Project 3: Technical Redesign Proposal

GOAL

To propose a technical redesign plan with supplemental materials for your company looking for its next move. For the final project for the course, you will work in groups to write an extended internal proposal for a company you "work for" on a new product or technical development they should pursue. You will need to provide detailed technical explanations of your proposed changes, while simultaneously writing persuasively to convince the company to accept your proposal. This project requires that you not only brainstorm ideas but work toward actually implementing them, with mock-ups, promotional materials, analysis of research, production processes, and specific details.

In addition to giving you practice in prevalent technical writing genres, this project is designed to build transferable skills in:

- Navigating between plain-style technical writing and persuasive argumentation
- Conducting primary and secondary research for evidence-based persuasion
- Collaborating cohesively with a team
- Learning and applying conventions in new genres
- Gauging audience expectations and establishing appropriate professional ethos

PROCESS

Because these projects will move in different directions and take shape as you collaborate with your group, here is a guide to navigating the project development process:

1. **Your proposal should be grounded in both primary and secondary research.** What evidence says this is a smart next move? What models are you following or avoiding? Primary research can take the form of surveys, focus groups, interviews, etc. Really think through what type of information will best help you understand your organization's needs. Do you need a high volume of responses to determine the prevalence of opinions (surveys)? Do you need more in-depth responses to understand the complexity of an issue (focus groups)? Do you need help from particular experts (interviews)? It's okay if you have to fake a realistic client base you don't have access to (ie. surveying Purdue students instead of engineering firms), but still make sure the research tool is thoroughly developed.

2. **Your proposal/plan needs to be specific and detailed.** What I mean by specific is that the final proposal needs to say more than "We should build smart cars." What does that entail, technically? Logistically, how do you make it happen? Is it feasible? Who will this affect and how? What are the goals and intended impact? What specific strategies does the company need to take (and avoid) for implementation? What I'm looking for in your final plans is deep

thinking and problem solving. Don't leave anything "for someone else to figure out down the line." ***This is an area where groups are sometimes caught off-guard--you need to not only propose an idea but also lay out a plan for implementing it!***

3. **You need to produce mock ups/supplemental materials relating to what you propose. They should be as close to ready-to-implement as possible.** What this looks like will really vary by project. You might produce a set of 5 small promotional materials or a single professional quality video for your new product. You might write a technical description of the production process or a mock up of a user interface. The materials you produce need to be substantial, but also balanced with what your plan is trying to accomplish.

4. **Make sure you have a clear strategy before you dive into producing materials.** Groups have gone astray on similar projects by failing to think through, research, and document their justification for creating an item *before* actually creating it. For instance, you can't make a poster before you determine specifically what it's advertising, to whom, where, when, and why. Is a poster even appropriate? Because we'll be working in different genres, make sure you do your research looking at examples and learning the conventions for what you're creating.

5. **Your final report should be 10 pages or more (including your supplemental materials).** In business proposal format, walk the company through the specifics of your plan, along with all of your research and thinking that justifies it (this should include an executive summary).

6. **You will pitch your proposal with a final presentation to the class.** This will most likely be 10 minute group presentations with PowerPoints the last week of class.

Example: You work for the NBA. After months of research conducting surveys and interviews with the world's biggest basketball fans as well reading up on the latest camera technology, you decide the next hot thing is microscopic cameras embedded in the jerseys of certain NBA players that offer consumers a stream of the game from a star player's perspective. You write up a summary of your research--both primary and secondary--and start assembling promotional materials, such as ads for this new camera angle/streaming service, and informational videos about how the cameras work and what kind of experience users can expect. You organize all of this information in a well-designed, usable and interactive internal proposal document addressed to the executives at the NBA corporation, aimed to persuade them to adopt your idea.

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AirPods 2

ENGL 421
Project 3 Proposal

[redacted]

Table of Contents

Introduction

History

One of the biggest advancements in music technology in the past couple decades was the invention of personal earphones. The first earbuds came out in 2001 with the original Ipod. Since then, the advancements Apple has made to their product has been astronomical. They have gone through many iterations, but it has all lead up to the current product.

