GUJARAT TECHNOLOGICAL UNIVERSITY

Chandkheda, Ahmedabad
Affiliated

A.D.PATEL INSTITUTE OF TECHNOLOGY

A Report On-**Distracted Driver Detection**

Under subject of
DESIGN ENGINEERING – 1B
B. E. II, Semester – IB
(Information Technology Branch)

Submitted by: Group:235036

Sr.	Name Of Student	Enrolment No.
1	Santani Dipkumar Ramjibhai	180010116047
2	Sapariya Prit Chandubhai	180010116048
3	Trapasiya Gaurav Yogeshbhai	180010116059
4	Patel Nil Vipulbhai	180010116036

Mr.Patel Hemanshubhai Amratlal
(Faculty Guide)

Dr. N C Chauhan
(Head of the Department)

Academic year (2019-2020)

INDEX

1. Introduction

I perceive and define the term as "**Reverse engineering** is a path of exploration from an end to start point (reverse journey of change) for developing an insightful understanding on each underlying applications of scientific and engineering principle of a product/process". For example, we take up a chair which we are using and explore as if it was once made up of raw wood (a tree maybe!) and ores in an iron mine (that made steel parts including fixtures!). Step-by-step each aspect needs to be considered from joinery to sizing of elements and finishing and protection layers (colours!) and so on.

We Make Distracted Driver Detection Product Prototype for which Require component like like Invision tool for Prototype, Also Require internet for data Transfer.We Perform basic practical on Arduino board and we get less accuracy.

Our Purpose to make Distracted Driver Detection Device.Component Require like Arduino for basic Practical, Raspberry pi for Actual Practical, Sensor & Wire, Phone and Web. Software like Invision tool for Prototype, Android Studio, Appery.IO is require for the Product. Theory need to Understand for the Product is Normative Decision theory, Image Processing, Data Science, Convolution Neural Network and also Deep Learning and machine Learning. Product Design Simple Prototype, Small Size, Easy interface.Cost is very Effective in Product our goal is to make very low price product which is easy to afforded by all user.

2. Canvases

2.1 AEIOU canvas

We Visited Anand Mall And AEIOU Canvas Based on it.
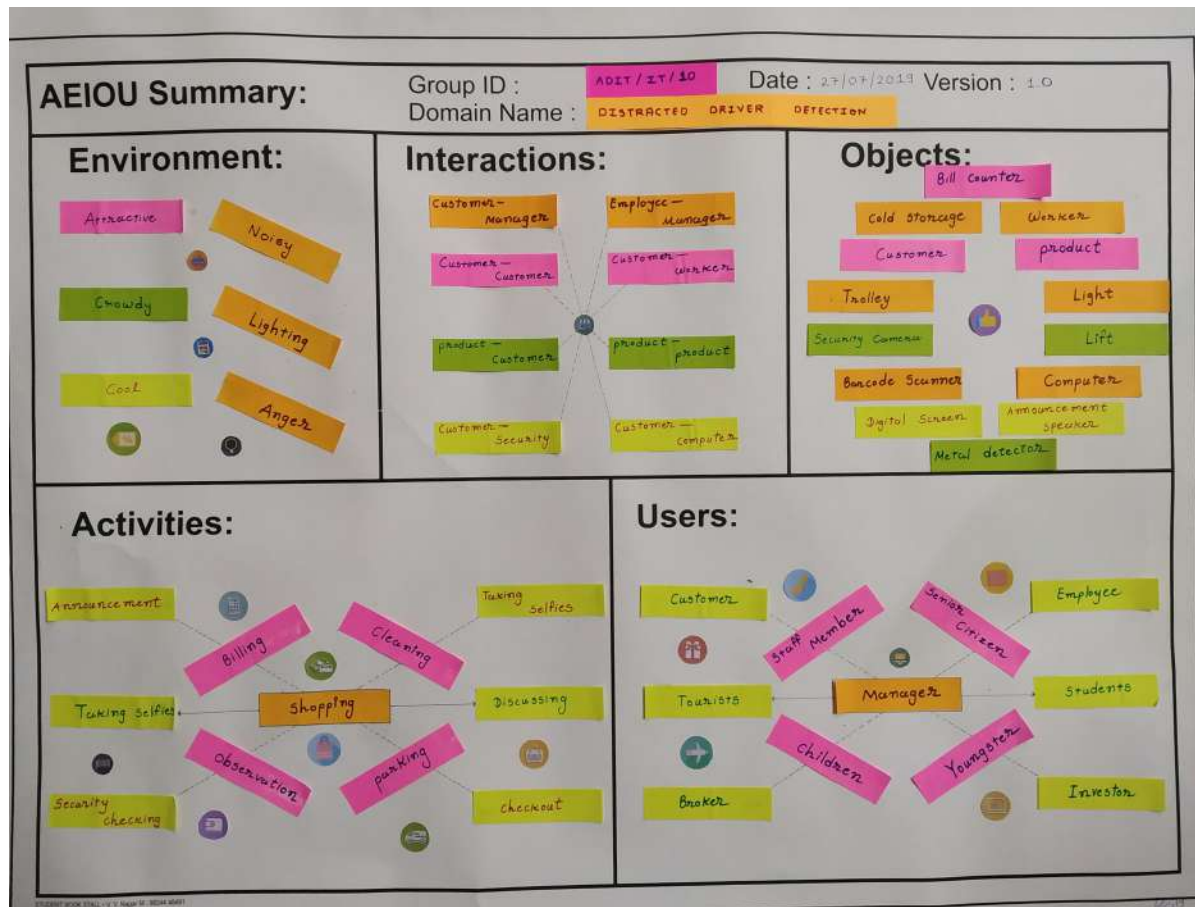
AEIOU stands for 5 elements to be coded: Activity, Environment, Interaction, Object, and User.

