Welcome to Touch 'n Go

Username

Text Box

Password

Temporary Passcode

Guest

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Executive Summary:

Our group wanted to focus on increasing the communication and safety of the vehicle by increasing the integration between the car and its driver. We started by thinking of what are required steps that every individual undertakes when first entering a car both safety and comfort settings. We came up with several different things that everyone adjusts to increases comfort and safety of their ride. Next, we thought of how we could incorporate this all into one system. A system where you would effortlessly sit in your car and everything would adjust and fix itself. This would make the driving experience more comfort and also make the roads safer by automatically adjusting mirrors and seats. Our final plan incorporates an individuals entertainment system, seat, mirrors, and phone connectivity with their individual fingerprint. We also decided to incorporate a function in which an administrator could limit their dependent's abilities within the car. For example, they can limit the range of the vehicle, number of occupants, time of day, etc. All of these alterations can effectively make the car more comfortable and safe.

Introduction and Problem Statement:

We would like to increase the communication and the proactive safety of the vehicle by 30% through increased integration between the car and its driver. Currently, systems are in place for cars to recognize an individual's fingerprint; however, this process is new and upcoming and hasn’t been fully integrated into the user's preferences. The current fingerprint identification has only been used to unlock doors or start the vehicle. Current systems do not in anyway inhibit or limit driver abilities, which could be used to keep the driver safe. This can help decrease the estimated 697,000 motor vehicle thefts (RMIIA) and the over 10.8 million motor vehicle accidents (census.gov).

The project will explore ways to better integrate the car’s systems with the Touch I.D. sensor to proactively integrate the car’s systems with the individual preferences by manipulating the car’s mirrors, radio, seats, and climate control preferences. This can be implemented by analyzing the different types of sensors and software required to remember and adjust individual preferences, the economic impact of concepts and whether they are affordable, and also, how this concept can be integrated without overloading the driver.

Background:

To check to make sure there were not any other ideas like ours on the market we did extensive research. We researched to see if there were any patents regarding application designs or technology that was similar to our. After completing all of our research it was clear that we were the first for our kind with this idea about integrating all of the systems in a car together, let alone with a touch screen/fingerprint scanner integrated into the system with a mobile app as the main control.
device. According to the US patent and image database, there are already patents on the individual systems such as mirror controls, seat controls, touch screen systems and wireless interface but no patents on applications to control each different systems together. According to Stephanie Mlot of PC magazine and Mikey Campbell of Apple insider, Apple has a pending patent for an apple interface application that will control the mirror, steering wheel and seat settings climate control at home through an apple IPhone device. But this system only interacts with apple devices and you will need an apple phone to run this system, there will be no touch interface in the car or finger print scanner for security. It only focuses on a few things that we are and not in the same way. Apple plans to have an app for home and car controls, but ours will focus solely on the car and will cover a broader more detailed spectrum of systems within the car. With our system we will have an application that will work on all smart phones no matter the brand and we will also expand upon their design by incorporating a security system with a touch screen/finger print sensor and a climate control system within the car as well as security features linked to a keypad and fingerprint scanner that you can set within the application on your phone. Although our design is similar to apples, we further expanded on the design in revolutionary ways, which they did not.

Customer Needs:

The relevance is based on the importance of the top from the left. Based on table 1 below we found that the highest ranking was the Reliability/Durability, which made sense because with something so integral to the driving experience and safety, we'd want it to be reliable and last a long time. The design features discussed below were all that we considered needs or wants of a customer.

Table 1:

<table>
<thead>
<tr>
<th>Ease of Use</th>
<th>Ease of Mfg</th>
<th>Cost</th>
<th>Audio Preferences</th>
<th>Mirror Preferences</th>
<th>Phone Connectivity</th>
<th>Seat Preferences</th>
<th>Reliability/Durability</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.5</td>
<td>1</td>
<td>1</td>
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<td>1</td>
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<td>5</td>
</tr>
<tr>
<td>1</td>
<td>.5</td>
<td>.33</td>
<td>.5</td>
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<td>5</td>
</tr>
<tr>
<td>.33</td>
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</tr>
<tr>
<td>8.33</td>
<td>4.2</td>
<td>4.86</td>
<td>8.2</td>
<td>10.20</td>
<td>10.70</td>
<td>11.20</td>
<td>34</td>
<td>91.69</td>
</tr>
</tbody>
</table>

Concept Generation:

For our initial design we decided to focus on the communication as well as ease of use between the driver and the car. We thought of adjustments that an individual has to go through as soon as they enter the vehicle. These adjustments included safety precautions, e.g. adjusting mirrors, or comfort adjustments, i.e. temperature settings, and from there we went into how exactly we could conveniently incorporate these daily adjustments. Based on this notion, we went on and made the Concept Generation Tree. See appendix one.

