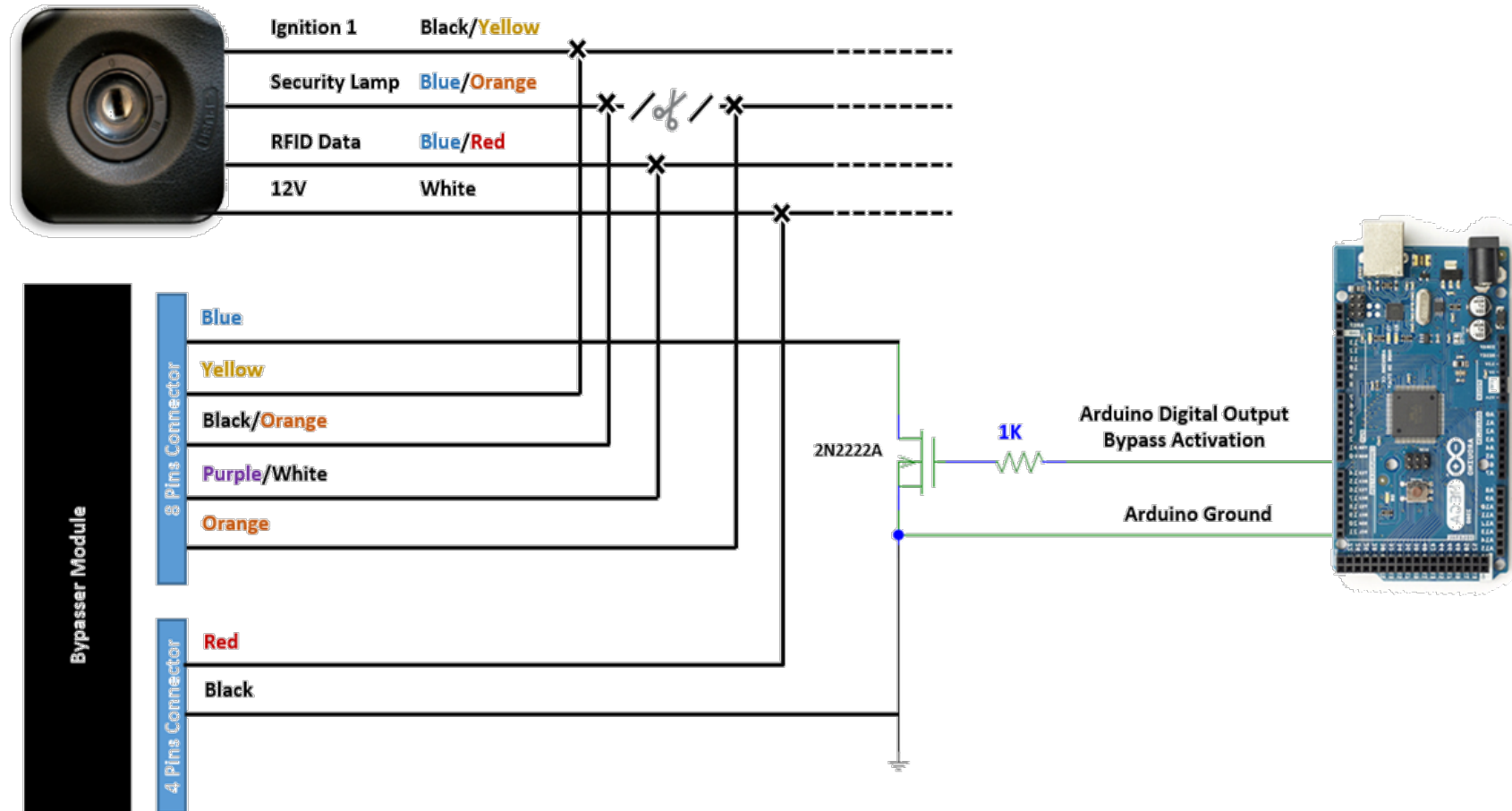# Relays Controlling

▶ Relay line terminals
   are not shown

Immobilizer System

- Prevents hot wiring the car

- Several methods were evaluated for bypassing the immobilizer

- Present on most cars sold after 2002