We Observe Activities like Parking,Security Checking, Shopping, Billing,Taking Selfies, Discussing,Announcement, Discussing, Checkout.

At Mall Environment is very Attractive ,Crowdy,Very Cool, Noisy, Lightfull,Someone like Anger.

In Mall Interactions happen between Customer and Staff,Customer and Customer,Employee and Manager,Product and Customer,Customer and Worker.
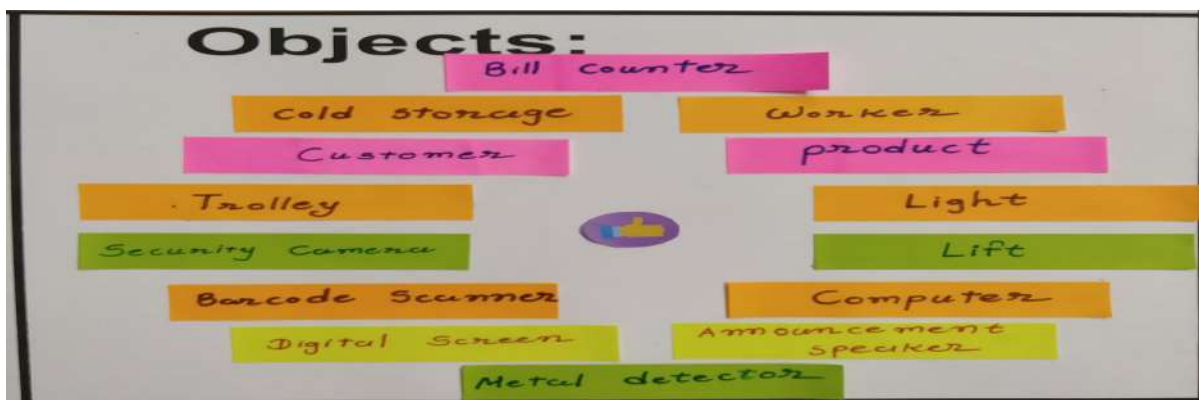
In Mall We Observe Many Object like Bill Counter,Cold Storage,Customer,Trolley,Security Camera,Bar code Scanner,Digital Screen,Metal Detector,Lift,Computer,Announcement Speaker, Worker,Product, Light, Lift, Computer and many more.