AirPods

The current iteration of Apple earphones are the AirPods, earphones that connect to your phone through bluetooth technology. The AirPods were released in December of 2016, and have become very popular everywhere. The amount of money that Apple has made from the AirPods is astronomical, a whopping $5.5 Billion dollars. Even though this is a large sum of money, this is obviously not their biggest stream of revenue. The AirPods are a useful and inventive piece of technology, but there are improvements that could be made to it.

Problem Identification

When Apple first released the AirPods in December of 2016, they were met with both praise and criticism. Though AirPods are considered a controversial choice of truly wireless earbuds, they have without a doubt made a huge impact on the wireless earbud market.

Pros

For starters, Apple's AirPods are a breeze to connect for both Apple and non Apple devices. Because of its W1 chip, it is a lot easier to pair for Apple devices, such as an iPhone, iPad, and Mac. Simply open up the case next to the device you want to pair and a prompt should appear on your device. Tap connect and that's it! Once you pair your AirPods once, you'll never have to pair them again. As soon as you open the case and put the AirPods in your ear, they automatically connect on their own.

Another neat feature of the AirPods is the proximity sensor built into each earbud. When listening to music, simply taking an earbud out of your ear will pause whatever's being listen to and putting that earbud back in resumes it. This is incredibly useful as it becomes a easy way to play and pause your music without needing inline controls.

The final feature I would like to address is battery life. Each earbud can last for five hours between charges. Putting the earbud back in the charging case for only 15 minutes fully refills those 5 hours. The case can recharge both earbuds about 5 times before needing to be charged itself for about an hour to an hour and a half.

Cons

Though the AirPods have some incredible strengths, they do have a few cons that need to be addressed. First of all, the design. Many have stated that the AirPods look like two toothbrushes sticking out of your ears. This isn't what I am referring to though. Because the AirPods only come in one size, there is a strong chance that they might not even stay in your ears. They sit on the inside of the ear rather than going inside the ear. Because of this, the seal the AirPods create with the ear is loose, resulting in a less noise cancellation, less bass, and a higher chance of the AirPods falling out.

Something else the AirPods are lacking in volume control. Currently, the only way to adjust the volume using the AirPods is using voice controls, which is not the most convenient way of accomplishing this task.

The last fault I see in the AirPods is the lack of wireless charging. With a design as simplistic as the AirPods, it would be relatively easy to implement this. Wireless charging is something that is becoming more and more common. Given that the AirPods themselves are wireless, it makes sense that they should charge wirelessly as well.

Problem Identification

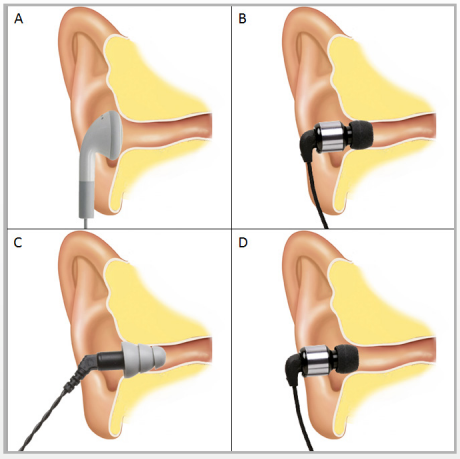
Primary Research

Because one of our group members owns a pair of AirPods, we figured we would take advantage of this. From this group member's personal experience. The best aspect of the AirPods is a tie between quick charging and the proximity sensors. Even for today's technology standards, 15 minutes of charge time for 5 hours of usage is incredibly fast. The proximity sensors are an amazing addition as well. Being able to simply take out an earbud to pause media seems like such a simple idea and it's used on the daily. These are two features that should be kept when redesigning the AirPods.

Secondary Research

Earbud Form Factor

For the best experience, earbuds should provide a seal between the ear tip and ear canal. Without a tight seal, the user can experience tinny, baseless sound with little noise isolation. To create a tight seal, most earbuds use silicone tips to drive the earbuds in the ear rather than on the ear. Regarding the eartips themselves, having different sizes can help the AirPods fit into different sized ear canals. Using bi flange or triple flange ear tips can create an even tighter seal.

