

# The Gas Exchange

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## Overview

As we approach the end of the fossil fuel era, with gas prices rising as a response, drivers today are increasingly searching for ways to increase their cars' gas mileage. While technology has provided advances such as hybrids and more fuel efficient engines, many drivers are still unaware of basic things that can give them a miles-per-gallon edge: efficient driving and a well maintained car. Even those drivers that are aware of these solutions, many do not have the discipline or motivation to practice them regularly.

Gas Exchange aims to provide a complete in-car system to motivate and assist drivers to drive more efficiently in a nonintrusive, helpful manner. In addition to real time driving feedback and driver training, Gas Exchange also incorporates a reward system to encourage and reinforce good driving. This system awards points to participating drivers and issues a driver rating that can then in turn be used for discounts on fuel purchases and car maintenance, reduced tolls, and lower insurance premiums.

## Contextual Inquiry Participants

**Dina** is in her late 20's, a software engineer, and an avid driver. Although she is highly dependent on her car and drives on a daily basis, she really does not put much thought into the whole process of driving other than to get where she needs to be as quickly as possible. Her 2009 Toyota Camry with automatic transmission is neither flashy nor highly efficient, but does exactly what she needs without any hassles. She wouldn't mind getting more efficiency out of her vehicle, especially if it will save her money, but she really does not want to invest much time or energy in the process.

**James** is also a software engineer and is in his late 30's. His primary vehicle is a 2008 Nissan Frontier pickup truck with a manual transmission is powerful, but only averages around 15 MPG. Like Dina, James does not really think too much about efficiency while driving, and instead modified his method of commuting in order to save on gas. James only drives to work three times a week, while bussing the other two days. In terms of maintenance, James is a strict by the book guy, bringing in his truck for regular maintenance according to the owner's manual.

**Oscar** is in his 30's and has driven a hybrid Honda civic since 2004 in order to be more environmentally friendly. He chooses to drive a hybrid primarily for its lower impact on the environment, and admits that he probably spent more on the hybrid premium than he would probably ever recoup in reduced fuel consumption. Unlike the Toyota Prius, his Honda has no status screens for the driver to monitor the

efficiency of the vehicle. In order to maintain optimal fuel efficiency, Oscar regularly maintains his car according to the owner's manual.

**Sherwin** is also in his late 30's, and is an aeronautical engineer. His main car is a Toyota Prius, but unlike Oscar, he purchased it primarily to save gas. Sherwin considers himself a "hyper miler", that is, a person who actively monitors and adjusts their driving style in order to maximize the fuel efficiency of their vehicle. For Sherwin, the advanced gauges and monitoring system of the Prius are perfect for assisting him in his goal of squeezing the most miles that he can from every gallon. One of his wishes is for an accelerometer so that he can correlate acceleration to gas consumption.

## Contextual Inquiry Results

### Awareness

It is clear that the attitudes of different drivers towards fuel efficiency vary greatly even within a demographic. Dina and Sherwin highlight two extremes. Dina is much more interested in simply driving to accomplish a task, and was more conscious of managing the playlist of her digital music player than she was of the miles per gallon she was getting. Sherwin on the other hand opines that he does not have enough instrumentation to carefully monitor his fuel consumption, and is constantly reviewing the mileage history of his car in order to make new personal mileage records. In the middle are James and Oscar, who take moderate approaches, but for different reasons. James in order to reduce the impact driving has on his pocketbook, and Oscar to reduce the impact driving has on the environment. Regardless of their base attitudes towards fuel efficiency, all drivers expressed that they would be interested in saving gas and improving the fuel efficiency of their vehicles. The main differentiator is the amount of effort each person is willing to expend in achieving this.

### Driver Feedback and Controls

With the exception of the Prius, the vehicles that the participants drove mostly had minimal fuel efficiency and maintenance feedback systems. Most cars had a minimal "service engine" light, and little else. None of the cars other than the Prius had any sort of efficiency gauge (MPG), and only the Prius had a voice control system. In addition to the MPG gauge, the Prius also had an advanced monitoring system that showed which drive system was engaged (motor or gas engine), and the charge/discharge state of the battery. Sherwin noted that this gauge was the most important for him as it helped him to fine tune and optimize his driving style for fuel efficiency. Dina mentioned that a gauge to help her save gas would be appreciated, but it must be very simple and easy to understand. Multiple participants mentioned that voice control systems would be useful, but that audio feedback should be minimal (use only when essential) and non-repetitive in order to minimize annoyance, and the tendency to ignore "nagging" messages.

### Maintenance

All of the participants indicated that they would immediately service their vehicles if a maintenance light were to come on. However, James was the only one who mentioned regularly doing simple manual checks such as tire pressure and oil level. The others relied strictly on instrumentation warnings and

following the recommended maintenance schedule as outlined by their cars' respective owner's manuals.

## **Trip Planning and Scheduling**

As important as trip planning is to optimizing fuel efficiency, it was not placed as high in our subject's list of priority as other items. For the most part, people tended to take the same routine routes, and drove whenever they needed to be somewhere rather than take advantage of traffic patterns. Oscar said he would delay leaving work for up to an hour or so in order to wait for lighter traffic, but the main motivating factor is to avoid traffic rather than to save fuel. When planning new routes, participants would mostly plan their route using GPS systems with the routing algorithms set for fastest time. One area nearly all participants agreed on is that they all take tolling into consideration when planning routes, and do a rough cost/benefit analysis when deciding whether or not to take the 520 bridge, which is the main toll all of the participants have to deal with. Dina is enrolled in an evening MBA program, and regularly takes the bus to school in order to minimize tolling and avoid parking hassles. James will take the bus a couple times of each week to save on gas.

## **Deals and Incentives**

All users take advantage of discounts when available. These are primarily through grocery store club cards (such as Safeway) and credit card rebates. Sherwin showed extra affinity for savings going as far as to plan his gasoline purchases at specific Costco stores at specific times in the week when he is near them to maximize savings due to both locality, and credit card rebates. Although he lives on the eastside, he plans his fueling around when he attended church in Seattle in order fuel up at the Seattle Costco.

## **Task Analysis**

### **Who is going to use the system?**

Our users are drivers who are willing to improve fuel efficiency, but are not necessarily willing to put extra effort into optimizing their situations. These drivers would be willing to take action when information and suggestions are convenient and readily available.

### **What tasks do they perform?**

Drivers perform a number of tasks today:

- Regular maintenance
- Trip planning and route optimization
- Saving money through incentive programs, insurance deals, etc...
- Responding appropriately to car status indicators
- Hypermiling and learning how to drive efficiently

Not all drivers carry out all of the above; with some doing more than others.

## What tasks are desired?

For our project, the following tasks are desired:

1. Getting an optimally planned trip which is balanced between time, money (tolls), and fuel efficiency
2. Getting discounts on gas, maintenance, and other driving related expenses
3. Discovering which maintenance tasks can be done to make the car more efficient, such as inflating the tires to spec or changing the engine oil
4. Learning how to drive efficiently and establishing good habits, both by getting instant feedback and through monetary incentives

## How are the tasks learned, and where are they performed?

Task	How learned	Where performed
<b>Regular maintenance</b>	Word of mouth, reading the manual	In the garage or by the mechanics
<b>Hypermiling</b>	Word of mouth, internet resources	In the car while driving
<b>Route optimization</b>	Word of mouth, internet mapping resources, GPS, personal experience, road signs	Before the car trip, during the drive, or over time from personal experience
<b>Discount/incentive programs</b>	Marketing (ads, fliers, etc.)	During shopping trips, online deal sites such as Groupon, billboards, signs, etc...
<b>Getting and responding to car status</b>	Personal experience, seeing a warning light and responding appropriately, being taught by others on how to actively check for signs of wear and tear	While driving the car, before and after driving
<b>Discovering ways to make the car more efficient</b>	Word of mouth, internet resources, expert knowledge	At the computer, talking to people, in-person at car clubs, garages, etc.
<b>Learning how to drive efficiently</b>	Word of mouth, internet resources	In the car while driving, at the computer, while driving.

## What's the relationship between customer & data?

There is a symbiotic relationship between the customer and data. During one side of the cycle, the customer generates data through every day driving activities. On the other side, the customer consumes the data to optimize driving behaviors. These factors include:

- Driving advice: suggestions on how to improve efficiency under current conditions (usually by a more experienced driver)
- Car performance/metrics: real-time performance data is presented by some vehicles with advanced information systems
- Car status: informs the customer about any car systems that require attention
- Traffic data/toll rates: information is utilized in optimizing trip routes

- Rewards accumulation: used to encourage and reinforce desired habits (such as shopping at a particular store)

### What other tools does the customer have?

Customers have a number of tools to deal with the tasks, such as:

- Existing gauges and instruments in the car
- Manual car tools, such as dipsticks and tire pressure gauges
- Internet websites/Discussion forums
- Mobile applications
- Existing deals and offer systems implemented by various stores

However, these are all spread out and not necessarily coupled together in any way shape or form.