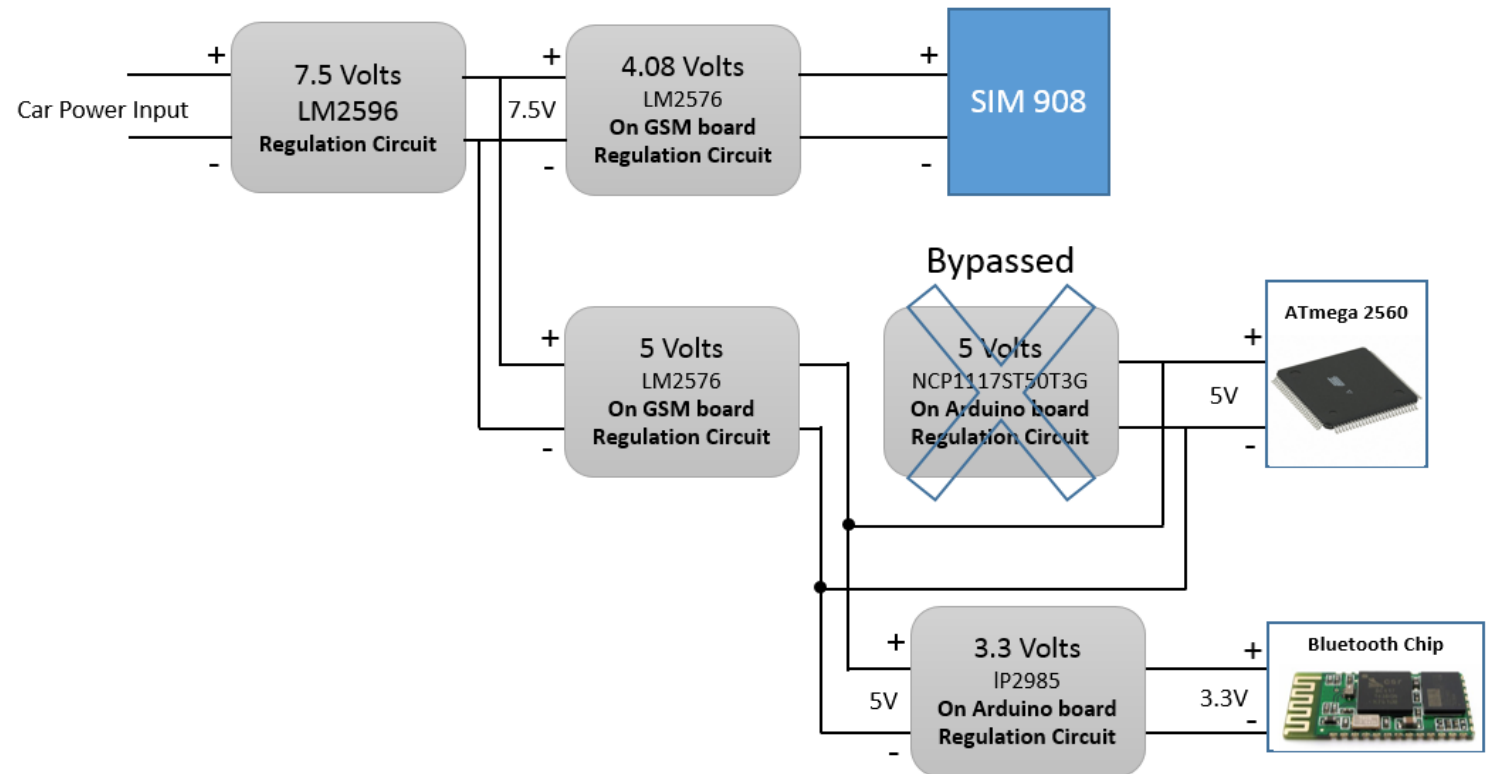
- Honda-SL3 Immobilizer is used for prototyping
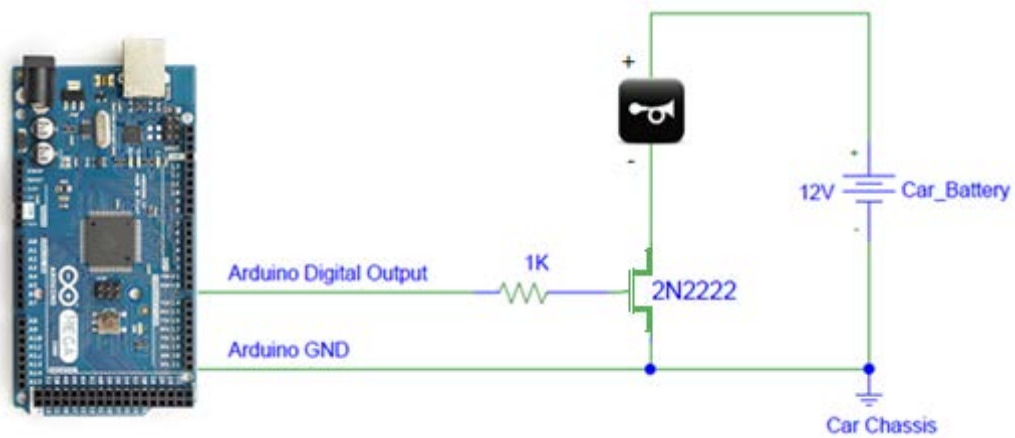
Bypassing the Immobilizer System
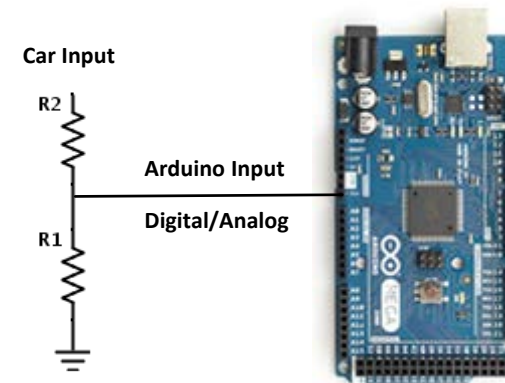
Powering the System