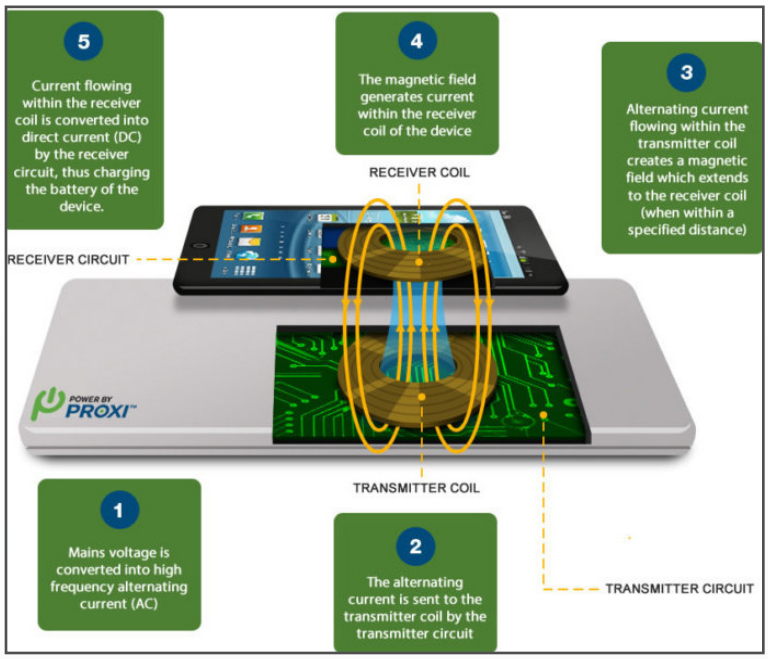


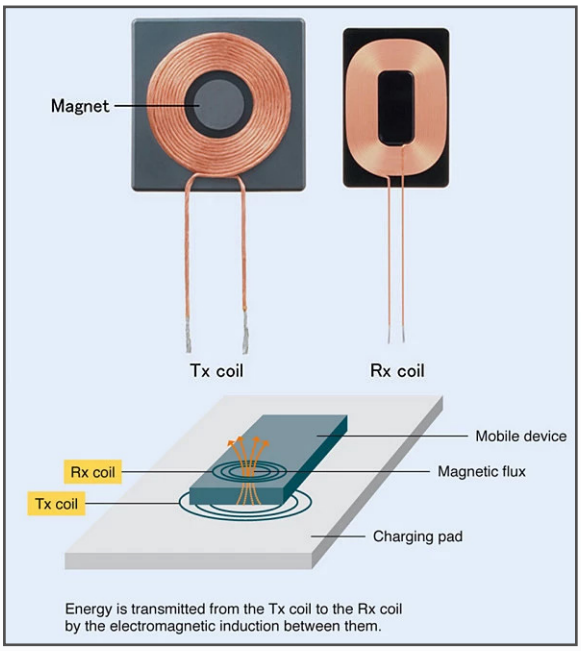
Wireless Charging

Wireless charging stations work by transferring power between the charging station and the Apple Air Pods/charging case that it is charging. This is done by first creating an inductor, which is a tiny bar magnet with many very flat loops of wire coiled around it. When an electric current passes through the coiled wire, there is an electromagnetic field created around the magnet. This then can be used to transfer the charge to the Air Pods. The charge is transferred by a transmitter in the station which communicates with the receivers in the Air Pods to use the charge for their battery.

Problem Identification

Wireless Charging (cont.)