### How do customers communicate with each other?

Customers can exchange tips and questions either through online resources such as special topic forums or in-person with friends or experts such as mechanics.

### How often are the tasks performed?

The frequency of the tasks really varies depending on the driver. It can range anywhere from daily or on a per-drive basis, to monthly, yearly, or never at all. Some tasks are prescribed on a schedule, such as regular maintenance at 5000 miles, where others are more drivers dependent. Overall, it's really up to the discretion of the driver, and many of the tasks may or may not need to be performed on a regular basis.

### What are the time constraints on the tasks?

Task	Constraint
Route Planning	Needs to be done before the trip is done
Car maintenance	Needs to be done before the car has issues
Hypermiling	Needs to be done in real time (while driving)
Taking advantage of promotions/discounts	Promotions often have expiration dates, so taking advantage of them needs to be done before such expiration dates

### What happens when things go wrong?

The consequences can range from fairly minor to catastrophic. On the innocuous side, a driver can experience lower gas mileage or missed discount opportunities. A driver may also waste unnecessary time or money by driving inefficient routes. More severely, a driver that neglects maintaining his/her vehicle can experience premature wear and tear on the car, or even worse, a break down.

## Tasks

### Task 1 – Planning an efficient route (easy)

Ever since tolling began on the 520 Bridge, driving between Seattle and the Eastside has transformed into a thought exercise for those trying to maximize their overall cost in both gas and toll costs. During rush hour, the “free” route across I-90 may actually end up costing more money in the extra gas expended while sitting in traffic, but at other times, I-90 may be the optimal choice.

Today, there are some mobile apps specifically tailored to answer the 520/I-90 question, but there aren’t any apps that generalize this across the country. The big mapping and routing websites offer various options for planning trips, but do not take factor in tolls or traffic patterns.

This first task is to plan the most efficient (gas, time, and toll) trip.

### Task 2 – Getting discounts on gas (easy)

Everybody likes to save money, and with ever higher fuel costs, saving money on gas can definitely add up. All the major gas companies offer branded credit cards which offer cash back. Other discounts, such as Safeway’s frequent shopper fuel discount program also exist. Many car dealers also offer gas cards to prospective drivers that test drive or buy a vehicle from them. While there are many options, they are all varied and spread out, and unless you know of a specific promotion or discount beforehand, it can be quite a hurdle to save a few cents here and there.

This task is to obtain a discount on gas at the pump (in a legal fashion!).

### Task 3 – Getting a car status and driving habits summary (medium)

A well maintained car not only helps prevent breakdowns and premature wear and tear, it also ensures optimal gas mileage. Most drivers know that properly inflated tires and good engine oil are key factors towards getting the best gas mileage possible from a car. However, fewer would think about the air filter, excess weight, and other lesser thought of, but equally important, car issues. Coupled with car issues, one’s cumulative driving habits will affect the overall gas mileage of the car. Various tools are already at the driver’s disposal, such as tire pressure gauges, engine oil dipsticks, and gas mileage calculators. However, these are all spread out and require extra effort to utilize. As a result, many drivers may put off doing their due diligence and end up letting their driving habits and their car’s health deteriorate.

Task 3 is to obtain a summary of the car’s health and an assessment of the driver’s driving habits. The health checklist should include the tire pressure, engine oil quality, excess weight, as well as an assessment of the driver’s current and past driving performance.

### Task 4 – Getting instant driving feedback (hard)

Driving schools teach us how to drive, but not how to drive *well* and *efficiently*. Many drivers are unaware of various techniques and tips key to driving as fuel efficiently as possible. In addition, simply knowing about the techniques means nothing without good practice and seat time. Unfortunately,

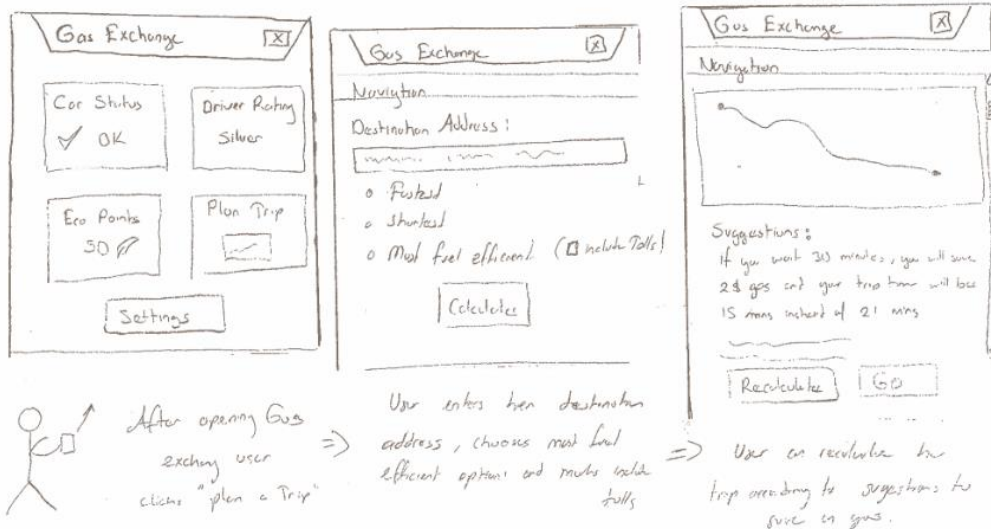
short of hiring an instructor to sit in your car and critique your driving, it is difficult to know if your current driving is done in an efficient manner.

Task 4 is to get instant feedback on your current driving. In addition to the current fuel efficiency of the vehicle, this would include advice on modifying current driving behaviors to improve the performance of the car.

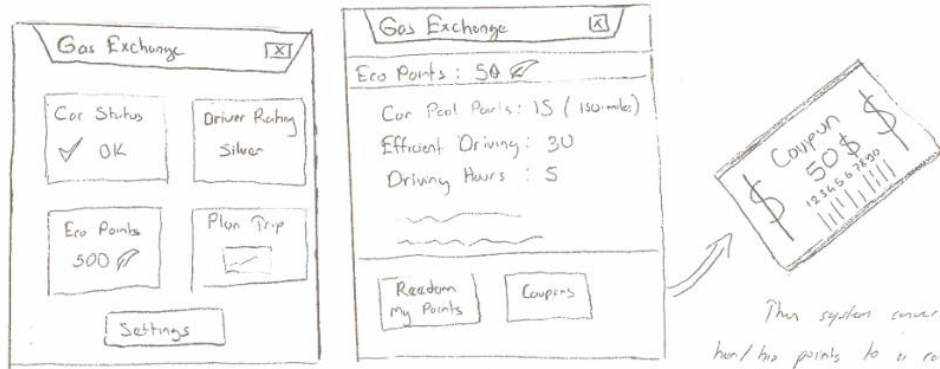
## Initial Designs

### Design 1 (Mobile App)

Task 1: Plan a Route



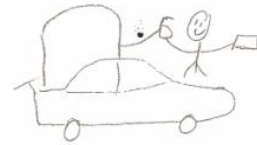
### Task 2: Get Discounts



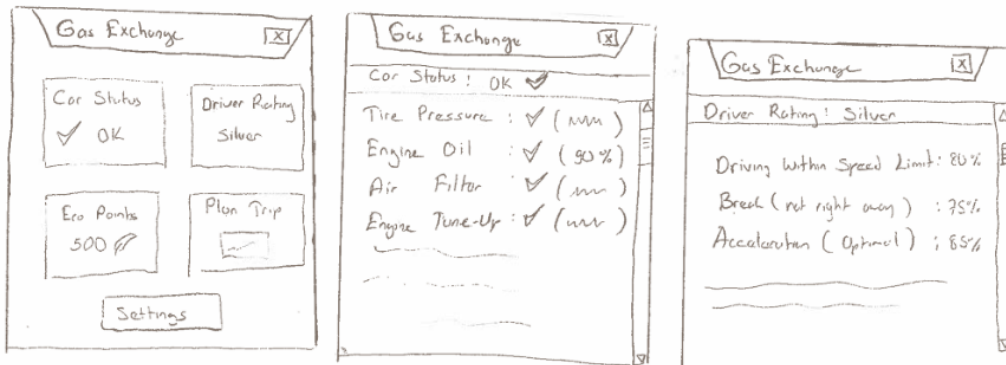
After opening Gas Exchange mobile application user sees that she earned 500 points

User sees how she earned these points (this encourages user to continue on good driving habits) then click redeem my points

Then system converts her/his points to a coupon and user uses it at a gas station pump



### Task 3: Car Status and Driving Habits



User opens his/her Gas Exchange mobile application and clicks car status button in order to get a detailed summary (this button also displays a general summary)

User is displayed a detailed car status report if there is a problem system also suggest how to resolve it.

