REVISION OF USE CASES – FORD PROJECT

A)

Use Case Name: Maintain Location of Vehicle	**ID: UC-10**	**Priority:** High
Actor: F.O.R.D System		
Description: System will make use of GPS and other mapping software, as well as other installed sensors, to collect and maintain location awareness at all times.		
Trigger: GPS and mapping software activated		
Type: [X] External [ ] Temporal		
Preconditions: 1. Vehicle must be started 2. Vehicles GPS system must be up to date		
Normal Course: 1.0 Request Vehicle Location 1. User: Starts Vehicle 2. System: Displays current location of vehicle on display screen 3. User: Enters destination location 4. System: Scans the area looking for the best possible route to location 5. System: Selects best possible route considering traffic, accidents, etc. 6. System: Proceeds to requested destination 7. System: Remains on route selected before proceeding to destination 8. System: Retrieves information concerning location of vehicle from various resources 9. System: Continuously updates current location of vehicle as it travels to destination		
Exceptions: E1 System is unable to retrieve data concerning location due to old GPS system 1. The system displays error message 2. The systems error message "system update required" 3. The system gives user option to update system now or later 4a. The user selects the "now" option 5a. The system automatically updates itself 6a. The system starts Normal course again 4b. The user selects the "later" option 5b. The system terminates the use case E2 Best possible route is under construction and road is closed		

B)

Use Case Name: Vehicle Location Detector	**ID:** UC-4	Priority: High

Actor: Systems

Description: System will have the capability to recognize nearby vehicle location, in an effort to prevent collisions.

Trigger: Starting the ignition

Type: X Externa Temporal

Preconditions:

1. System must be charged and serviced appropriately
2. Sensors must be active

Normal Course:

1.0 Drive to a destination

1. User: Starts the ignition and puts the vehicle in reverse.
2. System: Dings and displays vehicles approaching from the rear on the left and right
3. User: Keeps foot on the brake.
5. User: Releases foot off the brake, backs the vehicle up, puts foot back on brake, and put vehicle in drive
6. System: Drives forward
7. User: Distracted by a text message. Looks down
8. System: Alerted by the sensor that an object is approaching at higher speeds from the front passenger side of the vehicle. Digital displays board sounds warning alert and shows objects approaching. Says: "Warning, vehicle approaching on the passenger side at 65 mph."
9. User: Hears warning message and dinging sound and looks up to notice that the vehicle is veering off into oncoming traffic in the opposite lane. Swerves back into the correct lane. Dinging sound stops.
10. System: Displays all clear message and states "All clear"
11. User: Changes lanes and turns into destination. Parks vehicle. Press ignition off button.

Postconditions:

1. Ignition is off but sensors are still active

C)

Use Case Name: Blind spot detector	**ID:** UC-4	**Priority:** High

Actor: System

Description: System will have the capability to recognize nearby vehicle location, in effort to prevent collisions via blind spots.

Trigger: Vehicle in route to destination

Type: **X** External _Temporal

Preconditions:

1. System must be charged and serviced appropriately
2. GPS must have a stable connection

Normal Course:

1.0 Request a ride to a specific destination

1. User: Open door of vehicle and enters the vehicle
2. User: Determines desired destination
3. User: Proceeds to desired destination
4. System: Scans perimeter of vehicle
5. User: Checks screen to ensure that system has no alerts
6. System: Continuously scans perimeter of vehicle
7. System: Alerted by the sensor that a stop sign is ahead
8. User: Hears a dinging sound and comes to complete stop.
9. System: Video sensors for the blind spots are activated. Turning signal is activated
10. User: Ding sound heard. Object detected on digital display board moving slowly, a bike rider
11. System: Radar sensors are activated and the radio waves determine the vehicle's surroundings.
12. User: Ding sound heard and the display board shows the part of the vehicle that is closest to the object.
13. System: Detects oncoming vehicle moving at a high speed
14. User: Speeds up or re position vehicle to ensure that collision is avoided
15. System: Sensor detects vehicles ahead are moving slower, displays the speed decrease on screen
16. User: Sees vehicle ahead has slowed down on screen, and decreases to a slower speed to avoid collision
17. System: Video sensors for the blind spots are activated. Sensors detect no other oncoming vehicles surrounding. Displays ok to change lanes
18. User: Turns on signal and changes lanes in order to turn into destination
19. User: Arrives at destination
20. User: Opens door and leaves the vehicle.

