



Crazy Pillar 1.1.4

A Disappearing A- Pillar

Website: <https://sdmay18-20.sd.ece.iastate.edu>

Group members: Yixuan Wang, Han Liao, Wenrui Wu, Yaowei Lee, Guantong Zhou, Shengliang Liu

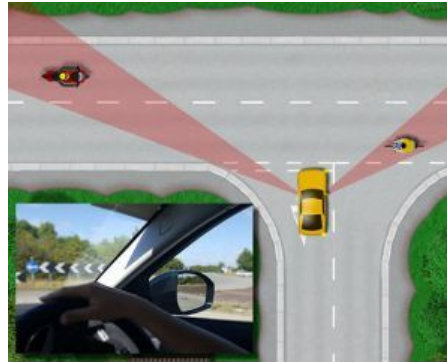
Professor name: Jaeyoun Kim

Problem Statement - Background Info

The A-pillar of a vehicle can generate blind spots to the driver.



P2&3,D rivingtesttips.com



A-Pillar Blind Spots



Car Pillars

P1, Drivingtesttips.com

Problem Statement - Background Info

1. Based on accident statistics for the year 2014, there were 3,401 seriously injured cyclists and 113 fatalities.
2. A study has found that the number of crashes caused by blind spots has increased by 50% over the last two years. (Motoring News)

Goal

The goal of our project is to make the A-pillar “virtually transparent” using the camera, display, and computation power of an inexpensive tablet.



Drivingtesttips.com

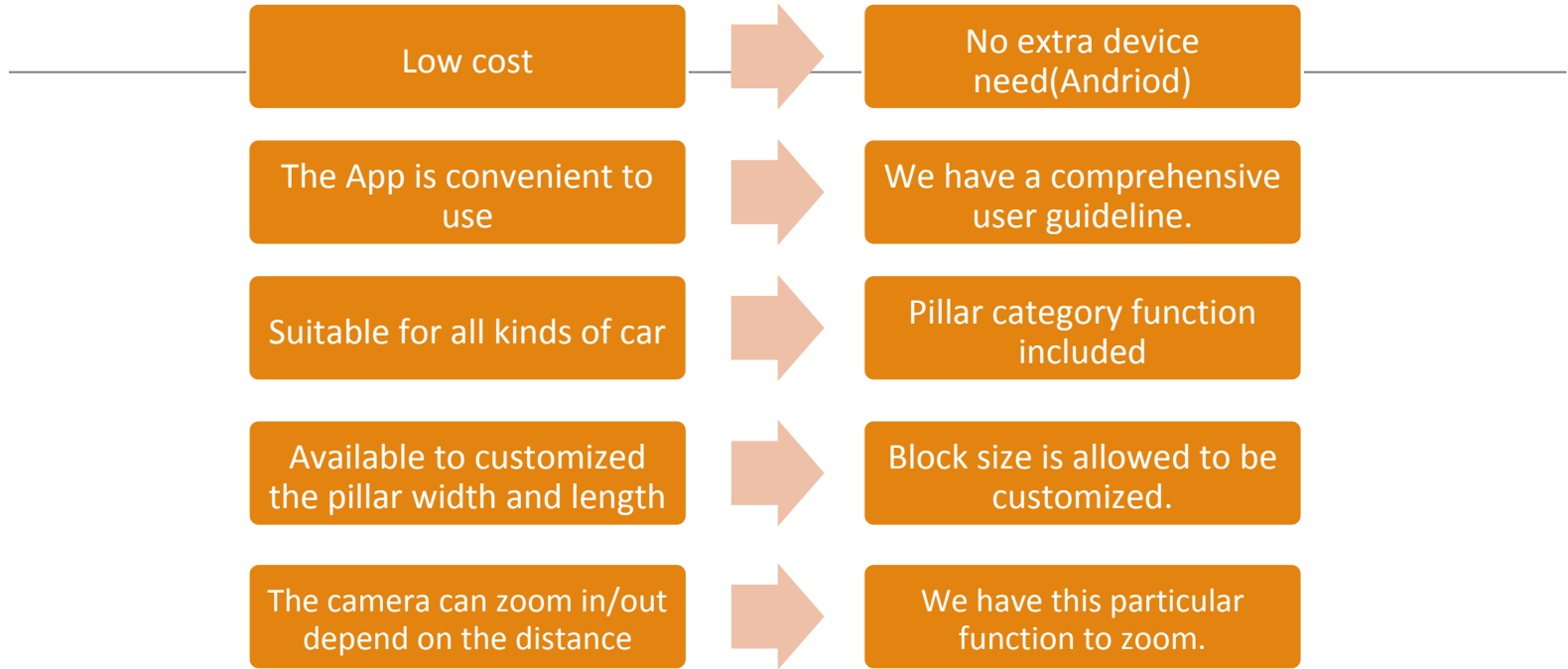


Conceptual Sketch



Affix a tablet onto the A-pillar to visualize the obstructed region and increase the peripheral vision range of the motorist.