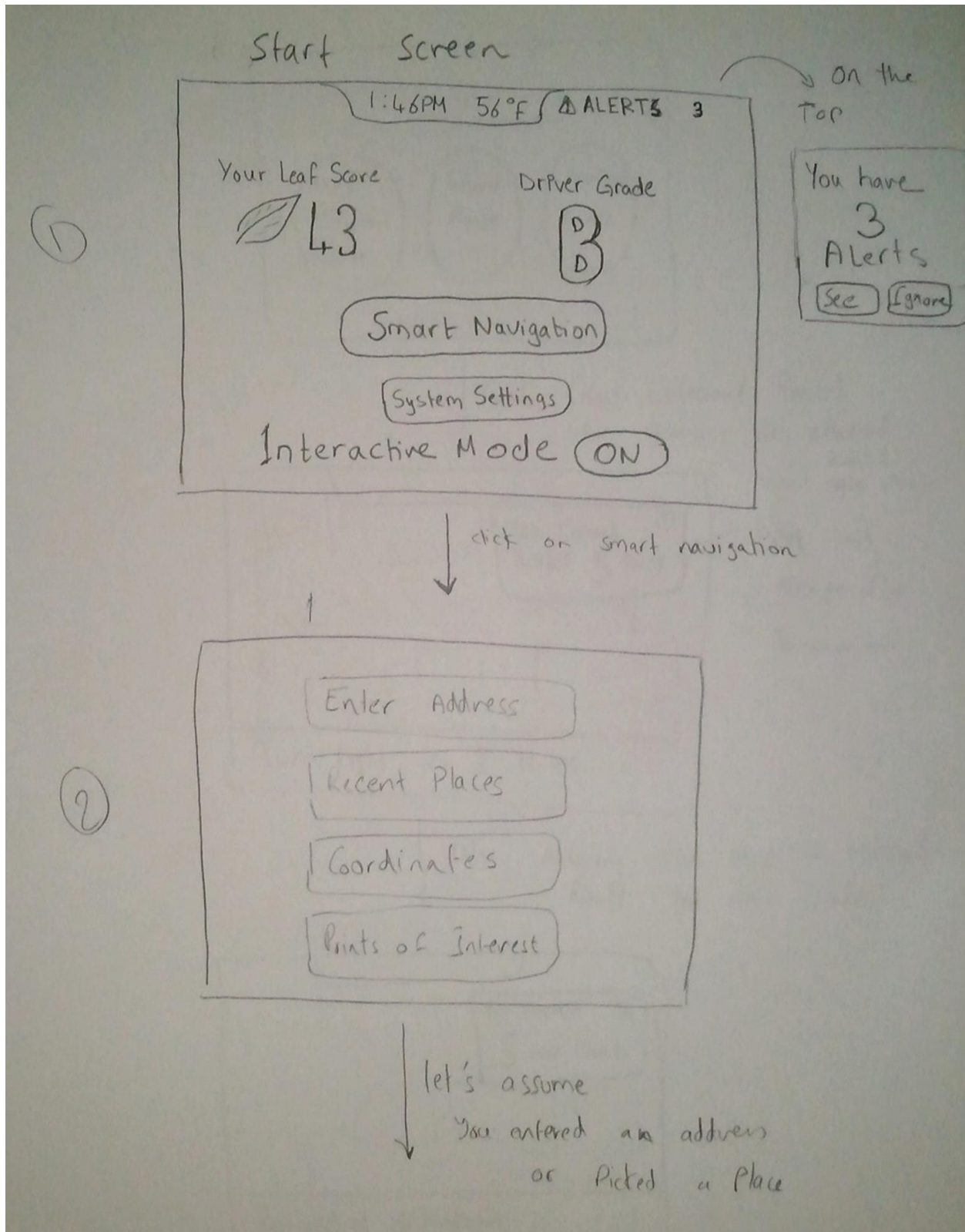
In order to get information about how driver is driving he/she clicks to Driver rating button on main window then detailed driver rating is displayed and also explains how user can improve himself.

Push

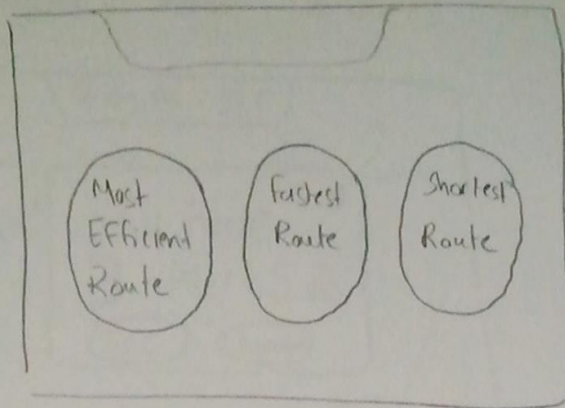
Instant feedback is given via voice commands



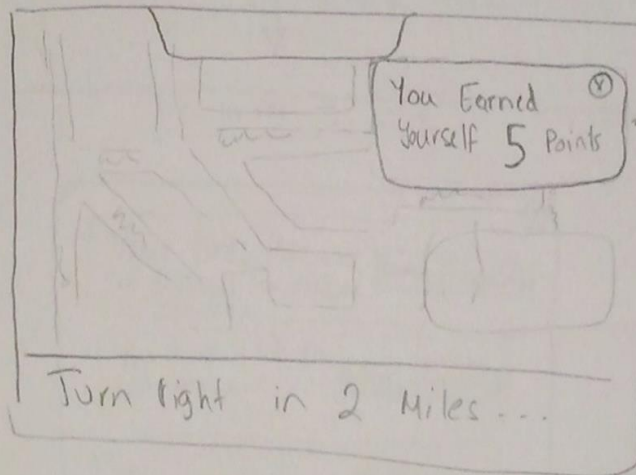
## Design 2



3

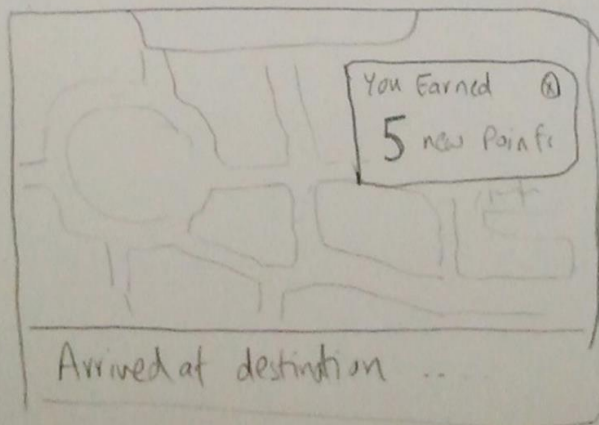


Click (Most Efficient Route)  
upon choosing the efficient route  
you gain points

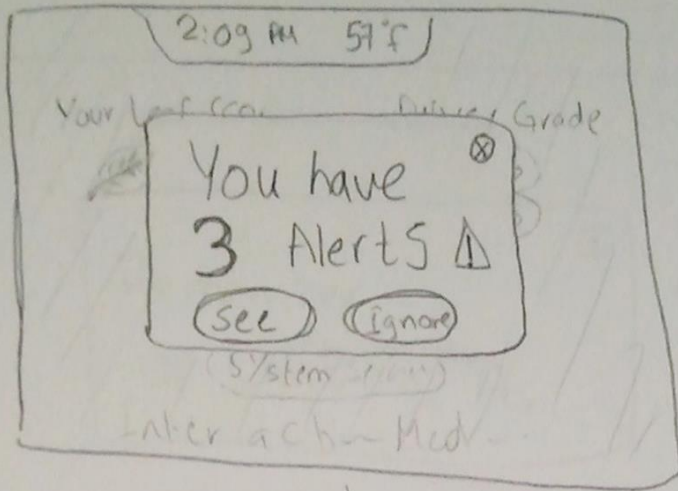


Popup that  
disappears in  
few seconds

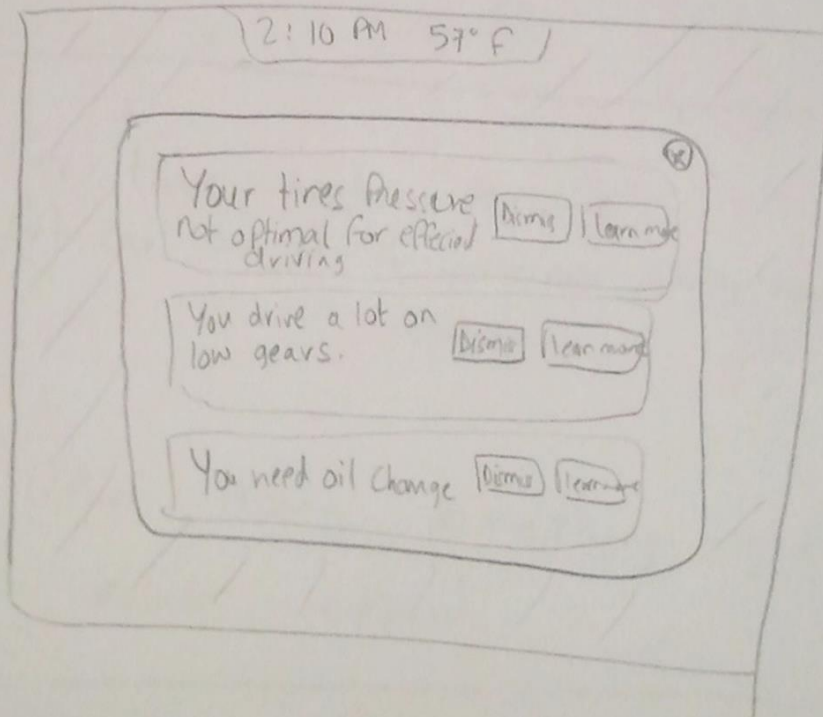
Upon arriving after using an efficient  
Route you gain points