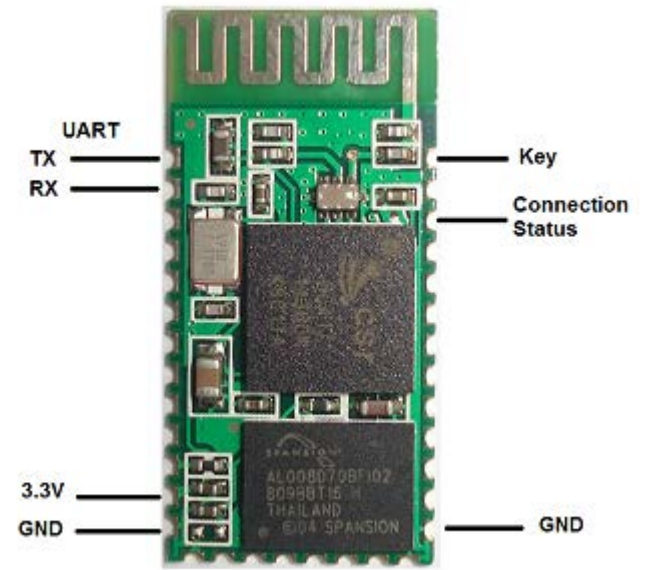- Single level issues
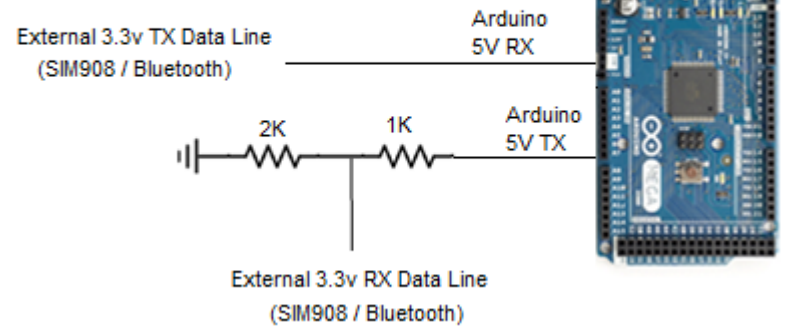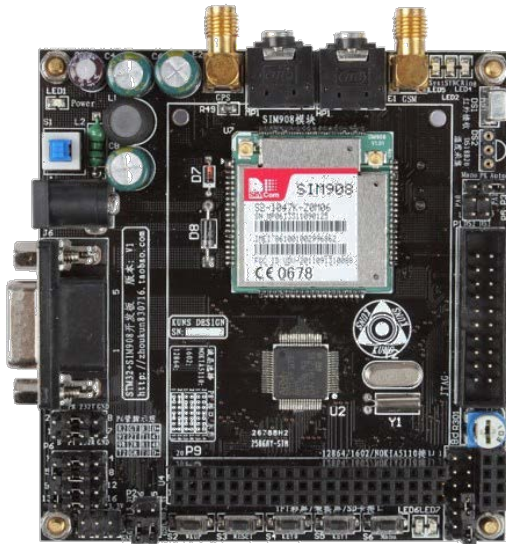
- Multilevel power design

