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AutoMoe

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40,200

NSC Motor Vehicle Fatality Estimates

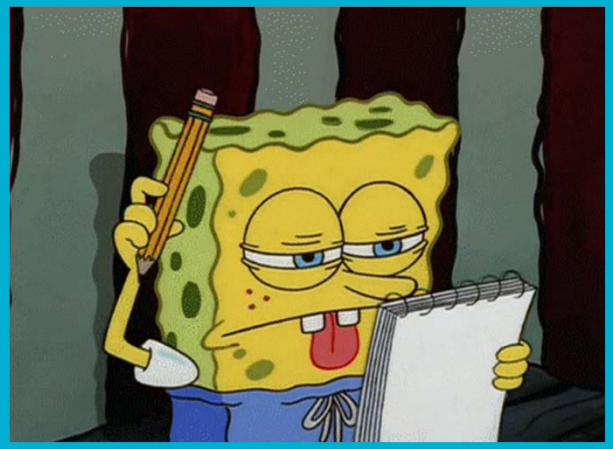
Prepared by the Statistics Department
National Safety Council

Table 1
December 2016
Motor-Vehicle Deaths and Changes
United States, Twelve Months, 2013 to 2016*

	Number of Deaths				Percent Changes				
					Corresponding Month			Four Month Moving Average +	
Month	2013	2014	2015	2016	2014 to 2016	2014 to 2015	2015 to 2016	2014 to 2015	2015 to 2016
January	2,642	2,572	2,754	2,740	7%	-1%		3%	
February	2,296	2,248	2,350	2,880	28%	23%		6%	
March	2,791	2,589	2,764	3,070	19%	11%		9%	
April	2,719	2,720	2,830	3,170	17%	12%		11%	
May	2,988	3,038	3,339	3,520	16%	5%		12%	
June	3,181	3,084	3,222	3,550	15%	10%		10%	
July	3,119	3,227	3,530	3,560	10%	1%		7%	
August	3,378	3,277	3,642	3,740	14%	3%		5%	
September	3,184	3,069	3,372	3,560	16%	6%		5%	
October	3,173	3,304	3,550	3,790	15%	7%		4%	
November	3,076	3,175	3,159	3,480	10%	10%		6%	
December	2,822	3,095	3,245	3,140	1%	-3%		5%	
TOTAL	**35,369**	**35,398**	**37,757**	**40,200**	**14%**	**6%**			

What's the Problem?

- Driving has numerous hazards and obstructions that can damage the car and driver.
- Blind spot accidents are results of switching lanes, incoming objects.



Current State of Art

Currently, many new vehicles have some level 1 & level 2 automation features such as:

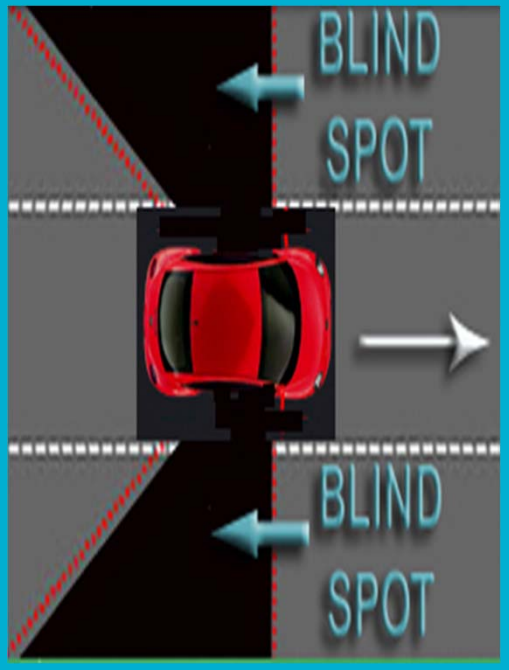
- Level 1
  a. Cruise Control
  b. Obstruction warning
  c. Parallel parking
- Level 2
- Automated lane guidance
- Driver fatigue detection

Future vehicles are projected to have some level 3 & level 4 automation features such as:

- Level 3
- Human emergency fail-safe

- Level 4
- Full automation/No Driver needed

What is Guiding Our Design?