Concept Selection:

Table 2: Concept-Scoring Matrix below demonstrates the method in which we chose our final design concept.

<table>
<thead>
<tr>
<th>Feature/Requirement (Weight)</th>
<th>Reliability/Durability (0.371)</th>
<th>Seat Preferences (0.122)</th>
<th>Phone Connectivity (0.117)</th>
<th>Mirror Preferences (0.111)</th>
<th>Ease of use (0.091)</th>
<th>Radio Preferences (0.084)</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Entertainment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unweighted</td>
<td>4</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>5</td>
<td>2.411</td>
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<tr>
<td>Weighted</td>
<td>1.484</td>
<td>0</td>
<td>0.234</td>
<td>0</td>
<td>0.273</td>
<td>0.42</td>
<td></td>
</tr>
<tr>
<td><strong>Mirrors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unweighted</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>3</td>
<td>0</td>
<td>2.683</td>
</tr>
<tr>
<td>Weighted</td>
<td>1.855</td>
<td>0</td>
<td>0.555</td>
<td>0.273</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Combination of ideas: Integrate mirrors, entertainment system, and seat preferences</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unweighted</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3.738</td>
</tr>
<tr>
<td>Weighted</td>
<td>1.113</td>
<td>0.61</td>
<td>0.585</td>
<td>0.555</td>
<td>0.455</td>
<td>0.42</td>
<td></td>
</tr>
</tbody>
</table>

Design 1 was focused on entertainment. This concept involved incorporating the individual’s radio preferences, saved songs, and phone connectivity. Design 2 focused on mirror adjustments. This concept involved incorporating the individual’s rear view mirror as well as side mirrors. Design 3 was a combination of our entire design tree. This design idea meant to integrate mirrors, entertainment system, as well as seat preferences and having the ability to set limitations through an app.

Based on the concept-scoring matrix above design 3, the combination of ideas, scored the highest. The group as a whole agreed with this notion because it most effectively increased communication between the car and the driver and safety. This design makes the system more expensive; something we didn’t consider until much later, and also makes the system overall less reliable, which was heavily scored. However, the increased features were able to compensate for both the cost as well as the reliability and durability issues.
**Prototype App:**

For our system to properly analyze and store individual preferences we decided to create an app. We decided this would be the best way because it is the most user friendly and understandable method for saving an individuals setting. In this section we will introduce the app and will discuss its user interface in different scenarios in the next section.

**Concept of Operations:**

The first scenario that we will discuss is that of a typical user altering his/her settings. For this scenario the main user will be a male. Prior to using this app he
would have linked his account to that of the car and administrator at which point
the administrator would accept him as a verified user. Once the user is in the care
he’d first register his finger with his account through the car’s touch screen. At this
point he’d open the app where he’d see Figure 1 from below. At this point he’d login
using his username and password he created and tap user. After moving on to the
next screen, as shown the Figure 2 below, he’d adjust his entertainment system,
setup his Bluetooth, and adjust his mirrors and seat. At this point he’d simply go on
the app and click save. The app would communicate with the car saving all of the
users settings. All of the adjustments he saved would be then linked to his
fingerprint and would be automatically adjusted when he scans his fingerprint to
turn on the car. As soon as the car is turned on, the limitations set by the
administrator would be displayed on the touch screen.