Sweat Resistant Earbuds

Sweat resistance in headphones is extremely necessary. If you are either working out or its simply hot outside, there is a large chance you might be sweating. The sweat could potentially get into the headphones and cause major water damage that will cause the AirPods to be not functional. Putting materials that are conducive to blocking sweat from entering the AirPods. Great materials for this would use a mixture of Polyurethane in rubber to help create a strong seal of sweat resistance. Using the IP Rating Code chart, the ideal rating of sweat resistance would be between IPX2 to IPX4. Looking at examples like Dwayne "The Rock" Johnson's collaboration with Under Armor, the sweat resistance material used was at a rating of IPX4, but the material was also used specifically for headphones, not earbuds.

Reference Table of IP Rating Code

1st Digit	Symbol	Solid Object Protection	2nd Digit	Symbol	Water Protection
0		Not protected	0		Not protected
1		Protected against solid objects greater than 50mm	1		Protected against vertically dripping water
2		Protected against solid objects greater than 12.5mm	2		Protected against dripping water when tilted up to 15°
3		Protected against solid objects greater than 2.5mm	3		Protected against spraying water
4		Protected against solid objects greater than 1.0mm	4		Protected against splashing water
5		Protected from the amount of dust	5		Protected against jetting water
6		Dust tight	6		Protected against powerfully jetting water
IP 6 6 (Code Letters; 1st Digit; 2nd Digit)			7		Protected against temporary immersion in water
			8		Protected against continuous immersion in water

Solution

General Design & Volume Control

The design we would like to go with for our redesigned AirPods will be an IEM (in ear monitor) design rather than the loose earbud design that the current AirPods have. This would deviate from Apple's existing designs for their earbuds. Because we are going with an IEM design, we will be using earbud tips, which is something that Apple has not done on their earbuds. Though it is a change from Apple's image, it would result in AirPods being more functional and appealing to a wider demographic.

We would also like to implement a volume control function. By swiping up or down on the stem of the AirPods, the user will be able to raise and lower the volume, which is something that has been heavily requested. This could be configured in the Bluetooth settings. The swiping motion could also be used for another function, though we have yet to come up with one.

The technical implementation for these would be a bit difficult. Though none of us have experience with manufacturing and creating earbuds, we can ideate using our existing knowledge. The IEM design of the earbuds (shown in our mockup) is a hybrid of the existing AirPods design and traditional IEM earbuds. The volume swipe mechanic could easily be a touch sensor located on the stem. The same touch sensor that is already located above the stem can be implemented on the stem itself. This would allow users to swipe up and down to change the volume. Because of the added technology, the stem might need to be a bit thicker to accommodate everything.

Solution

Wireless Charging

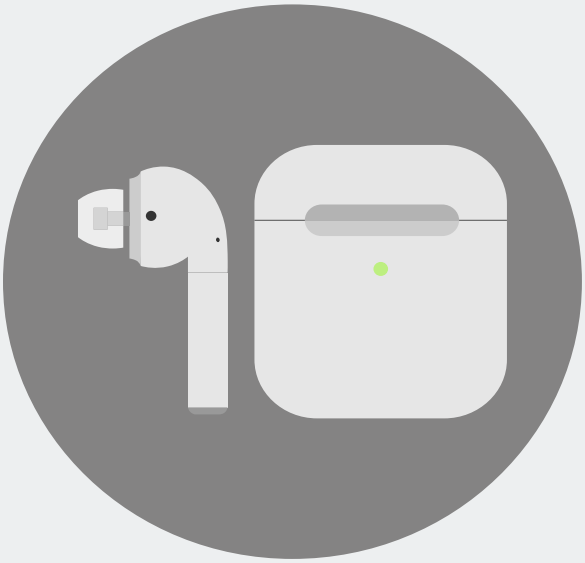
The current Air Pods battery life is estimated to last around 5 hours fully charged. However, many users have complained that their battery life drains much faster than this. Other related complaints are that the case that is used to charge the headphones oftentimes doesn't charge your headphones that fast or doesn't stay charged. This would be solved with a wireless charging station that could charge both the Air Pods and the charging case at the same time, as well as other compatible devices such as IPhones. It would still eliminate the need for any wires, but would allow the user to charge the Air Pods and case on the go in bags, lockers, cars, etc.