Obey 3 second Rule

15 ft of clear space in front of car

3 ft of clear space on sides of car

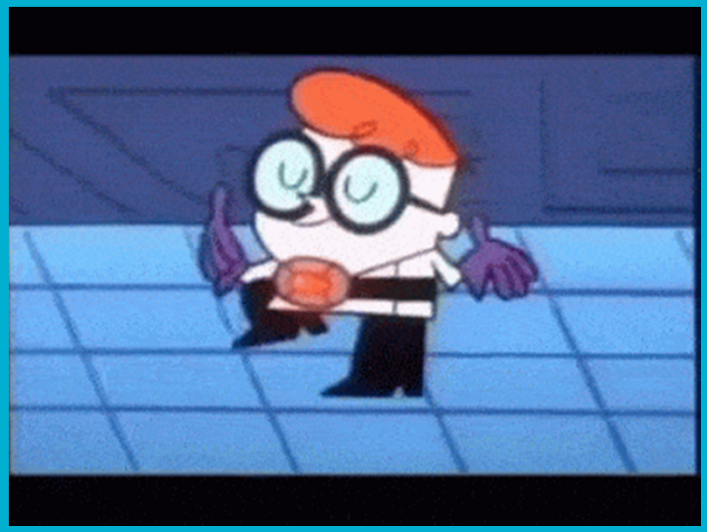
Quarter mile radius of awareness (15-20 seconds down the road)

