A Disappearing A pillar

PROJECT PLAN

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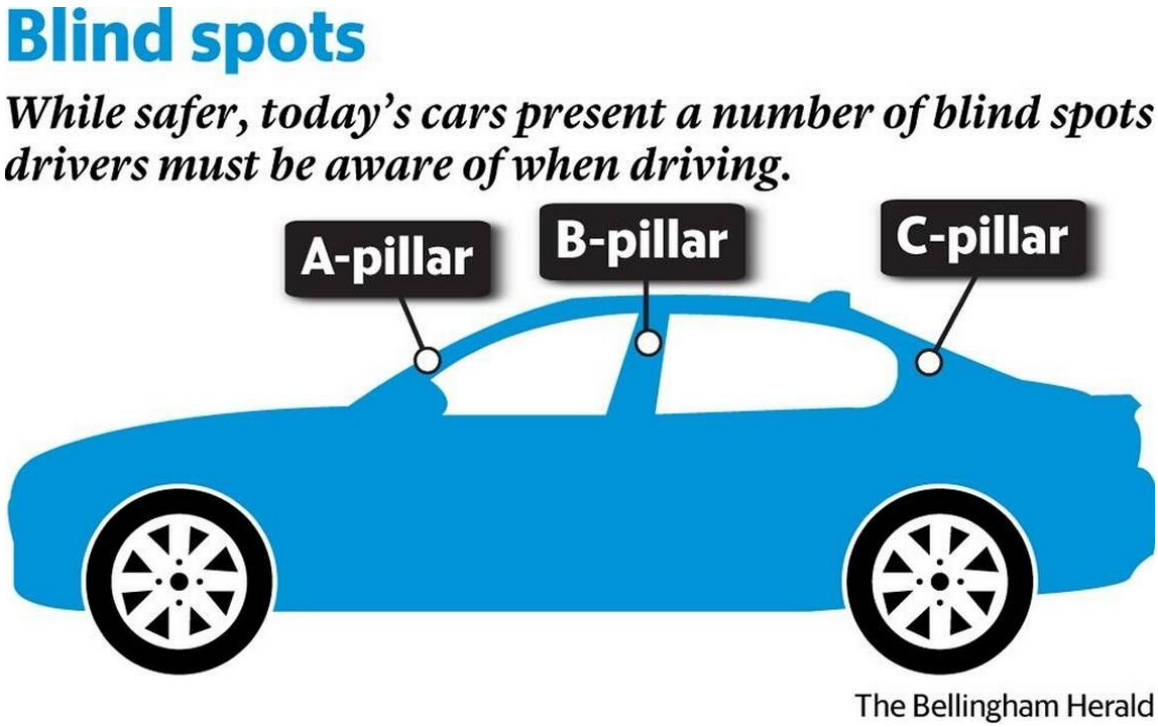
List of Definitions

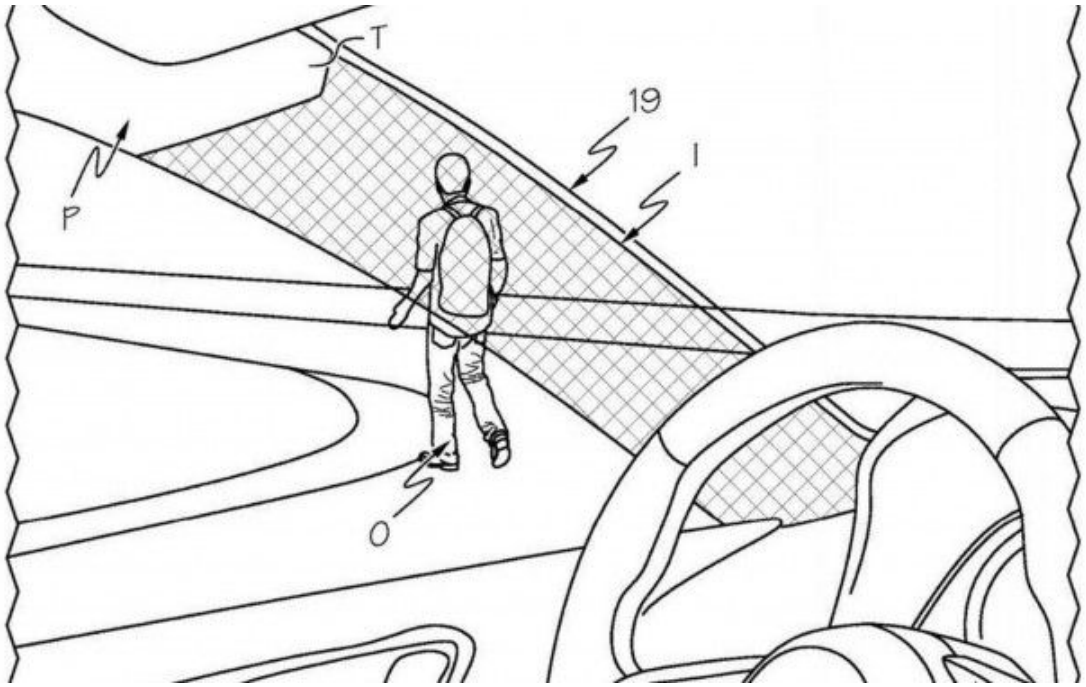
A pillar: Pillars are the vertical or diagonal supports of the window areas of a car, and a car usually has four pillars, namely A, B, C, and D moving from the front to rear. In this project, we are going to focus on the A pillar.