Sweat Resistant Earbuds

With the current design for the AirPods, it is difficult to implement the sweat resistant material, but with the change in design, it will be easy to add the Polyurethane mixture to the AirPods. The Polyurethane can be added to the removable earbud tips to provide a better seal for the AirPods so there is less of a chance for there to be leakage into the main electronic components of the AirPods. This is completely necessary to do to protect the AirPods from being damaged. When you pay $160 dollars for these very nice earbuds, you want them to last. If you frequent the gym, then the AirPods could be damaged very easily. Implementing this sweat resistant mixture to the AirPod tips will increase the longevity of the AirPods.

Solution (Mockup)

AirPods 2



In Ear Design

Music too quiet or loud? Simply swipe up or down on the AirPods stem to quickly and efficiently raise and lower the volume.

AirPods falling out? Our new design allows AirPods to fit snug *in* your ear, rather than *on* your ear, creating a tight seal. This increases bass, isolates outside sound, and most importantly, stays in your ears better.

Going to the gym? Lucky for you, we've designed the AirTips with the finest sweat resistant material.

AirPower

Your earbuds are wireless, so they should charge wirelessly too. Our new and improved AirPods Charging Case has been integrated with quick AirPower wireless charging technology.

By simply placing your AirPods on an AirPower Wireless Charging Mat*, we ensure that your AirPods Charging Case will charge faster than the previous generation AirPods. Spend less time charging and more time listening.

*(AirPower Wireless Charging Mat not included with AirPods 2nd Generation)

Solution

Mockup Explanation

Our mockup is a simple infographic that shows our redesigned AirPods & charging case with short descriptions of our changes. We wanted our infographic to look as similar as possible to existing Apple promotional material. Though Apple doesn't product infographics, they have a distinct visual style, which we tried to emulate with our infographic. The left half of the infographic discusses the changes to the earbud itself (IEM design, volume control, and polyethylene earbud tips) and the right half discusses the the wireless charging case (nicknamed AirPower). The mockups themselves were created using Adobe Illustrator and the infographic was created using Adobe InDesign.

Target Audience & Expected Results

Our target audience is people already invested in the Apple Ecosystem. These are people who already own one or more Apple products (such as an iPhone, iPad, Mac, Apple Watch, etc). These are people who are loyal to Apple and already have a potential bias to Apple products. Because of this loyalty, they are the most likely to purchase AirPods.
An alternate audience we could appeal to is people who aren't necessarily in the Apple Ecosystem, but are interested in purchasing wireless earbuds. From research and personal experience, many people did not purchase AirPods because they paled in comparison to other existing earbuds. With the changes we plan to implement, we predict that the AirPods will be at the top of the competition, encouraging a more casual Apple demographic to invest in a pair.

Conclusion

The evolution of personal headphones has resulted in Apple's innovative product Air Pods. There are several positive features such as instant connectivity, proximity sensors, and their battery life. But, there also are several negatives that need to be addressed like the design, volume control, sweat resistance, and lack of wireless charging. The changes we would make to the AirPods would result in a better product that would be hailed as fixing any general criticisms that consumers have. Making small adjustments to the design to make them more comfortable to the average user as well as implementing key features that would make them more user friendly. It would eliminate any advantage other competing wireless headphones have and would ensure a better quality model that would be well received by the target audience.

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Traffic Light Redesign

ENGL 421

PROJECT 3 PROPOSAL

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TABLE OF CONTENTS

INTRODUCTION

The History of Traffic Lights

The idea for the first electric traffic light came from Lester Wire, an American policeman, in 1912. The lights were first installed in Cleveland, Ohio in the year 1914, and the first electric traffic light had only red and green lights. Instead of a yellow light, it had a buzzer sound that would indicate that the light would be changing soon. In 1920, a policeman named William Potts invented the three-colored traffic light that could be displayed in all four directions. Detroit, Michigan became the first city to implement this design, and traffic lights still use the same design today.

Current Operations

Modern traffic lights are comprised of a controller, traffic light heads, and detection. The controller is the "brains" behind these signals and contains the information required to force the lights through various sequences. There are essentially 2 types of traffic lights: fixed time and actuated signals.