Post conditions:

1. Systems sensors are deactivated
2. Screen displays that the user has arrived safely

D)

This Use Cases was broken into 6 separate Use Cases, as determined by this team.

Use Case Name: Audio Proximity Warning of Notified Vehicles	**ID: UC - Da**	Priority: High
Actor: System		
Description: System should communicate to user via audio proximity warning of other vehicles that have been notified to avoid collision and save lives.		
Trigger: [USE CASE A] System needs to communicate to user that another vehicle is near and that the other vehicle's system has been notified. Type: **X** External ▫Temporal		
Preconditions: 1. This warning pertains to other vehicles that are similarly retrofitted with the V2V System.		
Normal Course: 1.0 The system recognizes a nearby vehicle. 1. User turns vehicle on 2. System boots up 3. System devices scan for vehicular proximities. 4. System devices detect nearby vehicle. 5. System devices generate message of proximity to user's V2V audio communication system and to the V2V System of the nearby vehicle. 6. System V2V audio communication receives message from system devices that a vehicle is nearby and that the nearby vehicle's system has been notified. 7. System V2V audio communication relays message to user: "Proximity warning, [Rear Left]. Other vehicle's system has been notified."		
Post Conditions: 1. User acknowledges system message. 2. User appropriately reacts to message to avoid collision and save lives. 3. System logs occurrence.		

Use Case Name: Audio Proximity Warning of Non-Notified Vehicles	**ID: UC - Db**	Priority: High
Actor: System		
Description: System should communicate to user via audio proximity a warning of other vehicles that have not been notified to recognize nearby vehicle location in effort to prevent collisions.		
Trigger: [USE CASE B] System needs to communicate to user that another vehicle is near. Type: **X** External ▫Temporal		
Preconditions: 1. This warning pertains to vehicles that are not retrofitted with the V2V system.		
Normal Course: 1.0 The system recognizes a nearby vehicle. 1. User turns vehicle on 2. System boots up 3. System devices scan for vehicular proximities. 4. System devices detect nearby vehicle. 5. System devices generate message of nearby vehicle to audio communication system. 6. System V2V audio communication receives message from system devices that a vehicle is nearby. 7. System V2V audio communication relays message to user: “Proximity warning, [Rear Left].”		
Post Conditions: 1. User verbally acknowledges system message. 2. User appropriately reacts to prevent collisions. 3. Systems logs occurrence.		

Use Case Name: Audio Position and Location Information	**ID: UC - Dc**	Priority: Medium
Actor: System		
Description: System should communicate to user via audio real-time position and location information.		
Trigger: USE CASE C Type: **X** External ▫Temporal		
Preconditions: 1. System will utilize satellite systems through bluetooth and wifi connectivity to determine real-time position and location. 2. System will utilize wifi in order to communicate with similar (remote-far away) systems in real time		
Normal Course: 1.0 Systems communicates position and location to user via audio. 1. User: Starts vehicle 2. System: User interface boots and user interface appears 3. System: "Good morning/afternoon/night." Say a command 4. User: Speaks to system to activate GPS "Navigation" 5. System: Uses satellite information to determine real-time position and location 6. System: Retrieve information of nearby systems and request to connect. 7. System: When connect will be able to communicate voice call and share information.		
Post Conditions: 1. System stores most frequent connections via Bluetooth & Wifi connectivity.		

Use Case Name: Audio Communication of Speed and Distance	**ID: UC - De**	Priority: High
Actor: System		
Description: System should communicate to user via audio speed and distance information.		
Trigger: System communicates information through audio communication system based on information from engine system Type: **X** External ▫Temporal		
Preconditions: 1. System connects to engine and tires systems		
Normal Course: 1.0 System communicates speed and distance. 1. User: starts up system 2. System: links up engine and tire system to vehicle system 3. System: Turns on and waits for a command from the user 4. User: asks the system for the car speed and how many miles away is the destination 5. System: uses the information from the tires and engine system to calculate the numbers 6. System: system displays and says the distance and speed through the audio and on screen displays 7. User: can adjust the speed and route the vehicle takes based on the information		
Post Conditions: 1. System stores distances and speeds for certain areas based on an archive of past routes driven to help the user adjust and let the user know what the options are and why.		