5 seconds of signaling before changing lanes

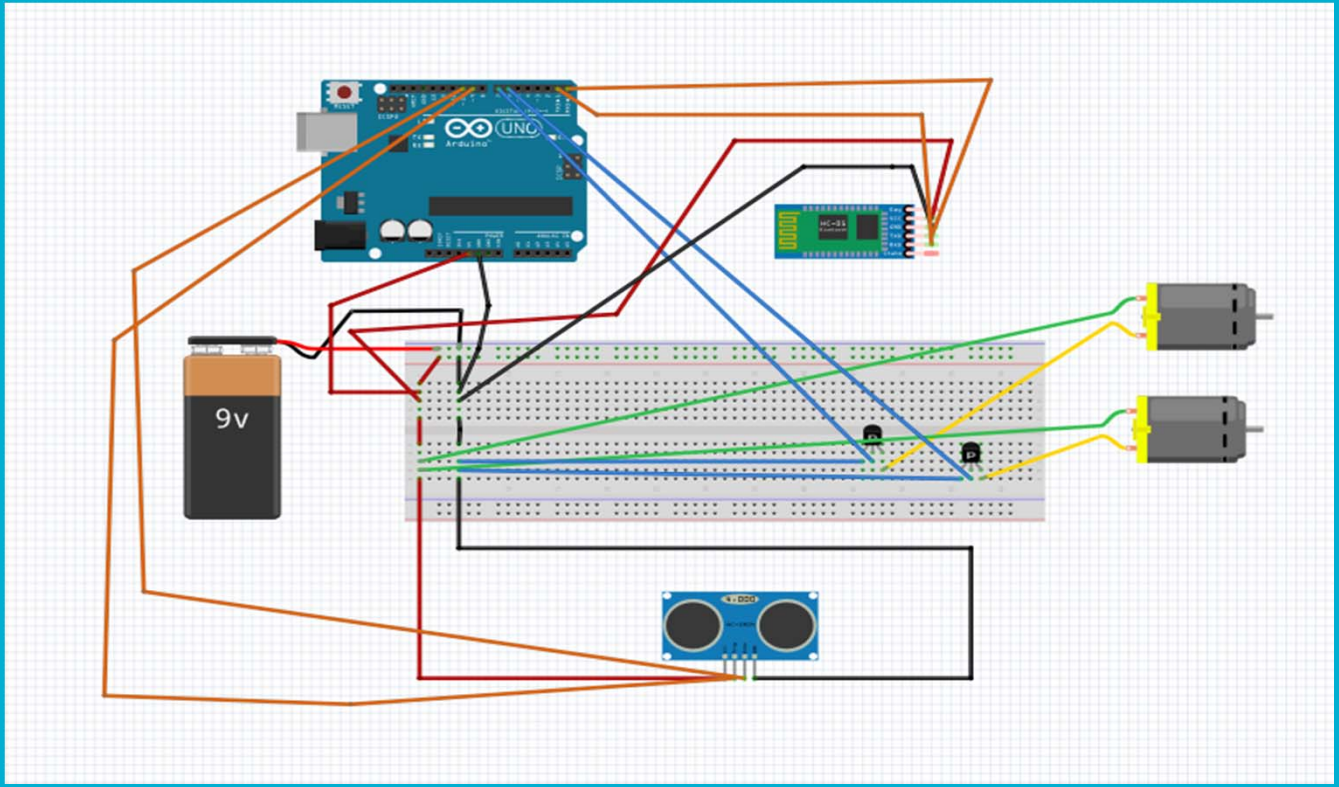
2 second reaction time

Design Features

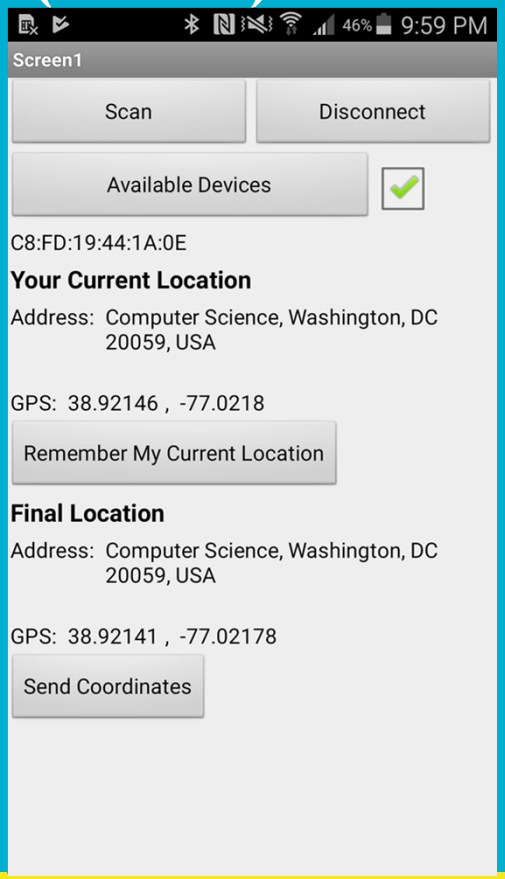
- Slow down
- If the vehicle is going straight, turn in the direction closest to our waypoint (more specifically, closest to the course to our waypoint).
- If the vehicle is already turning, then turn in the opposite direction to try to avoid the object.
- If we get within a definable distance of the object, stop, backup, and try again.



Design Solution



Design Solution (cont.)



Snippet of “processGPS” function→ where the Arduino processes the location information determined by the Android application/device.

```
void processGPS(void)
{
  currentLat = convertDegMinToDecDeg(GPS.latitude);
  currentLong = convertDegMinToDecDeg(GPS.longitude);

  if (GPS.lat == 'S')           // make them signed
    currentLat = -currentLat;
  if (GPS.lon = 'W')
    currentLong = -currentLong;

  // update the course and distance to waypoint based on our new position
  distanceToWaypoint();
  courseToWaypoint();

}   // processGPS(void)
// Called after new GPS data is received; updates our position and course/distance to waypoint
```

```
void calcDesiredTurn(void)
{
  // calculate where we need to turn to head to destination
  headingError = targetHeading - currentHeading;

  // adjust for compass wrap
  if (headingError < -180)
    headingError += 360;
  if (headingError > 180)
    headingError -= 360;

  // calculate which way to turn to intercept the targetHeading
  if (abs(headingError) <= HEADING_TOLERANCE)      // if within tolerance, don't turn
    turnDirection = straight;
  else if (headingError < 0)
    turnDirection = left;
  else if (headingError > 0)
    turnDirection = right;
  else
    turnDirection = straight;

}  // calcDesiredTurn()
```

← Snippet of “calDesiredTurn” function where the Arduino determines which is the best turn to make when the ultrasonic distance sensor detects an object in front of the vehicle.

Project Implementation Process

Embedded Video

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Embedded Video

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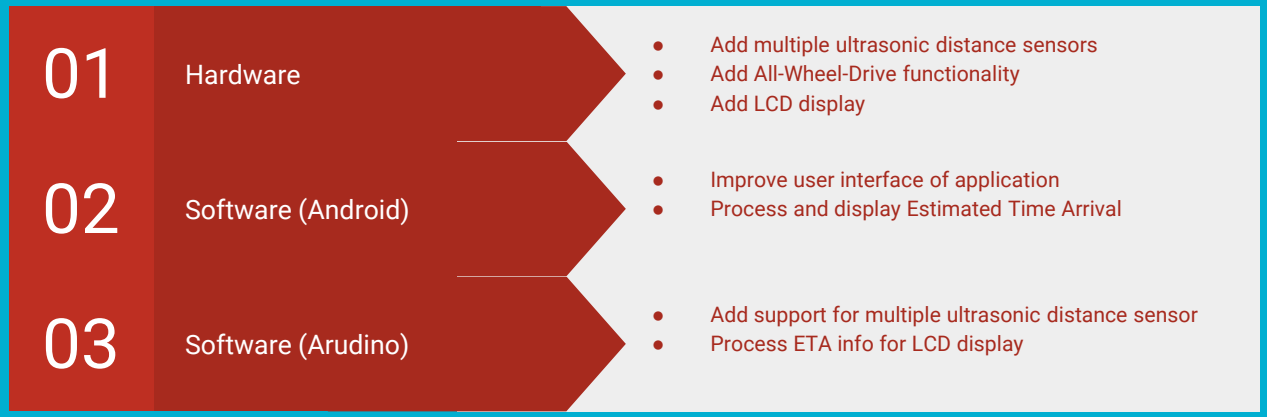
Embedded Video

Conclusion

Next Steps



- Team AutoMoe's goal is to develop an autonomous car. We shall achieve this goal by combining the functions of several sensors and modules to emulate high levels of autonomy.