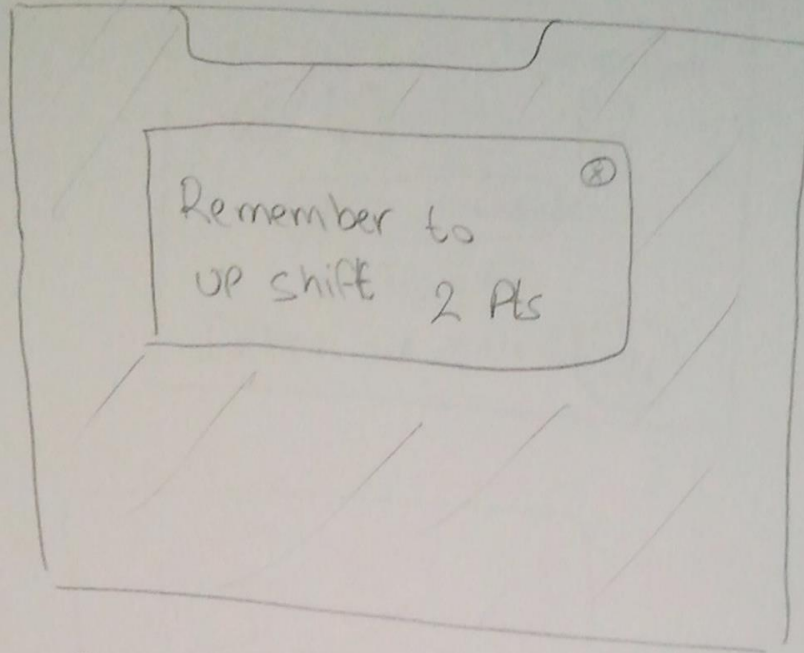
if You have alerts



Click see

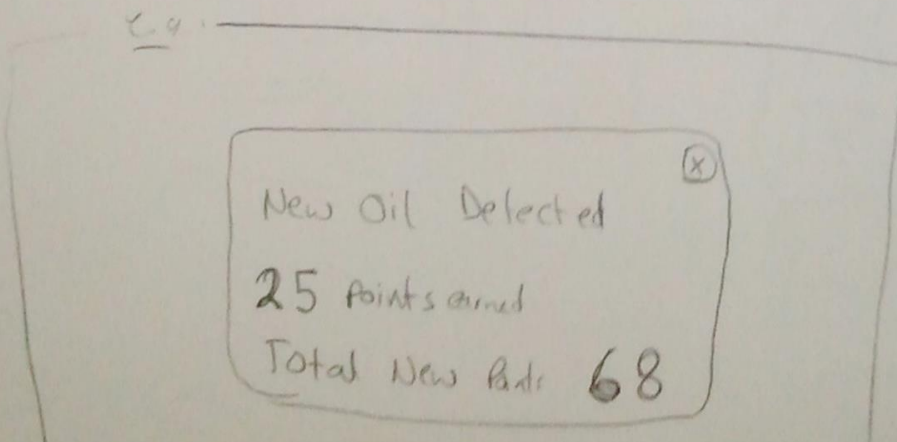


# Interactive Mode ON



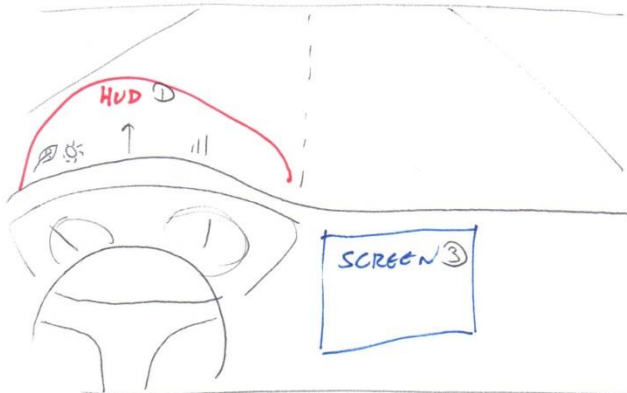
- \* Car tires needs Pressure
- \* Put car on N if you're not moving soon

Also Upon doing something right Popups with earned points appear

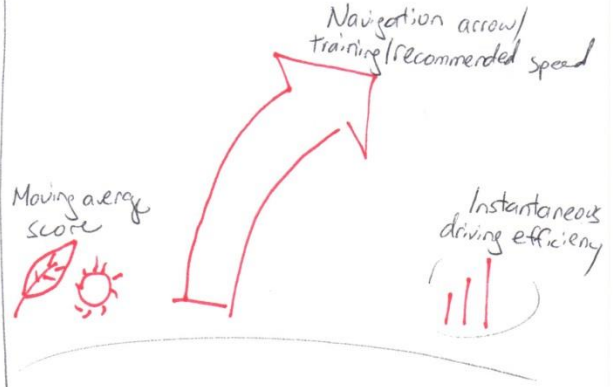


# Design 3

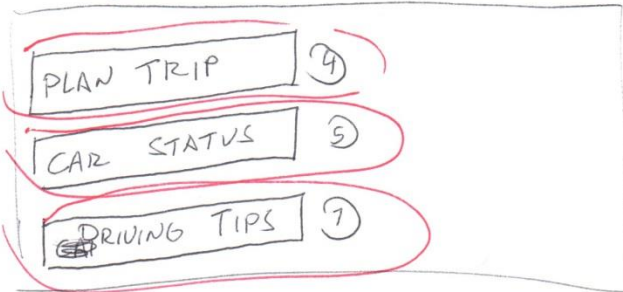
## ① WHILE DRIVING



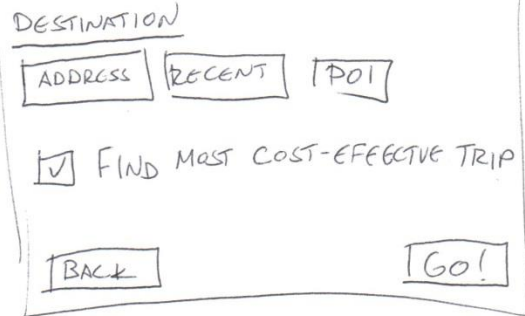
## ② HUD VIEW



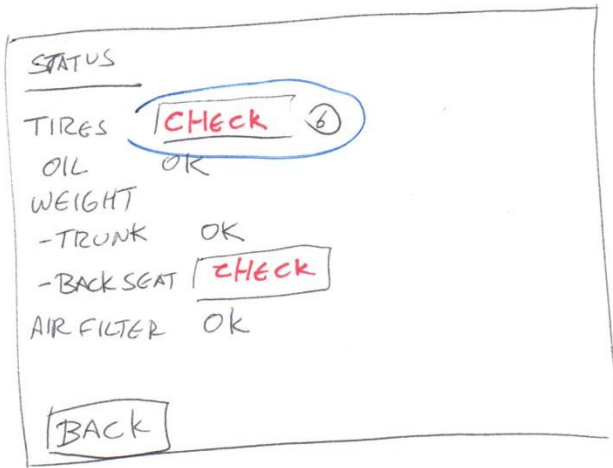
## ③ SCREEN VIEW - Intro / Homepage



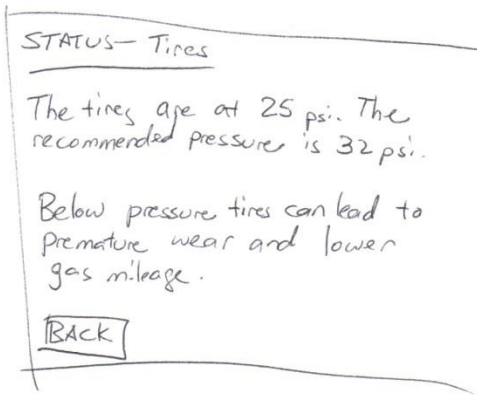
## ④ PLAN TRIP (STANDARD GPS SCREEN)