Mall User Like Broker,Tourists, Customer, Manager, Staff Member. Children, Senior Citizen, Employee, Student, Investor like Many more.

2.2. Mind Map
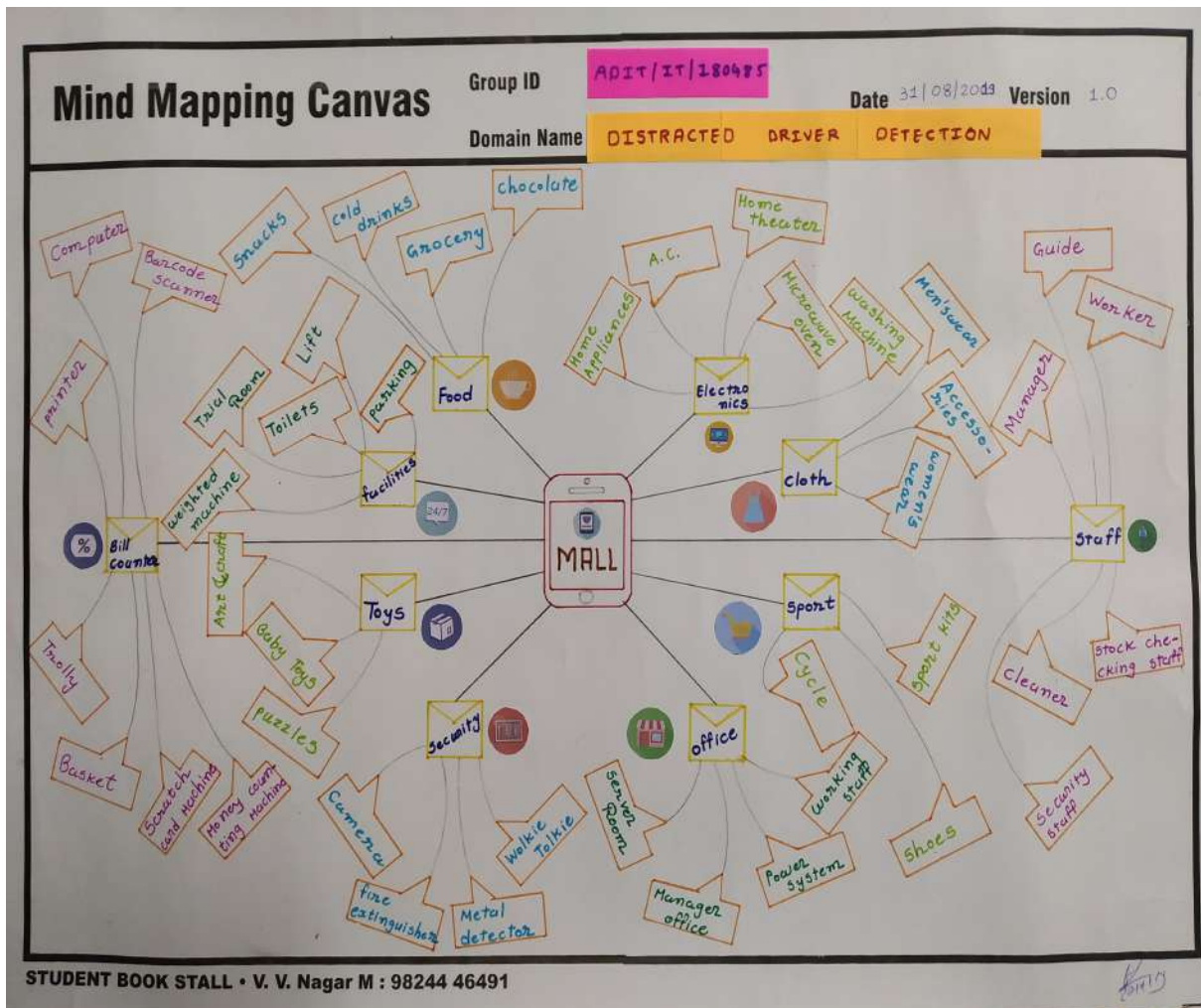
In Above Canvas the Directories are like Food, Facilities, Toys, Security, Office, Sport, Cloth, Electronics.**(1)Food** Sub directories like Snacks, Grocery, Cold Drinks, Chocolate.**(2)Facilities** sub directories like Trial Room, Lift, Parking, Weighted Machine, Rest Room and many more.**(3)Toys** Sub directories like Art & Craft, Baby toys department, Puzzles any many more toys which is really like by children.**(4)Security** sun directories like Camera, Fire Extinguisher, Metal Detector, Wolkie Talkie, Security Staff and many more.**(5)Office** sub directories like Manager Office, Server Room, Power System, Working Staff and many more.**(6)Sport** sub directories like Sport Shoes, All type of Kits, Cycle and many more Sport related thing.**(7)Cloth** sub directories like Means Wear, Women's Wear and also Children Wear and many cloth related thing.**(8)Electronics** sub directories like all Home Appliances, A.C., Home theatre and all type of electronics Gadgets