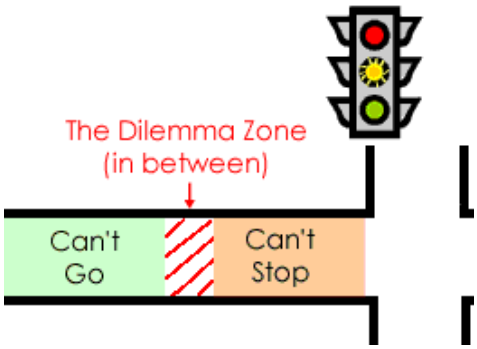
WIth a fixed time signal, green lights will be displayed for the same amount of time in each cycle regardless of the traffic conditions. These lights can be wasteful in areas with light traffic as cars can be forced to sit at an intersection even when there aren't any other cars, so these lights are more commonly used in areas where traffic can be heavily congested.

An actuated light, on the other hand, takes into account the vehicle demands on each side of the road and adjusts the green light accordingly. A vehicle passing a detector demands a green light and once the traffic light is green, any additional vehicles passing the detector will extend the phase. The light won't change until traffic dies down or a conflicting demand occurs which is why this kind of traffic light is useful in areas with low amounts of traffic.

PROBLEM IDENTIFICATION & PROPOSED SOLUTION

The results of an unpublished study for the Federal Highway Administration done on 306 signalized intersection crashes show that 25 percent of reported car accidents were caused by drivers attempting to beat the yellow light.

Personal experience shows that there is some difficulty in judging whether or not there is enough time to safely pass through an intersection when seeing a green or yellow light in the distance. The area on the road in which drivers face this uncertainty is called the "dilemma zone."



To reduce the number of car accidents that occur in and minimize the confusion that arises while passing through intersections, we propose a redesign of the traffic light to incorporate a blinking pattern to signify when the light is about to change from green to yellow.

PRIMARY RESEARCH

Each group member conducted 1-3 interviews with experienced drivers and asked the following set of questions to get a better idea of how people react to seeing a green or yellow light ahead of them while behind the wheel:

- What is your response when you see a green light a slight distance ahead of you?
- When do you see a traffic light turn to yellow as you approach an intersection?
- What do you see others do when facing the same situation?
- Could traffic lights in intersections be improved to prevent drivers from putting themselves at risk of being part of a red-light accident?

General consensus among those who were interviewed shows that most drivers would continue to drive at a steady speed or accelerate to pass through the intersection before the light turns red. Some of the subjects also point out the stress this situation would place on themselves or other drivers, which would lead to quick, ill-thought-out decisions.

"I feel like most people speed up when they see the yellow when they are close. It's important to check behind you, because if someone is on your tail, you can't brake or risk someone rear-ending you."

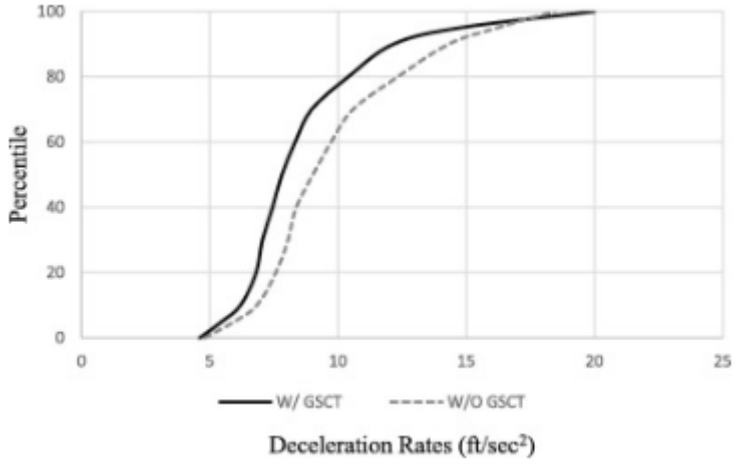
"[Speed up], that's how I learned it. Actually, I learned it from my dad, my dad would yell at me if I didn't do that. (He wanted me to be aggressive. When I first drove, I was very conservative with my driving.)"