Develop an App using Android Studio to transfer the images acquired from the camera to the screen seamlessly in real time.



Functional Requirements

Tablet (hardware): Nexus7

App development (software):

- Camera activity: Zoom in/out, block size change.
- Customization: Input the default size of the pillar.
- Pillar category: Allows users to choose the pillar size of their car.

Non Functional Requirements

- The size of the tablet is supposed to be suitable for the width of the A pillar.
- Safety issue - make sure tablet not blocks view of driver.
- Not falling down.
- Contact us - Our introduction and contact information.

Technical Considerations

- Use Java on Android Studio to develop an app on our tablet.
- We need to add camera function- camera2.

Cost Estimate

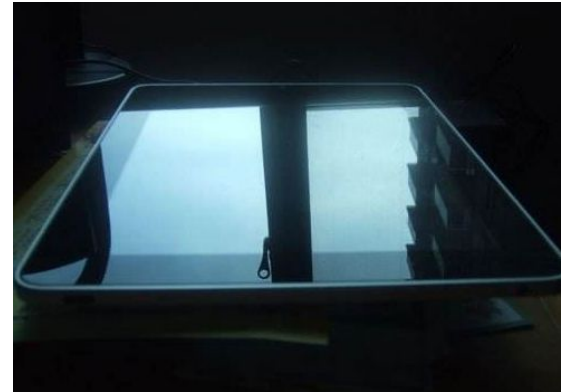
Android 6.0
Marshmallow



No additional cost if you have an android tablet

Potential Risks

1. During sunny days, driver cannot see tablet screen due to reflection.
2. Cannot recognize objects that are very close to car.
3. Sometimes the tablet might drop off from the window.



Functional Decomposition

Java doc

- ▼ com.example.lhan.crazypillar
 - ▶ views
 - Camera_activity
 - CrazyPillar
 - HelpSupport
 - Menu_Contact_Us
 - Menu_Customize
 - Menu_Introduction
 - Menu_Pillar_Category
 - Menu_Screen_Size
 - Menu_Tools
 - Privacy
 - Settings

Xml doc

- ▶ drawable
- ▼ layout
 - activity_cameraactivity.xml
 - activity_crazy_pillar.xml
 - activity_help_support.xml
 - activity_main.xml
 - activity_menu_contact_us.xml
 - activity_menu_customize.xml
 - activity_menu_introduction.xml
 - activity_menu_pillar_category.xml
 - activity_menu_screen_size.xml
 - activity_menu_tools.xml
 - activity_privacy.xml
 - activity_settings.xml
 - app_bar_crazy_pillar.xml
 - content_crazy_pillar.xml
 - layout_shape.xml
 - nav_header_crazy_pillar.xml

Detailed Design(Customize)

Menu_Customize class

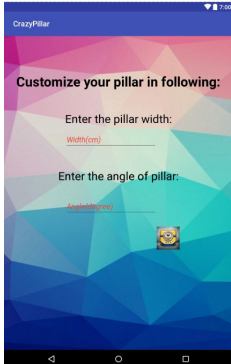
```
protected void onCreate(Bundle  
savedInstanceState)
```

```
Intent intent=new Intent(Menu_Customize.this,  
Camera_activity.class);
```

```
intent.putExtra("rwinput", rwinput);
```

```
intent.putExtra("rainput", rainput);
```

```
startActivity(intent);
```



Menu_Camera_activity class

```
if (getIntent() != null &&  
getIntent().getExtras() != null) {
```

```
size=Integer.valueOf(getIntent().getStringExtra  
("rwinput"));
```

```
angle=Integer.valueOf(getIntent().getStringExtra  
a("rainput"));
```

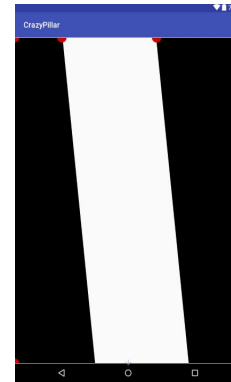
```
CustomView customView=new  
CustomView(this);
```

```
mcustomView=(CustomView) findViewById(R.id.cust  
omView);
```

```
mcustomView.changeSize(size,angle);  
}
```