2.3 Empathy Mapping Canvas

EMPATHY

Design For: DISTRACTED DRIVER DETECTION Design By: 180485
Date: 17/08/2019 Version: 1.0

USER
TECH
STAFF MEMBER
CHILDREN
SENIOR CITIZENS
STUDENTS
TOURISTS
MANAGER
YOUNGSTER

STAKEHOLDERS
MANAGER
INVESTOR
SUPPLIER
LANDOWNER
EMPLOYEE
BROKER
CUSTOMER

ACTIVITIES
MALL
SECURITY CHECKING
ANNOUNCEMENT
CHECKOUT
PARKING
BILLING
SHOPPING
CLEANING
OBSERVATION
DISCUSSING
ENSURING
TAKING SELFIES
PURCHASING
MARKETING

STORY BORDING

HAPPY — There Were Huge Traffic In Mall, But The People Maintained Mall's Decorum With Patience. So Staff Were Happy Because It Was Easy To Manage.

HAPPY — When Customers Entered the Mall, Their Presious Thing Were Preserved So That No Customer Would Have To Worry About Their Presious Thing.

SAD — Customers Were Unhappy Because Their Were A Long Queue For Billing, They Were Feeling Tired of Standing In Queue.

SAD — Previously The Offer Was On Item Purchases. But Recently It Is Expired. So Customer Feel Unhappy And Unsatisfied To See That.
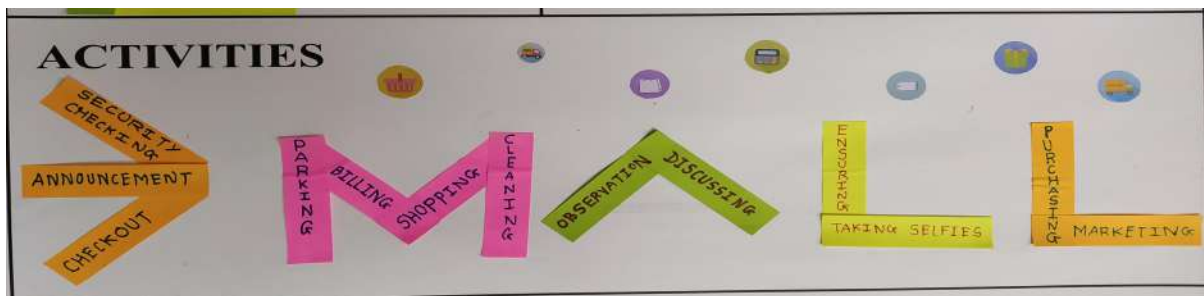
Empathy Means the ability to understand and share the feelings of another.
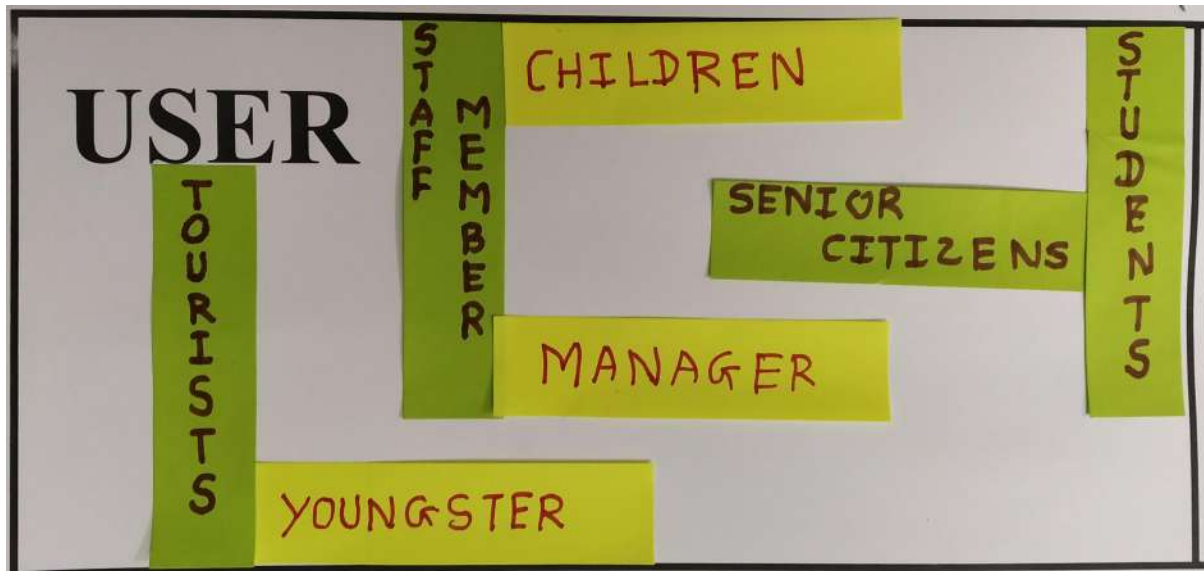
The Mall User like Tourists, Youngster, Staff Member, Manager, Senior Citizen, Students and many more.