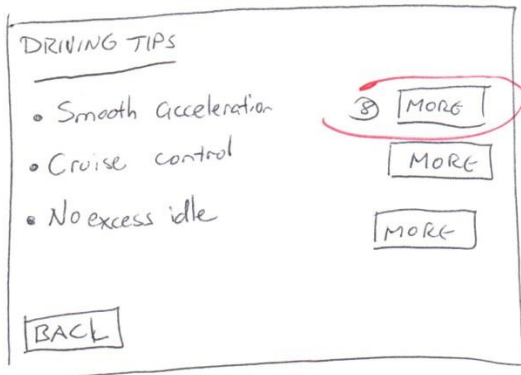
## ⑤ CAR STATUS



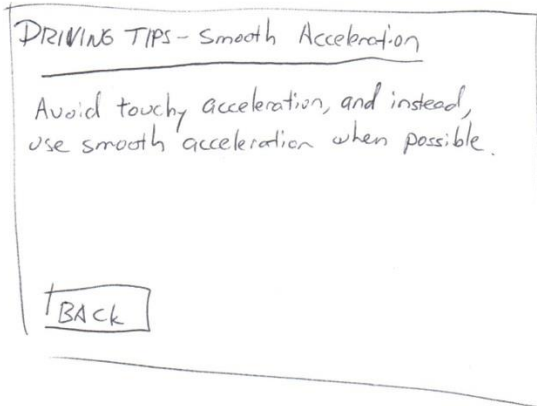
## ⑥ Click on TIRES'S CHECK button



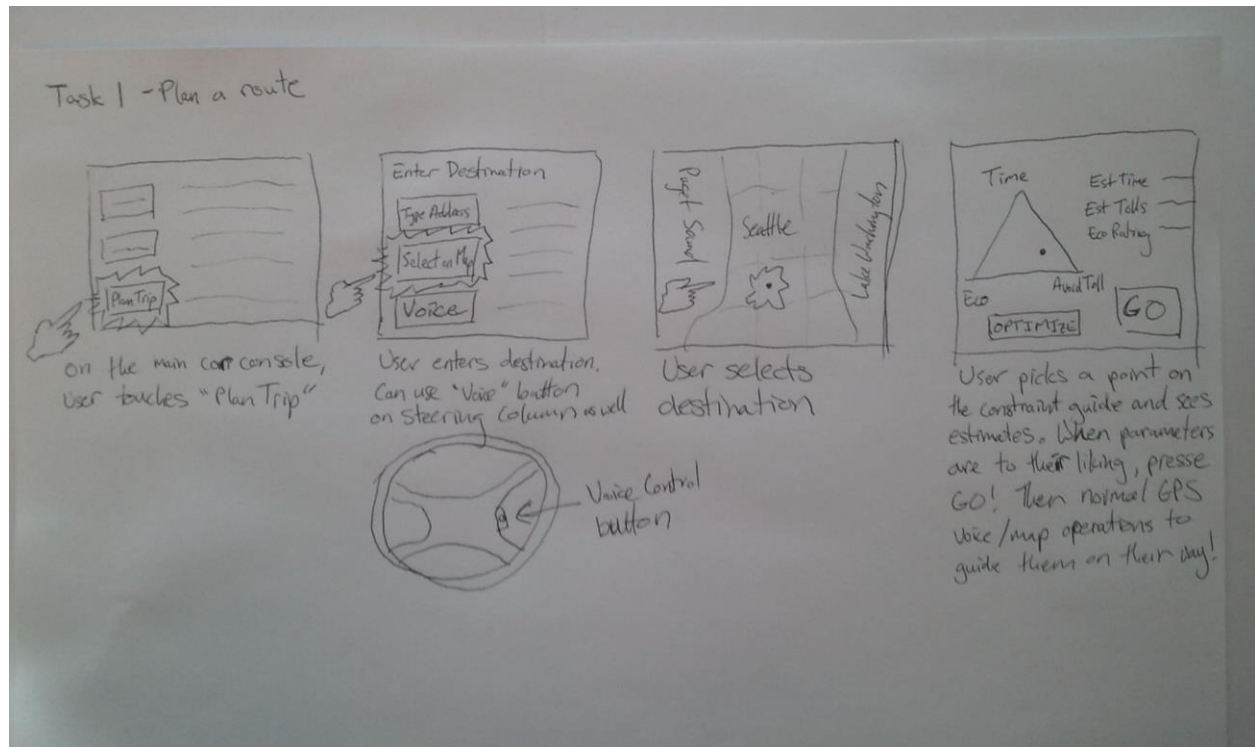
## ⑦ DRIVING TIPS



## ⑧ Click on "Smooth Acceleration"'s MORE button



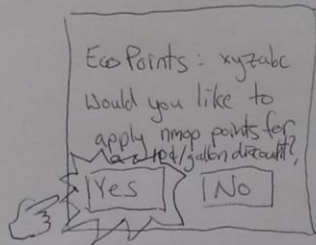
## Design 4



## Task 2 - Gas discounts



As car pulls up to the station, the pump is able to instantly ID the car and access the car/drivers ECO account

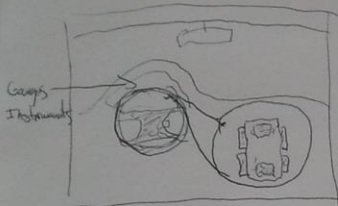


Pump panel shows driver her points and asks ~~if~~ if she would like to apply some towards a discount.

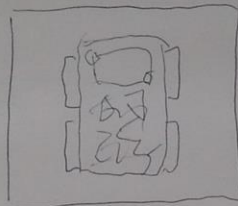


Driver fuels up, and is feeling great that her efforts towards helping the environment is also helping her pocket book!

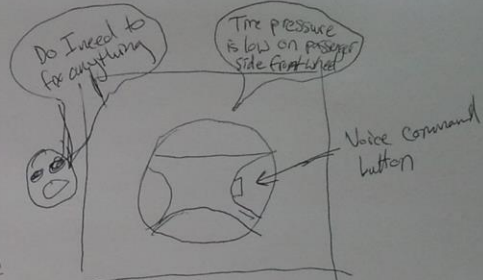
## Task 3 - Car Status and Driving Habits



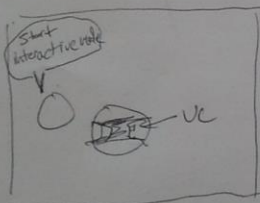
An additional gauge is added to the driver's instrument panel.



Gauge color codes different subsystems in the car for condition. Colors change from Green to Red over time so user has more fine details over the wear + tear



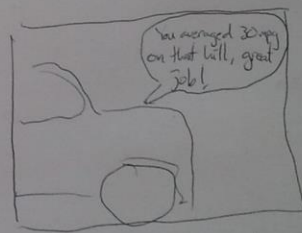
User can use the voice command button to get car status report and recommendations.



Driver can put car into interactive mode to get advice on improving driving

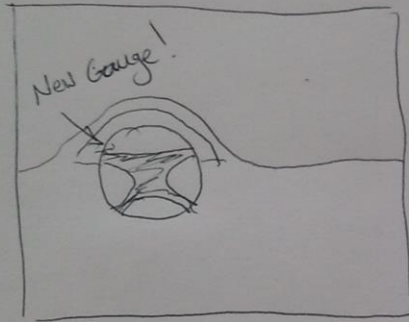


Car can then give feedback...

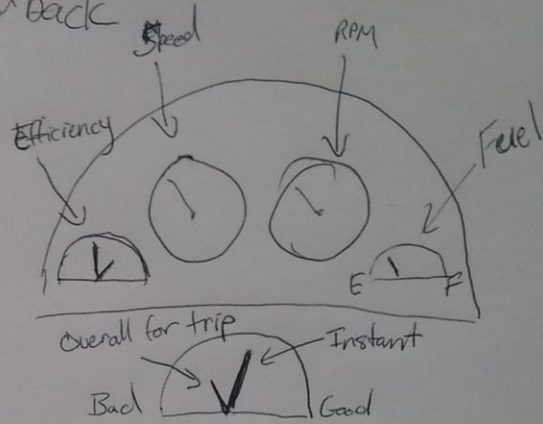


and encouragement. System can learn driving habits, and dial back the feedback as driving improves.

# Task 4 - Instant Feedback



Add a new gauge to the instrument panel



Efficiency Meter to give instant feedback. Not just MPG's. Takes into account accel, terrain, traffic, etc...