SECONDARY RESEARCH

Traffic signals using a similar concept of a time-based warning sign to alert drivers of a light change have already been put into practice. Research done by Oregon State University on traffic signal countdown timers (TSCTs) show that not only are drivers more likely to stop in a dilemma zone instead of accelerating through an intersection, but they also have gentler and safer deceleration rates.

According to the study, the probability of stopping in a dilemma zone increases by at least 13 percent and the rate of deceleration decreases by about 1.5 feet per second in the presence of a TSCT. Findings from the same research publication also show that countdown timers increase traffic efficiency due to a decrease in the amount of time it takes for vehicles immediately in front of the stoplight to begin driving by 0.82 seconds.

As of right now, TSCTs are prohibited by the U.S. Department of Transportation due to concerns about the inconsistency of traffic signal designs potentially causing confusion on the road. However, this system has been implemented successfully in other countries.



A study done in Poland analyzes the effectiveness of countdown timers and their effect on intersection safety for pedestrians and vehicles. The study found that with the countdown timer on, there was a reduction in vehicles that entered the intersection during the yellow light period, as well as a reduction in vehicles that entered the intersection during the red signal as well. The study determines that timers make the intersections safer, but that this study should be repeated on a larger scale to verify the findings, as not all intersections are alike, and the different geometry might have an undetermined effect on the results.

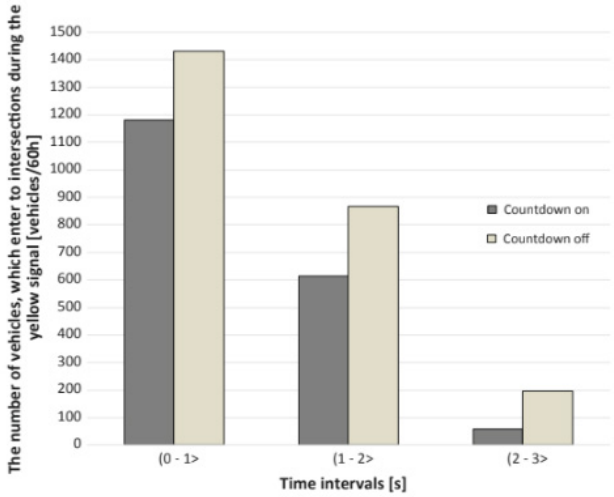


Fig. 3 Number of entries vehicles at crossroads during the yellow signal (*Source* Based on [1])