1 Introductory Material

1.1 Acknowledgement

The purpose of our project is to find a way to improve driver's vision field while making turns or going in reverse. To be more specific, we are achieve his by decreasing the impact of A pillar. A pillar is the vertical or near vertical supports of a car's window area, and a car usually have four pillars, named A, B, C, D moving from the front to rear. In this project, the most difficult part is how to transfer image onto a tablet and make drivers feel like they could see through A pillar.



1.2 problem Statement

In recent years, a number of accidents have been caused by drivers having an obstructed line of sight . According to Motoring News, The number of crashes caused by blind spots has increased by 50% over the last two years, a study has found. A specific example would be when drivers are waiting to make a turning at an intersection, they are unable to see what is hidden behind the A pillars, be it pedestrians or cyclists, due to this blindspot. Our project serves to provide a remedy to this problem by increasing the peripheral vision range of the driver.

In order to achieve this goal, we are going to use the camera of a tablet to capture what is going on around the car, especially the area that is covered by the A pillar. The images captured are then displayed on the screen of the tablet which is attached to the A pillar, so that driver can “see through” the A pillar and avoid accidents. The most fundamental part of our project would be to transfer the image from camera to the tablet, because this is the main part and we need to write code using Android Studio and upload it to our device. Because working with Android Studio is new to us and doing image processing is also a challenge to us, in our opinion, this would be the most hard part in our project. As for the final outputs, we hope our customer, drivers for example, they could use our tablet to look through A pillar and see the part that is covered by the pillar and avoid accidents.

1.3 Operating Environment

Our product is a software that is designed to be used in a tablet operating with an Android OS, the usage of this product is to assist drivers to get a wider peripheral view. Since this tablet will be attached to the A-pillar inside the car, we don’t need it to be waterproof. However, we need to ensure the tablet is securely fixed onto the pillar so it wouldn’t rotate or fall down while driving, which would be even more dangerous for the motorist.

Because the battery on the tablet is limited, we need to consider charging the tablet’s battery while users are using the product. Therefore, the tablet must be continuously charged via a cable connected to the USB port in the vehicle.

1.4 Intended Users and Intended uses

Our target user base for this project are motorists whose vehicles have wide A-pillars, due to the fact that vehicles with wider A-pillars will obstruct more of the driver's’ field of vision. This blind spot will be further exacerbated and ameliorated depending on the size of the A-pillar which differs from vehicle to vehicle. For our project however, it is assumed that the user base mainly drive Sports Utility Vehicles(SUVs) since these cars generally have wider A-pillars.

The motorists can attach the tablet onto the A pillars of their vehicles. The region outside the vehicle obstructed by the A pillar will be displayed on the screens of the tablets, giving the illusion of it being transparent. The section of the camera screen displayed will be parallelogram shaped, mirroring the shape of the A pillar. The angle, width, and height of the parallelogram display can be adjusted by the user depending on the width of the A pillar and the height of the driver.