Use Case Name: GPS Boot Message	**ID: UC - Df**	Priority: Medium
Actor: System		
Description: System should communicate to user via audio when GPS system is activated and ready.		
Trigger: Turn on of Vehicle Type: **X** External ▫Temporal		
Preconditions: 1. GPS features are activated.		
Normal Course: 1.0 GPS activation is communicated to user via audio. 1. System: User interface boots and user interface appears 2. System: "Good morning/afternoon/night." Say a command 3. User: Speaks to system to activate GPS "Navigation" 4. System: Uses satellite information to determine real-time position and location 5. System: Scans environment and displays a location on interface 6. System: Retrieve information of nearby systems and request to connect. 7. System: Uses bluetooth and wifi to continuously scan environment and displays real-time position on the interface .		
Post Conditions: 1. System stores GPS history from User for future command prompt recognition.		

Use Case Name: Audio Notification of Retrofit Boot-up	**ID: UC - Dg**	Priority: High
Actor: System		
Description: System should communicate to user via audio retrofit boot up information.		
Trigger: Turn on of Vehicle Type: **X** External ▫Temporal		
Preconditions: 1. System connects to audio of V2V retrofit system		
Normal Course: 1.0 Systems communicates boot up of the V2V Retrofit System 1. User : User starts up vehicle . 2. System: Visual display appears (User interface) 3. System: Startup options appear on screen system via question mark system voice asks "Would you like to customize your trip today? (Based off algorithms and past preferences) 4. User: Begins system routing by saying "Start then [location.]" (Example. Start, FAMU) 5. System: Provides directions along with suggestions. (Example. 'Lowest gas prices are 1 mile out from your destination at the Murphy express.) 6. System: Suggestion routes based off driving patterns over different days. (Example. Sam goes to Dunkin donuts between 3pm and 5pm every other Tuesday. 7. User: Communicates desired interactions at startup. (Example.No suggestions today)		
Post Conditions: 1. System generates suggestion based off of algorithms of past tendencies of the user. (Example. Route choice and most frequented areas.)		

Use Case Name: Audio Notification of Retrofit System Check	**ID: UC - Dh**	Priority: High
Actor: System		
Description: System should communicate via audio to user retrofit system check information.		
Trigger: System needs to communicate to user the status of the V2V system. Type: **X** External ▫Temporal		
Preconditions: 1. User has turned on vehicle which boots up the V2V retrofit system.		
Normal Course: 1.0 Retrofit System check message is communicated to user. 1. User : User starts up vehicle 2. System: System boots up and visual display appears (User interface) 3. System: System "Welcome where will you like to go today." 4. User: Generated directions based off distance key terms (nearest, closest, and furthest) 5. System: Asks User various questions in order to identify user preferences. 6. User: Answers various questions asked by system. 7. System: Retrieves responses and makes recommendations based off user preferences.		
Post Conditions: 1. System generates log report of V2V system check status at that date and time and stores it.		

Use Case Name: Audio Communication of Collision Indicator Warnings	**ID: UC - Di**	Priority: High
Actor: System		
Description: System should communicate to user via audio the collision indicator warnings activated on the inside and rearview mirrors.		
Trigger: System connects to audio system to be able to alert and signal that a collision is imminent Type: **X** External ▫Temporal		
Preconditions: 1. System connects to gps system 2. System connects to audio system 3. System connects to nearby vehicles systems for location purposes		
Normal Course: 1.0 System communicates with user of imminent collision 1. User starts vehicle 2. System greets user and connects to other involved systems (gps, satellite, other vehicles, & audio) 3. System searches for possible hazards for constant updates 4. User is told of locations to avoid while on the road 5. System sends consistent information back and forth between all of the systems 6. System gets information of possible or probable collision and lets the user know 7. User is told of the collision		
Post Conditions: 1. System will give the user an update on the vehicle's current condition and what is wrong.		

