Emergency Vehicle Detection System

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Acronym List:

EVDS - Emergency Vehicle Detection System
E.V- Emergency Vehicle (Police car, ambulance, Fire Engine)
MCU- Microcontroller

List of Tables/Figures:

1.0: Project Description

With the technological advancement of cars/trucks stereo systems and soundproofed cabins, emergency vehicles (E.V) have had a more difficult time getting drivers attention. This has caused an increase in accidents involving E.V., especially at wide intersections.

The Emergency Vehicle Detection System (EVDS) is an automated system installed on the roof cars/trucks that will alert the driver of the presence of an E.V. The system uses an array of four cardioid microphones and frequency filtering to detect the sirens produced by the oncoming ambulance, firetruck or police car. Once the E.V. has been detected, using the change in amplitude of the sound waves, the software will extrapolate the location of the E.V.

After the relative location of the E.V has been established, the system will decide if the driver needs to be alerted. For example, if the E.V entered the roadway behind the vehicle, and proceeds to travel away, the system will not give alarm. On the other hand, if the E.V is approaching the vehicle, either from the rear on the road, or sides at an intersection, the software will decide the appropriate response to give the driver.

The response given to the driver will be both auditory and visual. The blinking of an LED on the dash will warn the driver of the presence of an E.V. While the audio response will be played over the car speakers to instruct the driver to the safest location for both them and the E.V., whether it be to the right or left shoulder or to not enter the intersection. The audio response is crucial because it allows the system to control the music being played in the car. The music will be muted; the pre-recorded response will play, guaranteeing the driver will know the E.V is approaching.

Potential customers include car companies, emergency services, and possible the government. All of these are also potential sponsors.

2.0 Project Initial Requirements:

Microphones	4 microphones able to detect high amplitude sound frequencies(siren) 100 yards away
Audio Filter	Filter sound frequencies with a band-pass filter of ~ 500 - 3000 hz
Location Extrapolations	Detect the location of the E.V within 45 degrees
Audio Sampling	Take audio samples every .033 seconds
Audio Output	Have 6 unique audio recordings to alert and direct the driver

Table 1: Initial Requirement Checklist

3.0: Project Diagrams:

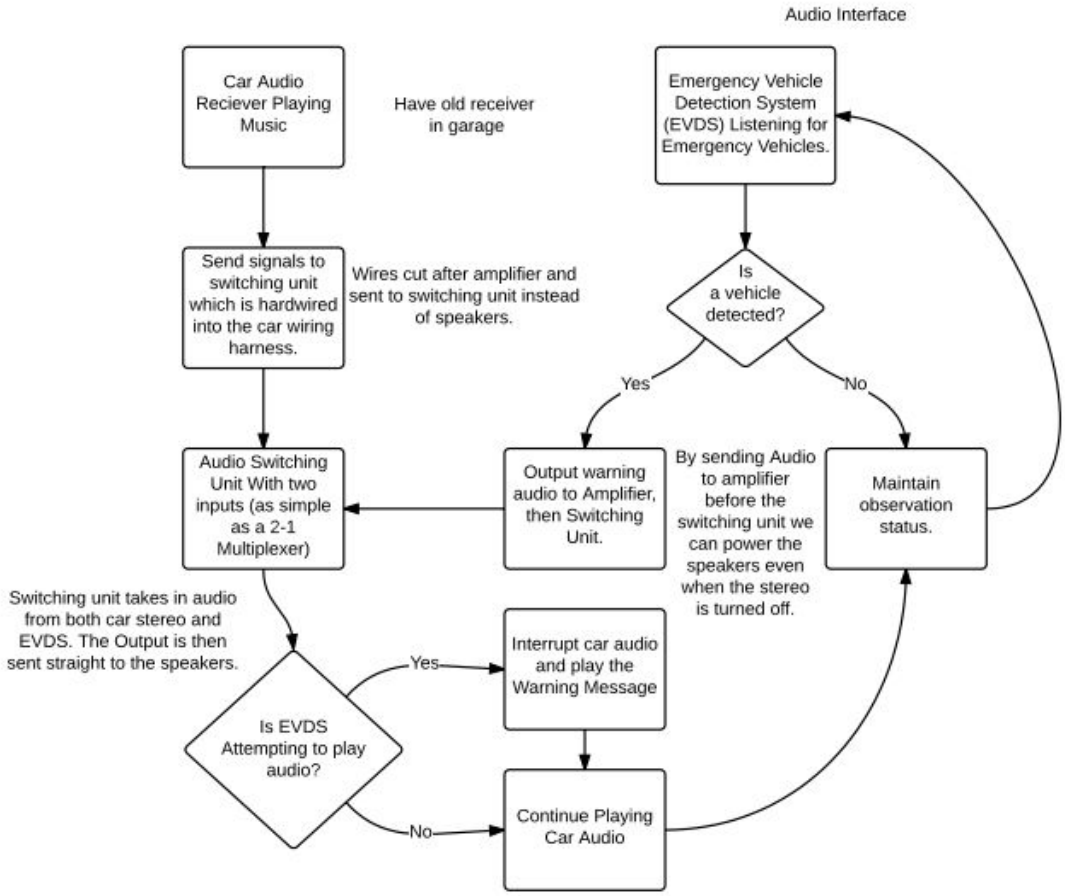

Figure 1- Overall Project System Flow

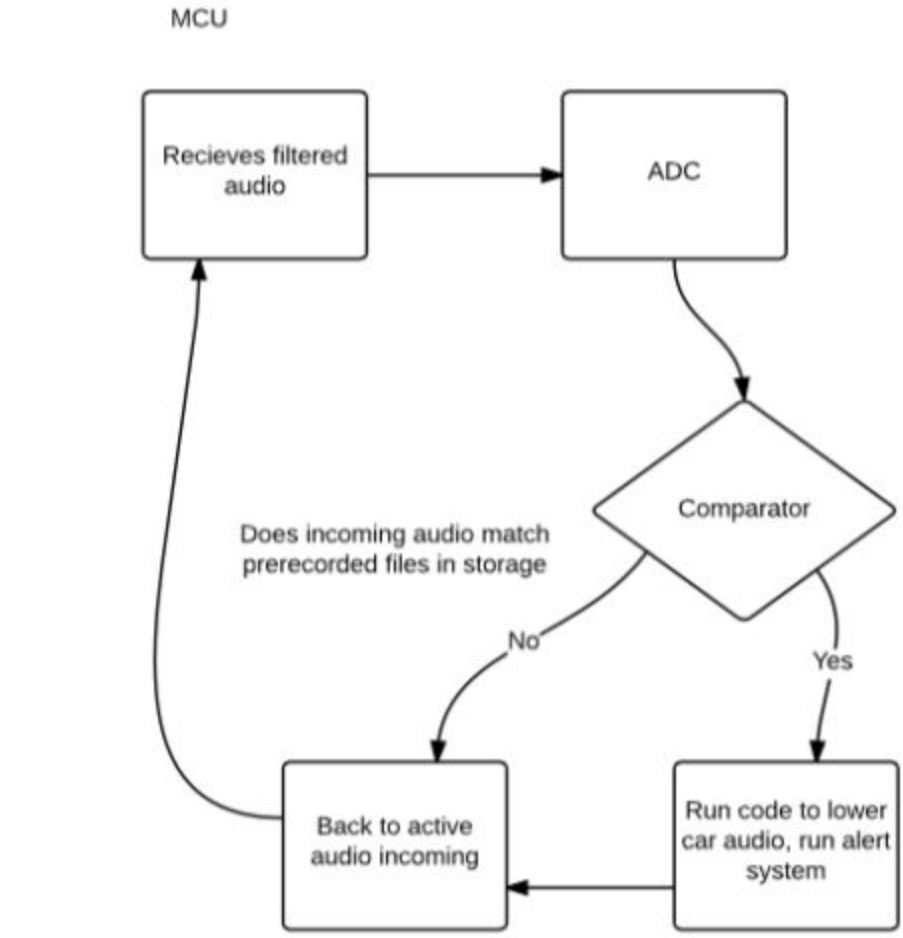

Figure 2: MCU Processes and Code

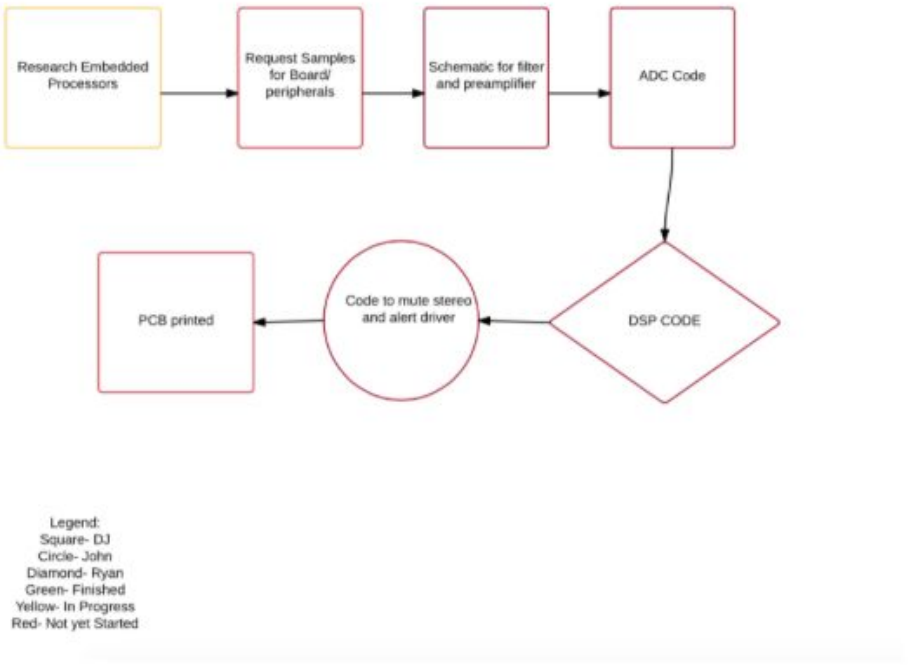

Figure-3: MCU Processes/Codes and Status

4.0: Estimated Project Budget

Description	Amount	notes
Microphones (2-4)	$137.50	Average of $75-200 cost
MCU	$20.00	Overshoot Cost
PCB Board (Custom)	$100.00	
3D Printed Casing	$100.00	Print mounting bracket into design
Wiring for speaker	$20.00	Ryan has this already
Battery	$50.00	

Siren	$50.00	Use loud speaker and computer
Car Audio Controller	$100.00	John has this already
Speaker	$50.00	Ryan has this already
Amp for audio controller	$100.00	
bolts/screws for mounting	$10.00	
"Car"	$10.00	Use cossey coop or cart

Table-2: Budget

5.0- Project Milestones:

Legend:

Not Started In Progress Complete

18 September

- Microphone Researched (Ryan)
- FD Siren Discussion (John)
- Board/MCU Sample (DJ)
- In House Parts List (All)
- Start Audio System (John)
- Soar Application (All)
- List of Possible Sponsors (All)

25 September

- Finalize Microphone (Numbers) (Ryan)
- Report Back on Coding Research (All)
- Have MCU Narrowed Down (DJ)
- Sponsor List (All)

2 October

- Code Research (All)
- Microphone Research (Ryan)

30 October (Halfway to Semester End)

- MCU Purchased (DJ)
- Microphones Ordered (Ryan)
- Start Coding (All)
  - DSP (Ryan)
  - ADC (DJ)
  - LED and Switcher (John)

- Filter Design Started (DJ)
- PCB Design Started (All)
- Start Casing Design (All)
    - PRINT ASAP

13 November

- CAD Drawing of Casing Done (All)
- Filter Design Done (DJ)
- PCB Design almost done (All)

4 December

- Audio Recordings Made (All)
- PCB Ordered (All)