1.5 Assumptions and Limitations

Assumptions:

1. The A-pillar should be as wide as possible but no wider than the tablet height.
2. Our product can be easily attached and detached on the A-pillars of any vehicle, so that different users with different vehicles will be able to use this app;
3. The product can be used for all kinds of cars in the world, and our app will store the data of the A-pillars of different cars after people input these information in our database.
4. The images acquired by camera will be cut into parallelogram shape, it will be magnified but the image quality and clarity will be as good as pre-magnification, and the cropped out parts will be opaque.

Limitations:

1. The cost to produce the end product shall be as low cost as possible, no other external devices are required excluding the tablet.
2. The camera used in this project is the built-in camera on the Nexus 7 2013, with outdated camera specifications in comparison to the state-of-the-art UHD cameras available today.
3. The system used is the Android OS, therefore the application will be unuseable on IOS devices.

1.6 Expected End Product and other Deliverables

The end product will be an application installed on a Nexus 7 2013 device. So the item delivered to client is just the tablet. The tablet is rechargeable when it runs out of power.

2 Proposed Approach and Statement of Work

2.1 Functional requirements

The aim of our project is to reduce the impact of the blind spot caused by the A pillar. We need to develop an android app to do way with the A pillar through the use of a tablet. The screen of the tablet will display the region outside the car

through a real time camera, working as an aid to improve the driver's peripheral field of vision obstructed by the A-pillar.

First of all, we need to use the android studio to develop our app, which means that we need to know how to programming on android studio first. In order to develop an app, we need to create an interface. This interface is able to show the real time sight of the outside pillar, and enhance the drives' judgment to the outside. So the camera interface should have a real-time image transmission function.

In addition, the app will provide some other auxiliary functions, such as user can customized the angle and width of the image according to their own vehicles. this function is convenient to use. it will ask two input data form users, angle and width. And it will automatically produce the shaped screen corresponding to the number entered by users.

Since we do not expect every customers will be able to measure their vehicles. So we will collect some most common brand vehicles, provide 30 or more measurement information for users to choose directly. We are going to implement this in "Pillar category".

2.2 Constraints considerations

In terms of the constraints of our project, because the image quality of our tablet and the setup issue with model car, our project could not totally make car pillar transparent. And because of the aim of this project is to provide an affordable method to increase the viewability of driver, we may not choose to use some high quality equipments, like go-pro camera. The image that we provide might not be that clear. But as time goes by and when we learn more, we hope to solve the setup issue with model car and make it as close to transparent as possible. As for the non-function requirements, I think it would be how to setup our tablet perfectly on the model car and find the correct angle to fix it, so that the view that driver get will be more close to the real situation.

2.3 Technology considerations

What we are using right now is the Nexus 7 Tablet from ASUS, released in 2013 which has a built in camera. We are trying to use this embedded camera to capture images and display them real time to the driver's eyes through some image processing in order to make the pillar appear transparent. Since the camera specifications are fairly outdated, the images displayed may have its quality slightly compromised.

There is an alternative way however, we can use an external camera with better specifications such as higher megapixels, connected to our tablet to capture images with a better resolution. This would also be much easier for users the

adjust the direction of the camera and the angle of the images. But this would bring up the overall cost of our project, defeating the purpose of this being a low cost project.

2.4 Safety considerations

Since our project is an App, all of our safety consideration is about driver. Sometimes, there may be a time delay between the transferring of images from the camera to the tablet screen then to the eyes of the driver. With that being said, the driver cannot be completely reliant on the application when they are driving.

2.5 Previous Work and Literature

Jaguar Land Rover's 360 Virtual Urban Windscreen

Jaguar released this new technology in late 2014, which can make the pillars of the vehicle look "transparent" in order to eliminate the effects of blind spot caused by the pillars. It uses a heads-up display (HUD) to give the user a warning when there is an object in the front of the car blocked by the pillars.

(Jaguar Landrover)

Although there are some differences between our project and this technology from Jaguar, we all have same goal in mind, which is to eliminate the impact of the blind spot caused by the pillars of a car. Our solution is to use an inexpensive and

convenient to achieve the same goal. All the driver needs to do is attach a tablet onto the pillar and use our app to make the pillar look “transparent” no matter what type of vehicles they are driving.