Car Interfacing Circuits
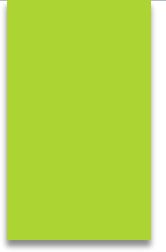

▶ Similar Circuits for Horn, Lock, Unlock, Arm, Disarm controlling

▶ Reading car inputs

Components Interfacing

External 3.3v TX Data Line
(SIM908 / Bluetooth)

Arduino
5V RX

2K   1K

Arduino
5V TX

External 3.3v RX Data Line
(SIM908 / Bluetooth)

UART
TX
RX
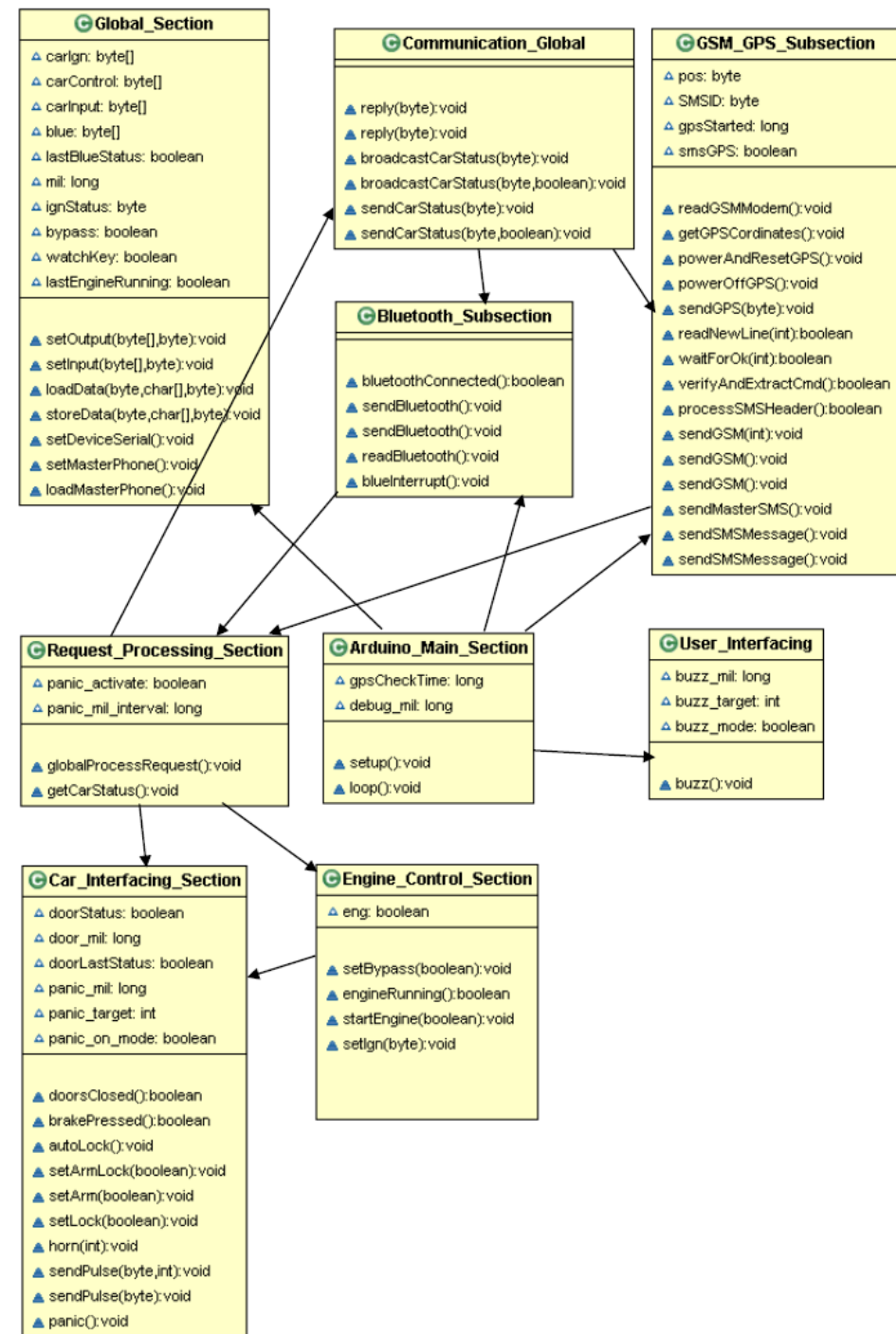
Key

Connection
Status

3.3V
GND

GND

Microcontroller Software
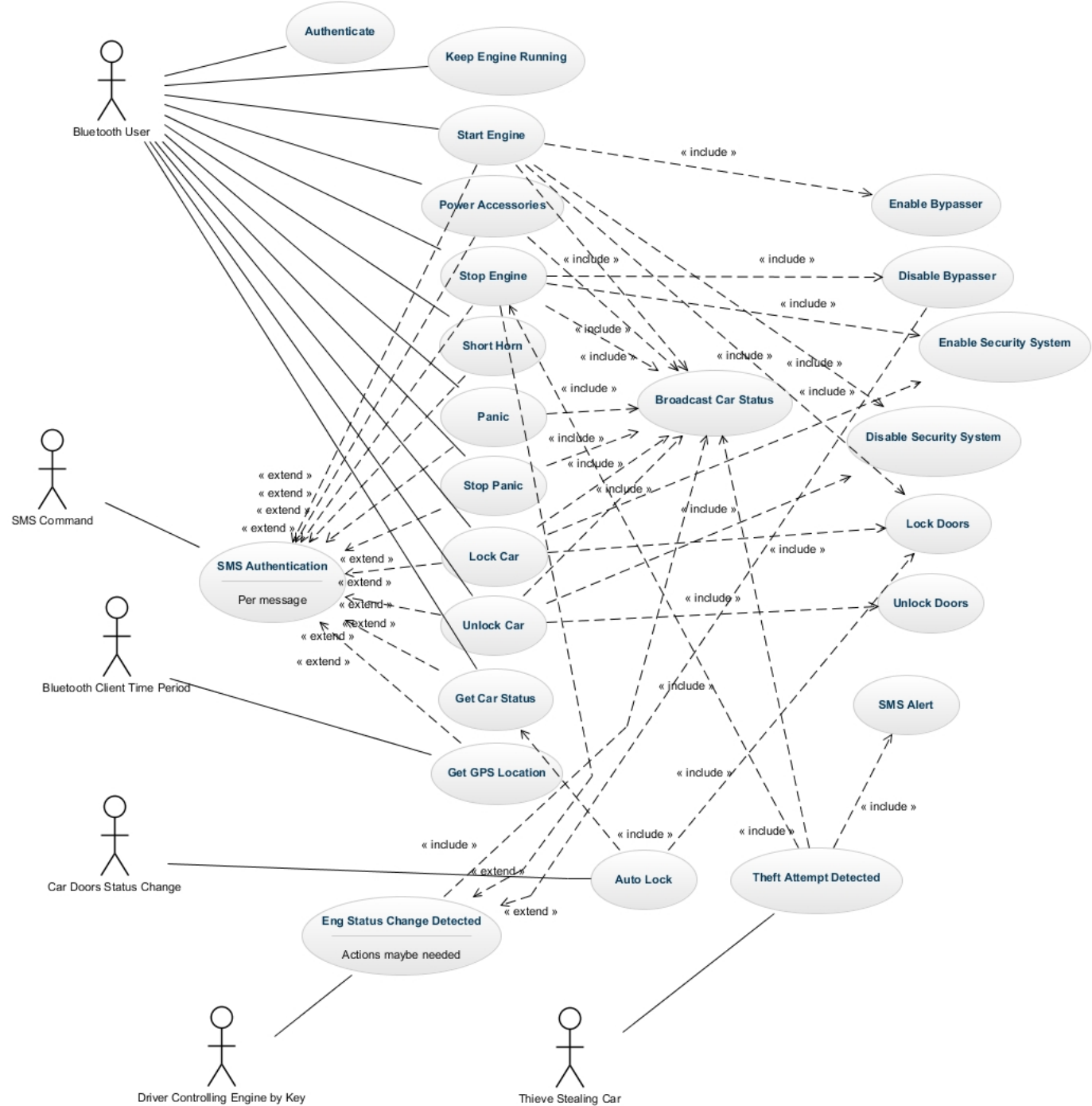
Code Sections Summary