E)

Use Case Name: Distance & Speed Recognition	ID: UC_001	Priority : High
Actor: Cognitive Response System (CRS)		
Description: System will connect with other vehicles to the operating vehicle and driver through a low frequency radio wave signal. A vehicle's speed and distance, that is within a 10 to 20-meter radius, will be entered into the system's internal algorithm. This will also allow send the driver's distance and speed information to other cars. The connection between V2V will help with safe driving decisions. The system will communicate any close vehicles or dangerous situations to the user through an audio recording which will indicate what side the danger is coming from. The unique ability of this system being able to communicate with other cars will allow more information to the user when their changing lanes at a high rate of speed. Drivers will know how much time remains to slow down from a high rate of speed before an accident.		
Trigger: CRS provides speed and distance Type: External		
Preconditions: 1. User turned the ignition on vehicle and CRS is initiated. 2. CRS calibrates per surroundings. 3. The vehicle is in motion.		
Normal Course: 1. CRS scans vehicles near front and rear ends, driver and passenger sides to retrieve distances. Collision radius distances are predetermined. 2. CRS communicates with other vehicles to retrieve data: a. The speed of vehicles in the radius. b. The distance of vehicles in the radius. 3. The speed of distance and speed of other vehicles in the radius is sent to the CRS console via a low frequency radio wave. 4. The CRS will input the speed and distance of other vehicles and the speed of the user's		

vehicle into the algorithm.

5. The algorithm calculates the speed and distance of the other vehicles and the speed of the user's vehicle.

6. The algorithm then determines the likelihood of a collision.
    a. If the algorithm determines a possible collision it alerts the driver with a voice command as to which side the collision is possible. The dashboard signal for CRS will flash, indicating which area(s) could collide.
    b. If the algorithm determines there is not a possible collision, the algorithm continues to analyze speed and distance of other vehicles and the user's vehicle.

7. The driver prepares to avoid contact with another vehicle based on which part(s) of the vehicle's frame is vulnerable to a possible collision.

8. The CRS continues to analyze the user's speed and distance along with other vehicles as the user continues to drive.

Postconditions:

1. CRS continues to analyze speed and distance.
2. CRS indicator will return to the 'Off' position.
3. Driver reacts if there is a possible collision.
4. CRS shuts down once the vehicle is turned off.

F)

Use Case Name: Obtain Location Awareness	**ID:** UC-1	**Priority:** High
Actor: User		
Description: After the User connects the system into the car, they will select their desired destination into the onboard GPS mapping system. It will guide the user to a series of street, city, state and zip code screens to get the most accurate location.		
Trigger: The user has a need/desire to be in a certain location		
Type: External		
Pre-Conditions: 1. The vehicle is powered on 2. The GPS server is up-to-date and connected on-line 3. The initial position of the car is different from the desired destination		
Normal Course 1. The system establishes a connection to the GPS server 2. The system displays the vehicle's current position on a map 3. The user specifies the desired location 4. The system displays the fastest route and any alternative routes to the destination 5. The system asks the user to select the desired route and to confirm the destination 6. Once user selects route, the system sends the destination address and obtains the directions from the GPS server 7. The system displays the GPS instructions to the user and gives the user the estimated time of arrival to the desired location 8. The system speaks to the user turn-by-turn in desired language 9. The system notifies the user of any changes in traffic pattern or arrival time 10. The system notifies the user when destination is reached 11. The system stores the destination for future use		
Post-Conditions: 1. User is directed to desired location. 2. GPS mapping coordinates are successfully saved into the system.		

G) System will be established for retrofitting to older vehicles

Name: New system retrofitting

Number: UC-7

Level: Kite

Description: HORNS application will be retrofitted to primarily any car

Actor: HORNS user and vehicle

Stakeholders: SBI Team, Engineering Team, Horns User and Ford

Triggers: wanting install HORNS
Preconditions:

1. Vehicle has a radio signal AM/FM
2. *HORNS user has Bluetooth capable device.
3. *HORNS user has HORNS application installed on their device.
4. The driver wants to install HORNS in their vehicle
5. Driver speaks English

Minimal Guarantee: HORNS system plugs in securely
Success Guarantee: HORNS system plugs in securely and functions with vehicles computer
Post conditions:

1. The driver has access to HORNS in the car.

Type: External
Normal Course:
User: Buys and plugs/pays to install HORNS via central console
System: Recognizes HORNS attached and alerts user that device is connected to the plug in
User: Ensure that no other connections are interfering with communicating with other cars
Systems: User car's speaker system to project alerts or commands from device
User: Reviews HORNS manual for any FAQ's or concerns
System: Responds to drivers environment and driving style
User: Begins to drive vehicle in desired direction
System: Sends voice alerts to drive to notify of upcoming obstacles
User: Adjust to upcoming obstacles (i.e. driver signals/brakes when needed)
System: Alerts driver with visual indicators when approaching obstacles within 10 meter radius
User: Views visual indicators and adjust driving style and pattern, accordingly
System: Adheres to drivers driving adjustments and voices successful maneuvering of obstacle
User: Reaches destination and turns off car
System: Alerts driver that system has shut off and disconnects from vehicle (System still plugged in)