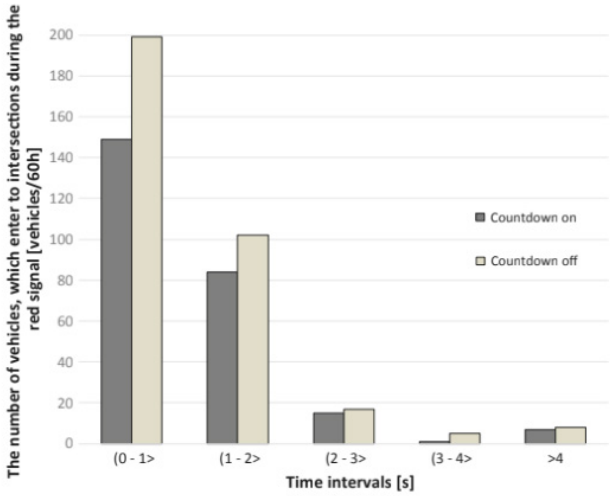
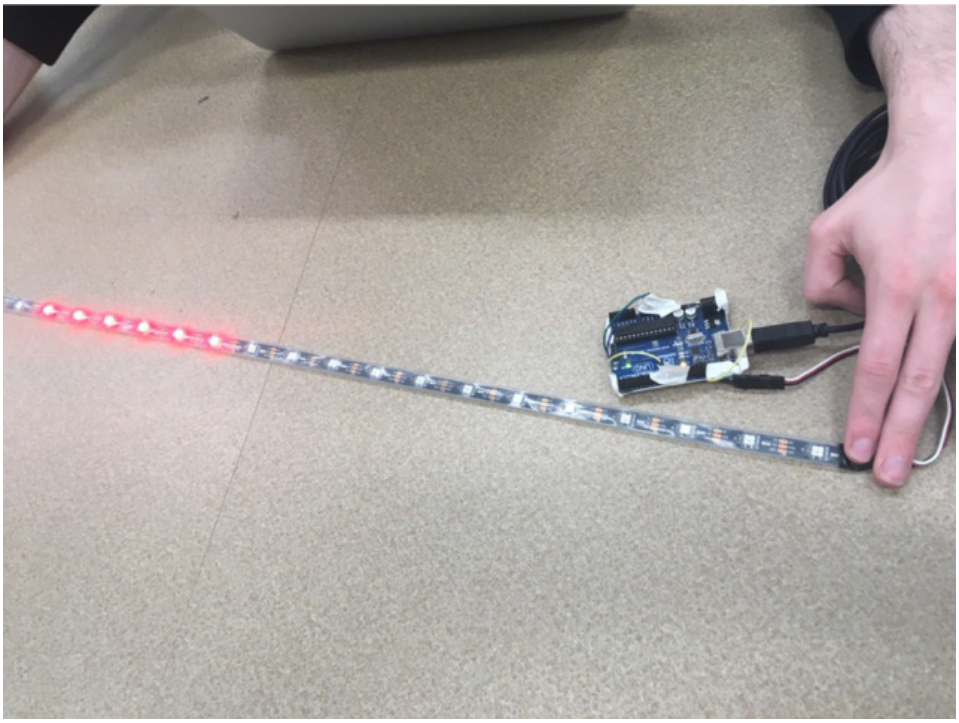


Fig. 4 Number of entries vehicles at crossroads during the red signal (*Source* Based on [1])

TECHNICAL DESCRIPTION

We are not proposing any changes to the physical dimensions of current traffic lights. A typical light measures 48" tall, 16" deep, 16" wide, and weighs around 55 pounds. The 3 lenses are each 12" in diameter and each is covered by a sun shade. For our redesign, before changing from a solid green light to a solid yellow light, we will have the green light flash, much like how a turn arrow flashes, beginning when there are 3 seconds left before the light turns to yellow. Each flash will be about 0.5 seconds. After 5 seconds of flashing, the light then change to yellow and then red as normal.

MODEL



THE 5 W'S OF THE NEW TRAFFIC LIGHT

WHO

All United States citizens who own/operate a vehicle

WHAT

A new traffic light that displays a flashing green light to alert drivers that the light is about to change to yellow

WHEN

January 1, 2020

WHERE

All signal-controlled intersections throughout the United States

WHY

To decrease 'dilemma zone' confusion while attempting to pass through an intersection

UNITED STATES DEPARTMENT OF TRANSPORTATION

IMPLEMENTATION

We all agree that before enforcing a country-wide switch to these new lights, further research needs to be conducted. A great way to do this would be to install the new traffic lights in several cities and collect data to see if it agrees with prior research. If the data suggests that these new traffic lights are a worthwhile investment, then we can proceed with installing them throughout the rest of the U.S. Obviously we cannot make this change without warning the public first, so we have created a sample public handout (see page 9) that can be mailed to citizens in the U.S. that own and operate a vehicle to inform them about the new traffic light.

CONCLUSION

The design of the three-colored traffic light has been tweaked and improved over its century of existence through the introduction of new elements, such as the turn signal. Several other changes have been made over time to improve signal visibility and to dissuade driver recklessness. However, little has been done to decrease the amount of confusion drivers face when caught in the dilemma zone of an intersection, where people see a green light in the distance but struggle to make a decision of whether they should keep driving or slow down. By giving a warning of when a green light would turn to yellow, we can encourage more cautious driving behaviors which will lead to fewer accidents in intersections.

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