- ▶ Global Section
- ▶ Communication Section
- ▶ Request Processing Section
- ▶ Arduino Main Section
- ▶ User Interfacing Section
- ▶ Car Interfacing and Control Section
- ▶ Engine Control Section

Use Case Diagram

- System Actors:
  - Bluetooth User
  - SMS User
  - Car Inputs
  - Car Driver
  - Thieve
  - Time

Communication Format

▶ Interactive Communication

Header (4)	Command (5)	Optional Arguments (?)	Trailer (1)
BGN>	XXXXX	?	<CR>

▶ Simple Communication

Header (9)	Device ID (10)	Command (5)	Optional Arguments (?)
SmartCar:	XXXXXXXXXX	XXXXX	?

Commands Summary

Command (Arguments)	Description	Originating Source	Command (Arguments)	Description	Originating Source
AUTHR (Device Serial)	Authentication Request	Bluetooth	ENGOF	Stop Engine & All Components	Bluetooth, SMS
SETSR (New Device Serial)	Change Device Serial Allowed once in lifetime	Bluetooth	SHORN	Short Horn	Bluetooth, SMS
			PANIC	Activate Panic Mode	Bluetooth, SMS
ENGST (Lock Car?)	Start Engine Request and lock car if desired	Bluetooth, SMS	PANCO	Stop Panic Mode	Bluetooth, SMS
			ENGKP	Keep Engine Running	Bluetooth
GETST	Get Car Status including engine status and panic mode	SMS Bluetooth will receive status updates automatically	SLOCK (Lock Car?)	Lock or Unlock Car	Bluetooth, SMS
			GTGPS	Car GPS Location Request	SMS Bluetooth will receive GPS updates automatically
ACCOF	Turn Car Accessories OFF	Bluetooth, SMS			
ACCON	Turn Car Accessories ON	Bluetooth, SMS	SETMP(PhoneNumber)	Set the master phone for communication	Bluetooth, SMS

Commands Summary

Command (Arguments)	Description	Potential Destination
WELCM	Welcome Message	Bluetooth
AUTHS	Authorization Succeeded	Bluetooth
AUTHF	Authorization Failed	Bluetooth
ACKW=(arg)	Acknowledgment for commands received or executed	Bluetooth, SMS Some acknowledgments will not be sent to SMS clients
STAT=(STATUS)	Car Status Details Used as acknowledgment as well	Bluetooth, SMS
GPSCO(GPSData)	GPS Data	Bluetooth, SMS
GPSNO	GPS Data not available Waiting for fix	Bluetooth

Short Messages from the system

- Human Readable Messages
  - Alerts
  - Destined to the master phone

- Data Messages
  - Destined to the command sender phone

Header (9)	Command (5)	Optional Arguments (?)
SmartCar:	XXXXX	?

Additional Features

- Engine Auto Shutdown
  - Environment
  - Gas Consumption
  - Engine Health

- Car Anti Theft

- Auto Lock

Android Application

Use Case Diagram

▶ System Actors:

  ▶ Mobile User

  ▶ Bluetooth System Message

  ▶ SMS System Message

Cars Management

▶ Multiple Cars Control & Management

Bluetooth Control

▶ Interactive User Interface

SMS Control

GPS Tracking

Questions