* Tabled Ideas for future development
*These idea include application development where information can be analyzed, transferred, and communicated by the driver

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H) System should be easily installable (as close to plug-and-play as possible)

Name: New system installation

Number: UC-8

Level: Kite

Description: HORNS application will be installed through vehicles computer

Actor: HORNS user and vehicle

Stakeholders: SBI Team, Engineering Team, Horns User and Ford

Triggers: wanting to communicate via HORNS
Preconditions:
1. Vehicle has a radio signal AM/FM
2. *HORNS user has Bluetooth capable device.
3. *HORNS user has HORNS application installed on their device.
4. *The driver in the ongoing vehicle installs HORNS
5. Driver speaks English

Minimal Guarantee: HORNS system plugs in securely.
Success Guarantee: HORNS system plugs in securely and functions with vehicles computer.
Post conditions:

1. The driver has access to HORNS in the car.
2. The driver receives voice alerts from the system

Type: External
Normal Course:
User: Buys and plugs in HORNS device into cars computer
System: Recognizes device attached and alerts user that device is connected
User: Ensure that no other audible distractions are interfering with device
Systems: User car's speaker system to project alerts or commands from device
User: Adjust vehicles volume to hear device
System: Adjust to rivers volume preference
User: Reviews HORNS manual for any FAQ's or concerns
System: Responds to drivers environment and driving style
User: Begins to drive vehicle in desired direction
System: Sends voice alerts to drive to notify of upcoming obstacles
User: Adjust to upcoming obstacles (i.e. driver signals/brakes when needed)
System: Alerts driver with visual indicators when approaching obstacles within 10 meter radius
User: Views visual indicators and adjust driving style and pattern, accordingly
System: Adheres to drivers driving adjustments and voices successful maneuvering of obstacle
User: Reaches destination and turns off car
System: Alerts driver that system has shut off and disconnects from vehicle (System still plugged in)

Additional Notes:
Alerts may be sent to driver through multiple lines of signaling: Voice alerts, beeping tone alert, custom tone alert, indicators to accommodate both deaf and colorblind drivers, and visual indicator placed on side and rear view mirrors
Additional Normal Course:
*System: User: Buys and installs HORNS and turns on
*System: Welcome message appears

*User: Activates Bluetooth on phone
*System: Connects to Bluetooth on the phone
*User: Clicks preferences
*System: Displays preferences
*User: Selected audio or visual preference, edits HORNS settings as desired.
*System: Adjust to desired HORNS user preferences

* Tabled Ideas for future development
*These idea include application development where information can be analyzed, transferred, and communicated by the driver

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I) Collision indicator should be placed inside the vehicle and rear view mirrors to direct driver attention. No indicator placed on front console of dashboard to avoid distracting driver. Indicator will be both voice and visual to accommodate deaf and color blind drivers

Use Case Name: Vehicle collision indicator **ID:** A-1 **Priority:** High
Actor: External vehicle
Description: Vehicle will notify driver if another car is too close to it
Trigger: External vehicle enters the vehicle's operating perimeter
Type: External
Assumption: 1. Each vehicle has a local perimeter of communication with other vehicles 2. Collision indicator is in appropriate view of the driver without hindering attention
Preconditions: 1. Vehicle is powered on and in operation

Normal Course:

1. **System:** Operating vehicle is actively sensing all vehicles within its local perimeter

2. **External Vehicle:** Enters the perimeter
3. **System:** Senses position of external vehicle and alerts driver with audio notification
4. **External Vehicle:** Vehicle alerts its own driver of possible collision with audio notification
5. **System:** Driver can adjust speed or position to avoid collision according to audio notification
6. **External Vehicle:** Driver can adjust speed or position to avoid collision according to audio notification
7. **E1:** System driver and External Vehicle driver ignore audio notifications (occurs at Step 5 and 6)
    a. System and External Vehicle continue course into possible collision