## Selected Interface Design

Our final design is a combination of features from the initial designs. We decided to have multiple methods for interacting with the user (the driver):

- A main touch screen console in the car's dashboard
  - This serves as our main display showing detailed status and messages. It's where the driver can learn about their driving status, car status and the rewards they have accumulated. It also provides an interface for efficiently planning a trip that incorporates constraints such as travel time, toll costs, and environmental impact. It can also show alerts that draw the user's attention to things that can improve the car's performance.
- A head-up display (HUD) on the windshield for displaying real time information in a non-distracting manner.
  - This is a transparent display that presents data without requiring users to look away from their primary driving view. This is the same model currently being used in some advanced car and military aircraft.
- Voice communication
  - For giving the user audible feedback such as
    - Greeting the user when they enter the car
    - Giving navigation direction
    - Notify the users when there is something they can do while driving to improve the efficiency (like putting the car on Neutral, down-shifting or up-shifting when necessary, ..etc)
  - For allowing the user to issue "hands-free" and "eye-free" commands to the system
- Mobile Companion App
  - Offline viewing of performance history, driver rating, points accumulated, etc...
  - Trip planning
  - Redemption of rewards

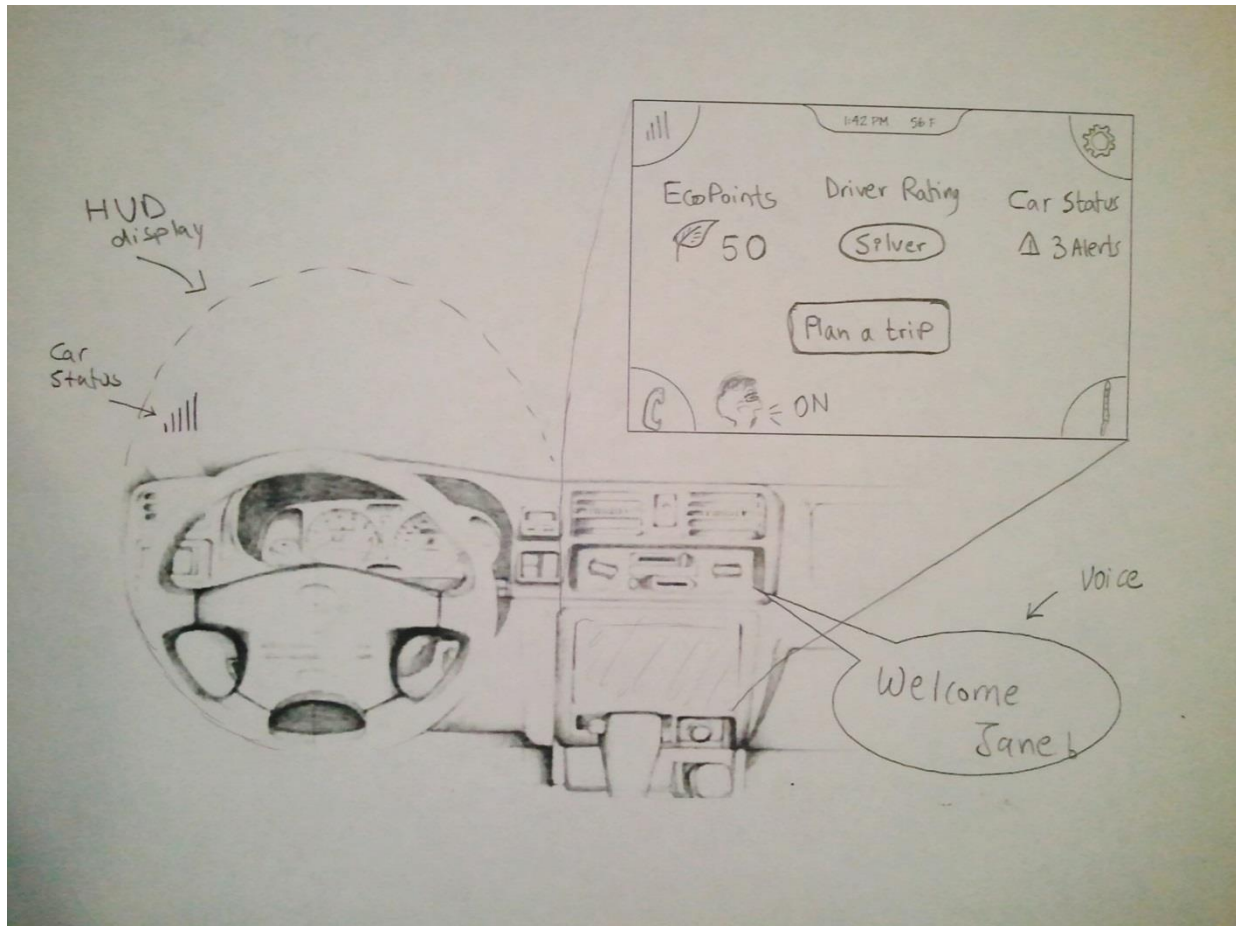
There are two main reasons for using multiple feedback mechanisms. First, people learn best when presented information in multiple ways and using multiple senses. Second, the user has an option to use the feedback mechanism that is most appropriate for the situation. Before and after driving, the main screen and mobile companion app gives much more detailed information and options. However, while driving, the HUD provides less distraction and places the information at the point of consumption, while voice interactions allows the driver to interact with the system without removing his/her eyes from the road or hands from the wheel.

## Functionality Summary

- The initial screen will be a simple screen showing three main statuses:
  - The user's ECO points which are the points users have earned so far by being efficient in their driving. These points can be later redeemed via other channels that are out of the scope of this project (internet, gas station, insurance discounts,..etc)

- The user's ranking which reflects how efficient the user is in his driving. Different levels can be earned through consistently following the car efficiency tips the system provides to the driver (like putting the car on neutral while waiting, frequency of shifting gear if manual, keeping the car maintained, keeping an optimum tires pressure, using routes with less up-hill sections,..etc
  - The car status. This shows any alerts about any required (or preferred) maintenance the user needs to perform to get the car to perform efficiently.
- The main screen also has a 'Plan a trip' option that lets the user pick the destination they want to go to, then offers an interface that lets the user adjust the route based on their priorities which can be eco efficiency, time or toll-free roads.
- The system can be put into an interactive tutoring mode. When turned on, it gives audible feedback to the user while driving on ways they can improve their driving efficiency, with the goal of training and encouraging efficient driving habits.
- The heads up display also shows a car status signal that gives the user instant feedback on the current fuel efficiency of the car relative to driving conditions.
- The HUD is also used to display directions while navigating and brief, non-distracting notifications and alerts.
- The mobile app replicates the functionality of the main screen, and allows for “offline” viewing of information, and trip planning.
- The mobile app also allows for redemption of rewards when away from the car. App syncs with the same account that the car's systems are linked to.