2.6 Possible Risks and risk management

There are no huge risks associated with this project since it is mostly coding based and in doors. One significant risk it when we are actually testing out our prototype on the roads, since one malfunction with the application or the tablet may cause road accidents if we are not being careful.

Thus, in order to mitigate this risk, we need to test it somewhere where there aren’t many cars.

2.7 Project Proposed Milestones and evaluation criteria

There are several key milestones in our project. The first one is having our user interface ready and sync it onto the tablet, this progress is significant since we can actually see it on the tablet which shows that we are making progress. The second milestone is having the real time image capture in our app with the built in camera. Now, next milestone would be finishing the adjustable image size function and then attaching it on the A-pillar of the model SUV to test it out.

2.8 Project tracking procedures

Since our project is to develop an app, we can easily track our progress. We need to test our project after every major procedure. On top of this part, we need to use android studio monitor to show the results every time when we have some new progress.

2.9 Objective of the task

Our goal of this object is to remove the blind spots on the A pillar. We need to use a tablet to display the images hidden by the a pillar, so that drivers can see

pedestrians or other road users hidden behind the A-pillar. If this can be achieved, the accidents caused by this blind spot can be drastically reduced.

2.10 Task approach

2.11 Expected Results and Validation

The desired outcome is to eliminate the A pillars in the car via digital means, so that the blind spots are completely “see through”, thus rendering the A pillars essentially transparent. If the images displayed on the tablet is a mirror image of what is being blocked by the A pillar, our project is a success.

3 Estimated Resources and Project Timeline

3.1 Personnel effort requirements

The work we have done in the project	Explanation of the work	Timeline
Design the website	Introduce team mates to the project	week 3
Order the tablet	Tablet is required and it is the needed product in our project	week 3
Learn how to use Android Studio	Download Android Studio and watch video to learn how to code in it.	week 4
Design the interface	Introduce users about our application	week 5
Upload the information of team members	Introduce our team members and divide teamwork to each member based on their interests.	week 6
The screen cut of the image	Writing code on Android Studio to cut image on the camera interface and try to make our camera interface customizable by entering the width and height by users.	week 7-8

3.2 Other resource requirements

Our project is mostly coding based, so the required sources are just the tablet and the software we are using called Android Studio.

3.2 Financial requirements

Our project does not have financial requirements since the aim of the project is provide a solution that is as low cost as possible.

3.3 Project Timeline

Brainstorm for proposed solution		Medium	Done	Aug 29 - Sep 10
Design the team webpage		Medium	Done	Sep 11 - 17
Order the tablet, camera and other required tools		High	Done	Sep 11 - 24
Choose the suitable tools to design the programming work		High	Done	Sep 1 - 30
Self-learn how to use Android Studios		Medium	Working on it	Sep 12 - 24
Design User Interface for the App		High	Working on it	Sep 25 - Oct 1
Project Plan V1		High	Done	Sep 25 - Oct 1
Work on the writing a code for Data Acquisition, Data Processing, and Real ...		High	Working on it	Oct 1 - Nov 30
Project Plan V2		Medium	Working on it	Oct 31 - Nov 5
Test the App using the Tablet		High	Working on it	Oct 3 - 6
Test it out on a car		Medium	Working on it	Nov 6 - 12
Final Project Plan		High	Working on it	Nov 28 - Dec 3

4 Closure Materials

4.1 CONCLUSION

We have finished approximately half of our project, which is to make the camera capture real time images and then crop the images obtained into a size that would fit the size of the A-pillar. This is because we need to show the real time sight of the area outside obstructed by the A-pillar in order to enhance the driver's' visual judgement outside the car. So the camera interface should have a real-time image transmission function.

The part that we are going to be focusing on is to make this image size controllable and trying to implement all the functions in the App. We also hope our App could provide some other auxiliary functions, such as user-customizable width and angle of the camera screen according to their own vehicles. We are going to be implement some touch functions on the camera interface such as the ability to increase or decrease the height of the display just by dragging your fingers outwards or inwards and also the ability to cut the size of image in the screen.

4.2 REFERENCES

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