Menu_CutomeView class

```
public void changeSize(int  
width,int angle){  
Width=width*100;  
Angle=angle;  
cos=(float)  
(Math.cos(Math.toRadians(Angle))  
);  
}
```

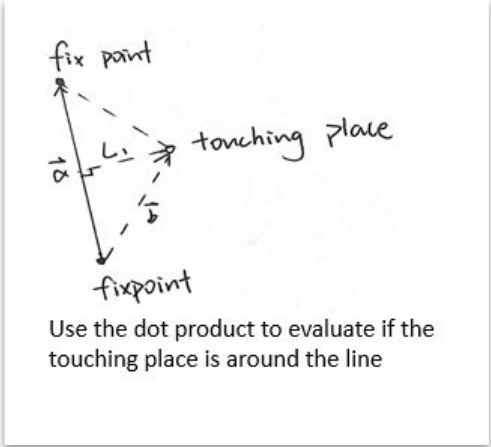


Detailed Design(Block size layout)



Step1: Evaluate if the area touched is around the line.
Step2: Depending on the movement of fingers, the blocks will pulled to left or right.
Step 3: Create a new CustomView.

Step 1: Evaluate if the touch place is around the circle
Step 2: Depend on the finger position, move the red circle to a certain place.
Step3: Create a new CustomView.



```
public boolean onTouchEvent(MotionEvent event)
```

```
public void onDraw(Canvas canvas)
```

Test Plan



Step 1:
Test car(Ford Edge) and
tester



Step 2:
Affixed magnetic holder
onto the windscreen to hold
the tablet



Step 3:
Tablet is attached onto
The A-pillar.



Step 4:
A video is recorded while
the vehicle is moving
from the driver's view.

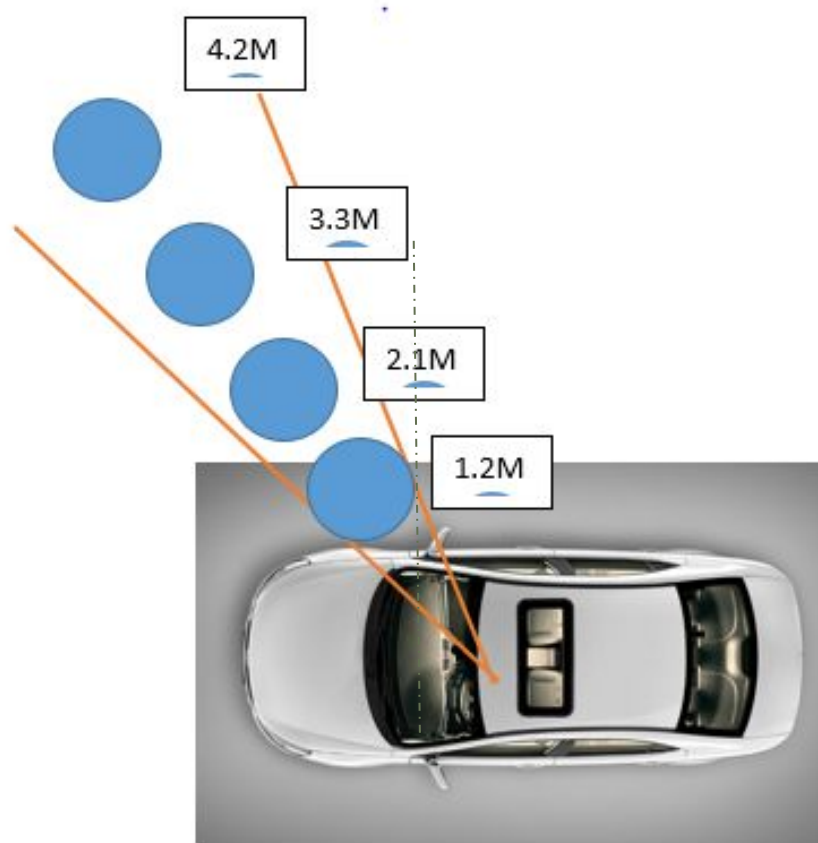
Ford Mustang



Demonstration



Top



Front:



4.2M



3.3M



2.1M



1.2M

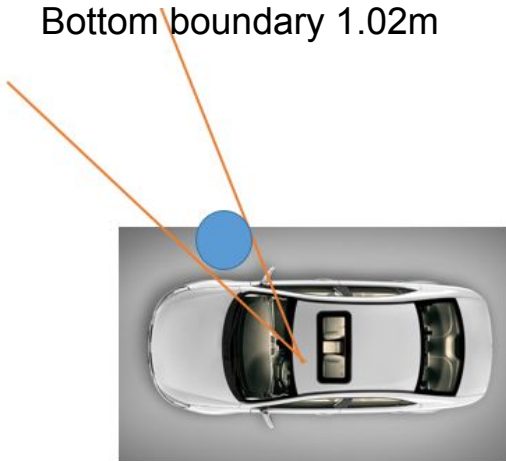


Testing distance

Distance: 1.2m

Up boundary 1.275m

Bottom boundary 1.02m

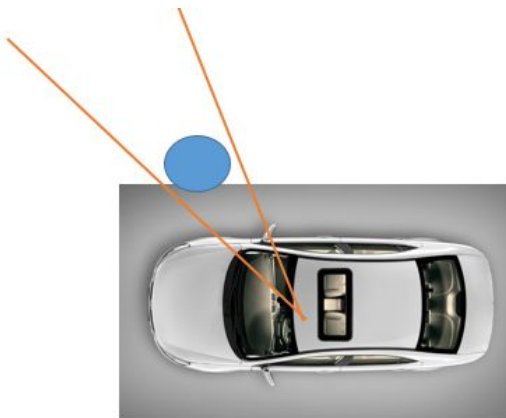


Testing distance

Distance: 2.1m

Up boundary 1.41m

Bottom boundary 0.85m

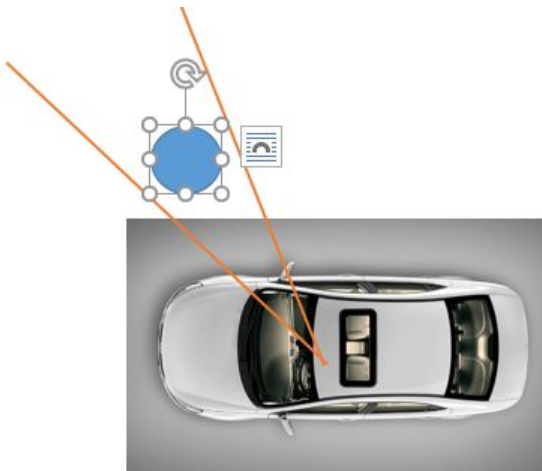


Testing distance

Distance: 3.3m

Up boundary 1.53m

Bottom boundary 0.56m

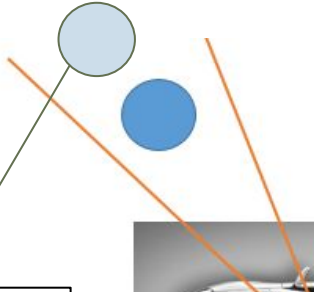


Testing distance

Distance: 4.2m

Up boundary 1.5m

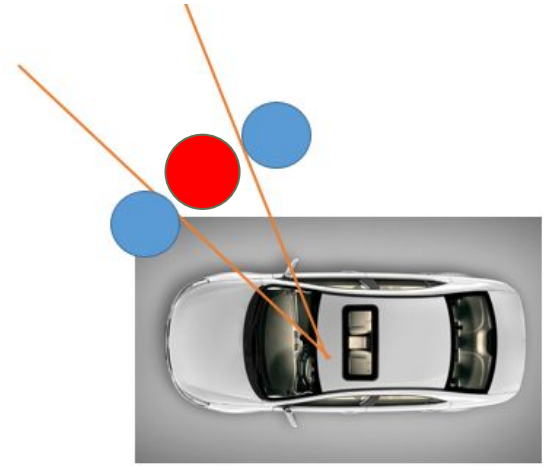
Bottom boundary 0.17m



6M Furthest point.
Not clear after this
distance



Visual Angle



Visual Angle:
Right: 30 degrees
Left: 70 degrees

Reference

<https://www.drivingtesttips.biz/driving-test-tutorials/a-pillar-blind-spots.html>

<http://www.motortrend.com/news/2016-ces-tech-highlights/>

<https://www.androidauthority.com/android-studio-tutorial-beginners-637572/>

<http://techtrickz.com/how-to/unofficial-aosp-android-6-0-marshmallow-available-for-nexus-s-installation-guide/>

<https://www.xda-developers.com/push-your-nexus-7-to-the-limit-with-elite-kernel/>

<https://www.youtube.com/watch?v=c98h41TkREA>

<https://www.zhihu.com/question/62307321/answer/242934910>

*Thank
you!*