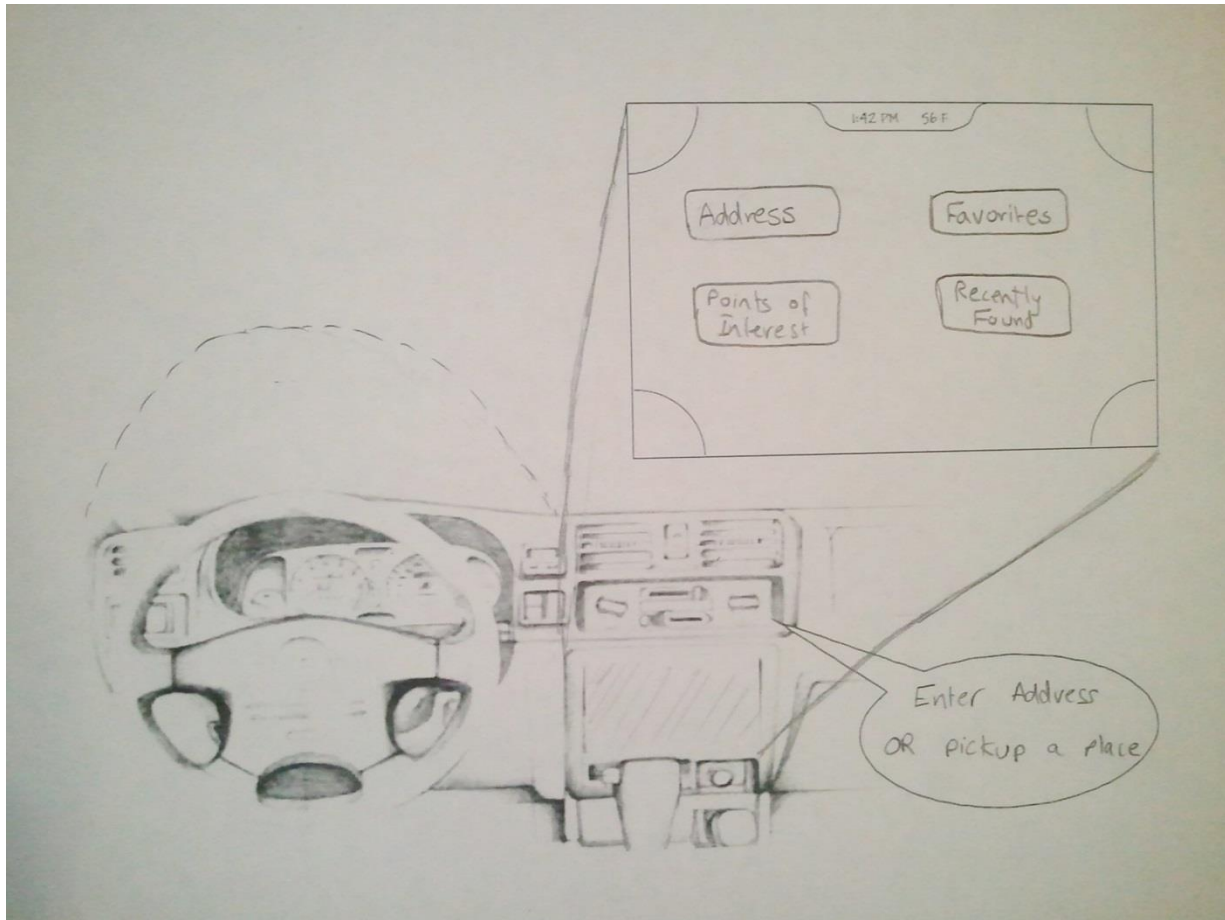
## Design walkthrough



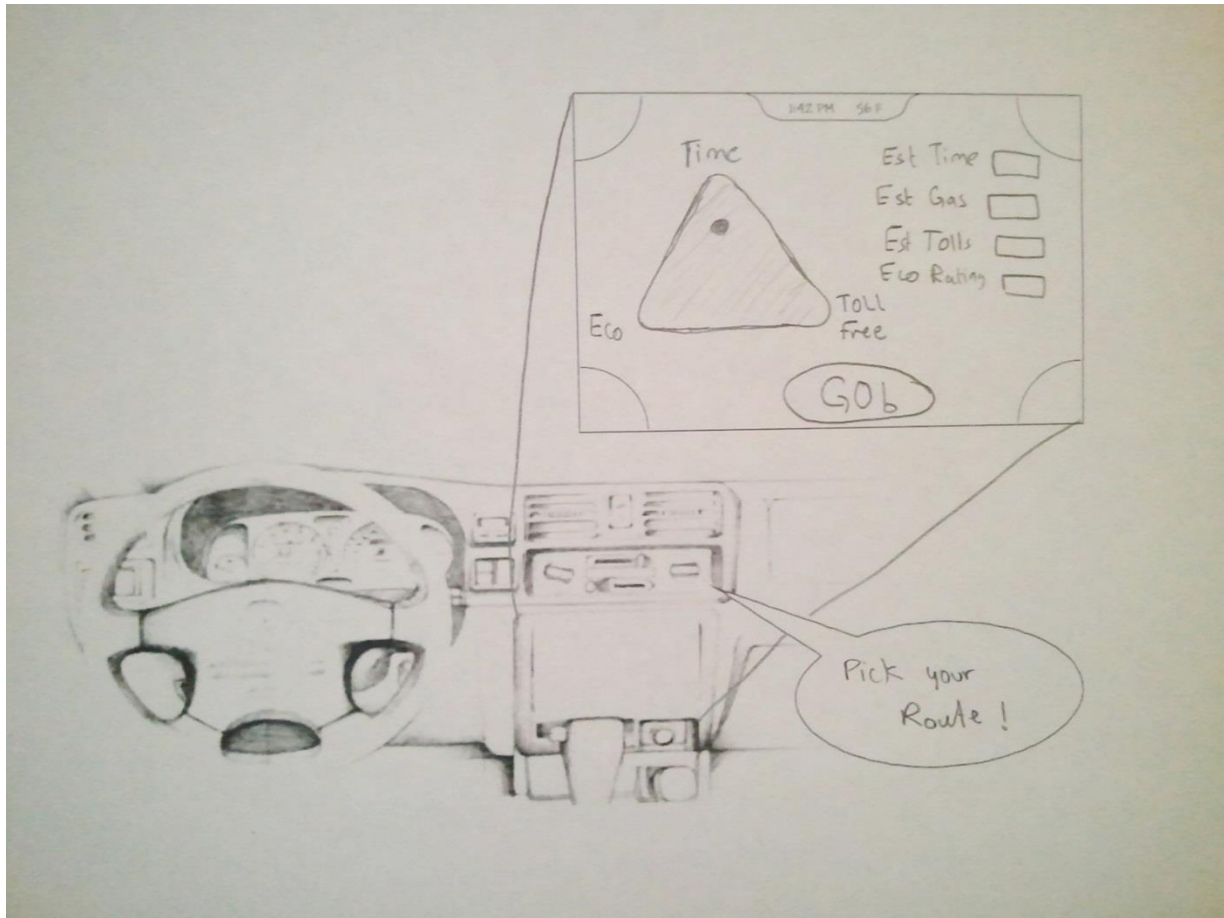
Main screen + HUD + Voice

When the user first enters the car the system greet him/her with a voice greeting. It can use their keys or whatever way to determine the identity of the user (outside the scope of this project). The screen is showing the ECO points, the driver rating and the car status

The HUD is showing a small signal showing the overall health/status of the car

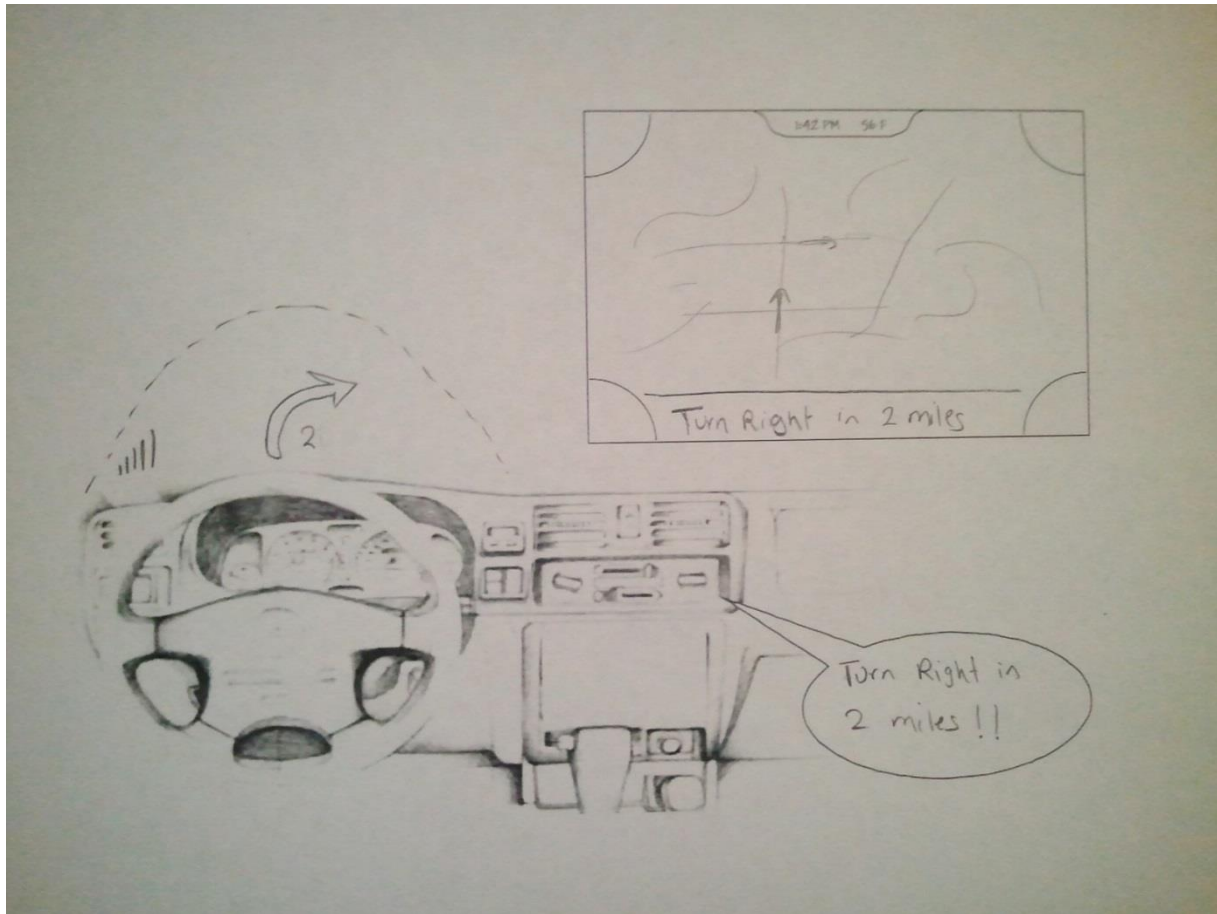


Upon selecting the 'Plan a trip' option the user is presented multiple options for specifying the destination, whether by entering the address, using a saved location, search a location, or even picking one from a list of recent locations.



