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### What is Hacking?

Hack /hak/

- use a computer to gain unauthorized access to data in a system.
- to circumvent security and break into (a network, computer, file, etc.), usually with malicious intent. To modify (a computer program or electronic device) or write (a program) in a skillful or clever

way.

### Problem Definition

#### Long Term Goal

- Building a well secured autonomous vehicle to perform specific tasks.
- Hacking within a vehicle to better build the security perimeters.

#### 2017 - 2018 Academic Year Goal

- To find a defense against an intrusion with the use of a software-defined radio (SDR).

#### **Problem Statement**

Research to better
 increase defensive
 perimeters, to provide
 safety to consumer.

## Design Requirement

- Software defined radio kit should cost **under** \$200.
- Staying restricted to free computer software

#### Ease of Use

Cost

- Many videos online, on how to construct and operate the software define
- Takes less than an hour to finish instructional directions.

#### <u>Compliance</u>

FCC Part 15 (Radio
 Frequency Devices)

#### **Intellectual Property**

Software Defined Radio
 will be purchased from
 NooElec.com

### Current Status of Art

#### Can Bus

- CAN Bus stands for Controller area Network
- Ates back to 1986
- Basically the nervous system, facilitating communication through all parts of the body (car).
- The purpose of the CAN Bus to allow any ECU (electronic control units) to communicate with the entire system without causing an overload to the controller computer.



#### Current Status of Art

#### OBD (On Board Diagnostics System)

- California Air resources Board (CARB) required OBD in all new cars in 1991 for emission control purposes.
- t's a computer-based system originally designed to reduce emissions by monitoring the performance of major engine components.









### Solution Design

- Car Keys Frequencies range
  from 315 MHz (North
  American made cars) to 433.92
  MHz for (European, Japanese,
  and Asian Cars).
- Spy Server, small server software was developed for users to share their radios over the net, but also works for SDRs.





# IMPLEMENTATION

## Capturing the signal (no signal as yet)



# Capturing the signal

SDR# v1.0.0.1664 - RTL-SDR (USB)



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 $\times$ 

## PREVENTING

-CAN bus captures Modified signal sent from NooElec ham it up sdr (transceiver device)



# CAN Frame



## PREVENTION

itration Field

Complete CAN Fram

+End of Frame +

CAN identifier spoofing will be opened. -Attacker appears like a legitimate source. Use peripheral devices to act as encryption and decryption

Control -

# PREVENTING HACKING

- Authentication or Authorization
- # Message has to be validated
  - # Only trust commands from the controller associated
  - with that part Not external.
- # the CAN identifier field must be encrypted

# Conclusion

# -Demonstration (explanation of the defense system)