The second scenario I will walk you through is that of an administrator
adjusting the user’s limitations. For this scenario the administrator will be a female.
Prior to sing this app she would have already made her self an administrative
account that is linked to the car. In order to adjust limitations she would simply
login to the app, as seen in Figure 1 below, as the administrator. At this point he’d be
redirected to Figure 3 where she can select the specific individual’s settings she’d
like to adjust. After tapping on the specific person, she’d be redirected to Figure 4
below. At this point she can check which limitations she’d like to place on the user or
completely delete the user if she likes. Once she checks the specific limitations she’d
like to enforce she can click next to get to the specific settings. At this point she’d be
redirected to Figure 5 below where she can alter the dates, days of the week, and
times the user is allowed to drive the car. The administrator can also click next
where she will be redirected to Figure 6 where she can adjust the number of
occupants allowed in the car as well as limit the locations the user can go. In order
to get back to the login window, all the administrator needs to do is continuously
click back. If a user is to break his/her limitations the administrator is notified
immediately through a text. The car itself will not turn on during the limited days
and times and if there are too many occupants, however, if the user goes further
than the allowed distance he will be given a notification. The administrator of course
has the ability to change settings at anytime to allow the user to drive the car.

The third scenario I will discuss is that of a temporary user. This feature is
especially useful for when the administrator wants to lend the car out for a specified
amount of time but is not for a permanent user, for example a coworker. The
administrator simply logs in through figure 1 below where she is redirected to
Figure 3. Here she taps on Temporary user and is redirected to Figure 7. At this
window she can create a temporary code for the temporary user and also limit the
number of days the code is valid. At this point the temporary user is just like any
other user and the administrator can adjust limitations for this user just as she
would for any other. For the user to login, for this scenario it will be a male, he
simply enters the vehicle and taps the touchscreen and enters his temporary code.
At this point he can login to the app where he’d be redirected to Figure 2 and can
adjust his settings as if he were a normal user.
Cost and Feasibility Analysis:

We estimated the costs for Delphi would $178.84. This was based on the estimated manufacturing and retail price to be $150 and for Delphi to pay about $64.10. We also estimated that it would take two engineers working full time for two weeks to finalize the design. Along with assembly and labor cost we found the total to be $178.84 as the price it would cost Delphi to make. Therefore the total accessory cost would be $536.52. The customer will technically pay for it when they buy their car because it will already be integrated in the system. Through safety the product will be able to break even because it causes less accidents. For example, it avoids crashes when the mirrors are in the wrong position and the car is switching lanes or backing up. Also, it breaks even through convenience because the customers can save time by not having to adjust things such as the seat position, the mirrors, the radio, and the temperature every time they get in the car. As of right now this is a luxury item since most higher end cars already have touchscreens in them and the software is expensive; therefore, law wouldn’t require this. The closest product we could find to ours was a “Biometric Security Fingerprint Car Starter” on Amazon selling for about $450 (http://www.amazon.com/Biometric-Security-
Fingerprint-Car-Starter/dp/B002AUTV8K. This uses the same concept of the fingerprint scanner but doesn’t use the touchscreen already in the car so it requires extra accessories. Also, we’ve included an app with our design so it is user-friendlier and includes things other than just security. The automakers would have to be very careful when installing the software because, for example, if the fingerprint scanner malfunctioned and gave access to the wrong person it could turn out very bad. In addition if the mirrors didn’t move then the person driving might not notice until trying to switch lanes. By including a warning message on the touchscreen to check everything before driving would help minimize these issues.

**Life Cycle Analysis:**

The Touch ‘n Go system itself has no negative impact on the life cycle of the vehicle. All of the items it uses are already in place. We essentially need a connecting system and software to create the Touch ‘n Go system. This system, however, would increase the life span of a car by protecting the car from theft and protecting the driver from crashes by having properly adjusted setting each and every time the driver enters the vehicle.

**Conclusions:**

Touch ‘n Go is a great innovation in both the comfort and safety of a vehicle. In will create a system that adjusts seat preferences, entertainment settings, climate control settings, mirror setting, seat settings, limitation settings, and of course, engine start. We believe this product is ideal for both families and car rental companies due to its ability to limit and track the vehicle in ways currently unavailable. From here, we expect the design to become much more elaborate. We hope for a seamless integration between the driver and the car user where the car knows where you’re going, the temperature outside, and can accommodate all environmental and personal factors before you even enter your car. A “smarter” car seems to be in the near future with the advancement in artificial intelligence and product integration.

Our group learned a lot from this project, mostly regarding this final report. We learned how to write a formal final report. We also learned a lot about Delphi and other companies that make the car industry what it is. Without companies like these, the automotive industry would not be able to advance as quickly as it does. All in all, this was a great experience and introduced us engineers to the world of business and corporate engineering.
Appendix One:

Figure 1: Concept Generation tree