The user will then use an intuitive constraint weighting system to guide the system's routing algorithm. The user can thus specify what criteria they most care about at that time. This includes can be Eco friendliness (which results in providing the most efficient route, and thus accrues the most Eco points), time, or toll savings.

All they need to do is just move the circle inside the triangle towards the criteria they care most about, and they can see the time, tolls, eco rating estimates update in real time. Once the estimates are satisfactory, the user presses "Go!" to display the route map and begin voice navigation.

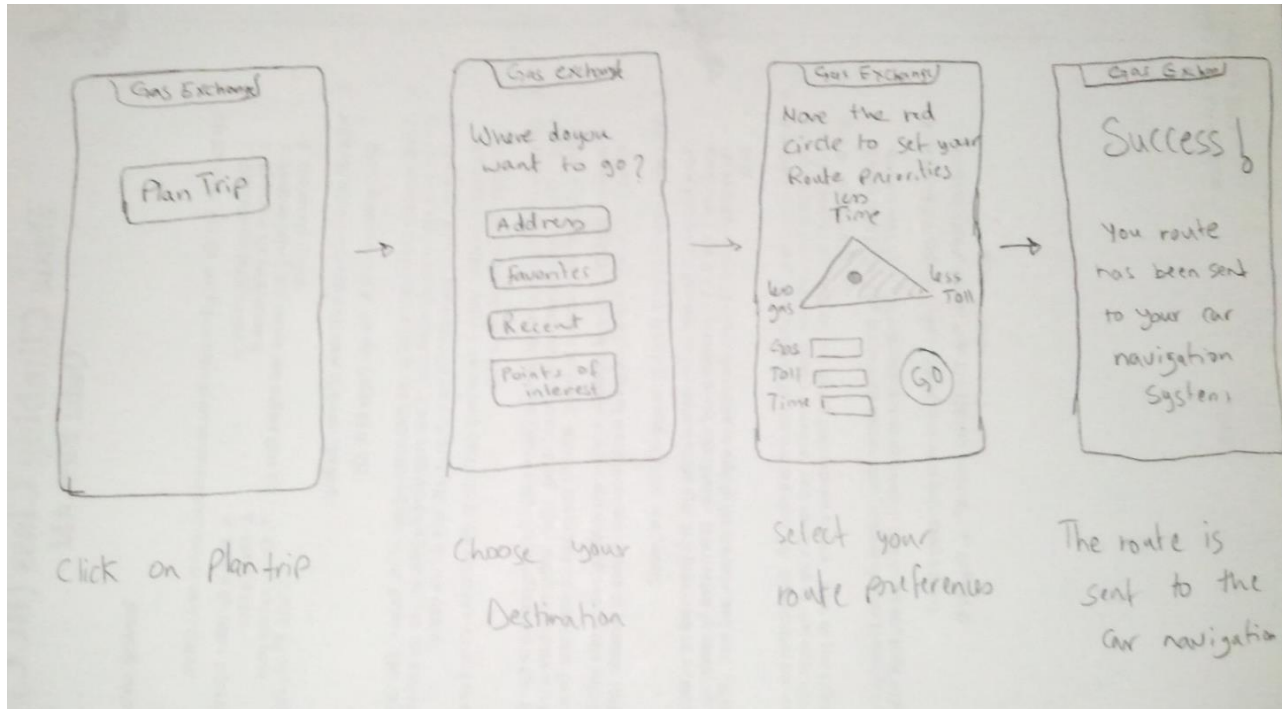


Once they pick a route the system will start navigating to the destination using this route. The screen will show the map along with detailed instructions. Voice prompts will guide the user the turns/routes they need to take, and the HUD display will show arrows and distances to notify the users when they need to turn. The guidance arrow will also change colors and grow/shrink to notify the user whether or not he/she is accelerating at the proper rate or traveling at the optimal speed.

The system will also issue voice prompts and show a message on the main screen if the interactive mode is on to give the driver tip while driving on how to improve their car efficiency

## Mobile Companion App

There will also be a mobile app to allow users to access the system when away from their car. It allows the user to view their vehicle status, driver score, eco points, etc..., and can allow the user to accomplish tasks such as trip planning before even getting into the car! In this sketch, the app allows user select a destination, and then configure a route based on their preferences. Once they get in the car, the route is automatically synced to the onboard system and navigation can start immediately after ignition.



## Scenarios

### Scenario 1 – Planning an efficient route (easy)

It's Friday afternoon, and Alice is just finishing up another day at work in her Bellevue office. She loves sushi and her coworkers suggested a great restaurant in Seattle. After work she wants to go there to try out their various delicacies with her coworker John. However, she doesn't know much about Seattle traffic and does not want to waste gas and time sitting in the traffic. She starts up the Gas Exchange mobile companion app, and navigates to the trip planning screen. She enters her destination address and then moves the guidance cursor within the triangular constraints guide to modify the potential route's estimated time, toll fees, and eco rating. Once she sees estimates that are satisfactory, she presses "Go!" to get driving directions. The driving assistant returns the most efficient according to her constraints, and then informs her that delaying her trip for 15 minutes will save her \$3 in toll fees, and shorten her driving time from 35 minutes to 29 minutes. She decides to stay a little later and finish up some email instead. After she wraps up her emails, Alice heads down to garage with John and they start their commute. Since she is carpooling she also earns extra points.

### Scenario 2 – Getting discounts on gas (easy)

Like everyone else, Jane also likes to save money. She knows that through "Gas Exchange", her good driving habits will not only be rewarded as better fuel economy, but also financially as gas discounts. After using gas exchange and driving responsibly, Jane earns 500 eco points. When she arrives at the nearest gas station, the pump identifies her vehicle and looks up her available eco points. After choosing her payment option, the pump console offers to apply 100 of her eco points towards a \$0.10 per gallon discount. Jane selects "Yes", and sees the price per gallon displayed drop by \$0.10. After filling her tank with discounted fuel, Jane carries the pride and rewarding feeling of being a responsible driver.

### Scenario 3 – Getting a car status and driving habits summary (medium)

John is an average driver who is concerned about savings and his carbon footprint on this planet. He is aware of that keeping his car well maintained will help him in both leaving a smaller carbon footprint and saving money. He also wants to learn about good driving habits and improve his skills to be able to drive his car more efficiently. Thanks to Gas Exchange, now it is a lot easier to accomplish those tasks. After work, John goes to garage to head home and starts his car. Before starting his trip, he notices there is a yellow warning sign next to the car Status button in his car's in-dash console. He selects this warning sign and a detailed car status screen appears. In this screen John sees that if he increases his car's tire pressure he will save another 2% on gas, and if he cleans/replaces his car's air filter he will gain another 1% in fuel efficiency. John stops at a gas station on his way to home and adjusts his tire pressure and replaces his air filter. In less than 10 minutes, John has realized an additional 3% increase in fuel efficiency.

The next day at work during a coffee break, John opens Gas Exchange mobile application on his cell phone to see how his driving has been. He notices his driver rating is silver and then clicks the driver rating button to see details. He learns that he needs to improve his starting and braking because



currently he is consuming 18% more gas than optimal due to his "Jack-rabbit" starts and hard braking. He also learns that if he uses cruise control he could save another 3% on gas. He closes Gas Exchange mobile application and from now on he pays more attention to developing better driving habits to improve his rating and fuel economy.

#### **Scenario 4 – Getting instant driving feedback (hard)**

Jane is a typical driver. Like many of us, she learned how to drive from her friends and parents. Since driving well and efficiently is not part of any requirement to get a driver license, she has limited understanding and knowledge of how to drive efficiently. She definitely appreciates it whenever someone gives her feedback about her driving skills. However, none of her friends are experts. After getting Gas Exchange onboard her car, she believes that she now has a friend who could really help her out. On a sunny Saturday afternoon, she decides to practice and improve her driving efficiency. She starts her car, enables instant driving voice feedback, and enters her destination address in her car's in-dash display. After receiving these simple inputs, Gas Exchange shows efficient driving instructions on her HUD display such as optimum speed while taking a certain exit or suggests to use cruise control on some part of a high way. She sees result of her driving skills instantly on both HUD display and instantaneous driving efficiency bars. Voice guidance gently reminds her when she is exhibiting poor driving behavior, and praises her when she drives through a particularly challenging stretch with fantastic efficiency! Thanks to Gas exchange's audible coaching and visual feedback she learned and practiced efficient driving habits, and became a better driver.