Mall ST AKHOLDERS like Manager, Investor, Broker, Customer, Landowner, Supplier, Employee and many more.
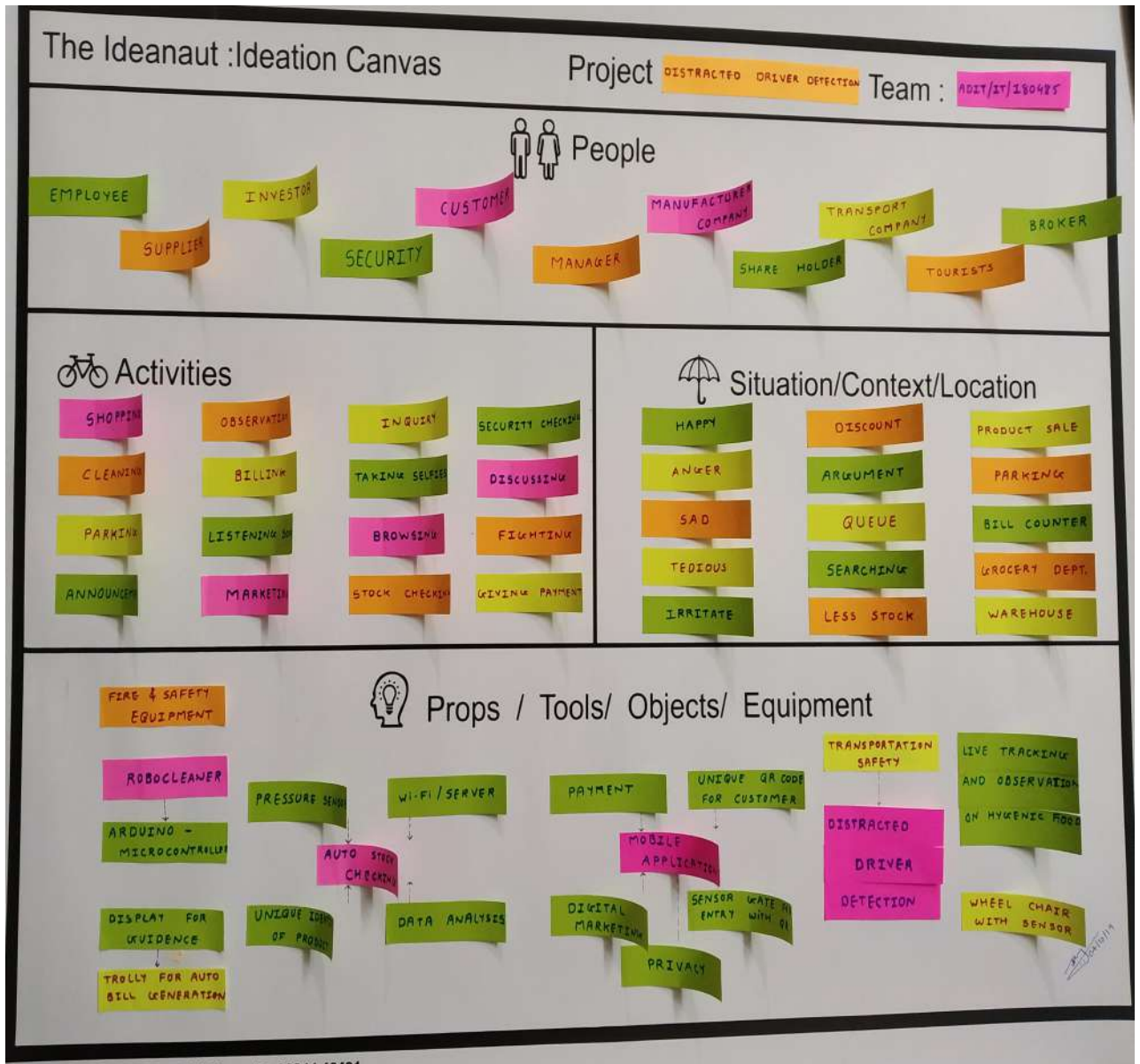
We Observe Activities like Parking,Security Checking, Shopping, Billing,Taking Selfies, Discussing,Announcement, Discussing, Checkout, Supplying, Cleaning, Ensuring, Marketing.

STORY BORDING

HAPPY

There were Huge Traffic In Mall, But The People Maintained Mall's Decoram With Patience. So Staff Were Happy Because It Was Easy To Manage.

HAPPY

When Customers Entered the Mall, Their Presious Thing Were Preserved So That No Customer Would Have To Worry About Their Presious Thing.

SAD

Customers Were Unhappy Because Their Were A Long Queue For Billing, They Were Feeling Tired of Standing In Queue.

SAD

Previously The Offer Was On Item Purchases, But Recently It IS Expired, So Customer Feel Unhappy And Unsatisfied To See That.

STUDENT BOOK STALL • V. V. Nagar M : 98244 46491

2.4 Ideation Canvas

Ideation is the process where you generate ideas and solutions through sessions such as Sketching, Prototyping, Brainstorming, Brainwriting, Worst Possible Idea, and a wealth of other ideation techniques. Ideation is also the third stage in the Design Thinking process.

People like Employee, Supplier, Investor, Security, Manager, Share Holder, Broker, Tourists, Transport Company, Manufacture Company and many more.

We Observe Activities like Parking,Security Checking, Shopping, Billing,Taking Selfies, Discussing,Announcement, Discussing, Checkout, Supplying, Cleaning, Ensuring, Marketing.

Situation like All Customer are happy because the announcement of discount in product sale. Another situation like one customer is anger because another customer argument him for parking slot.Many Customer are sad because they waiting in queue for billing.Some customer are irritate because they not get sufficient thing because of less stock of warehouse.

STUDENT BOOK STALL • V. V. Nagar M : 98244 46491
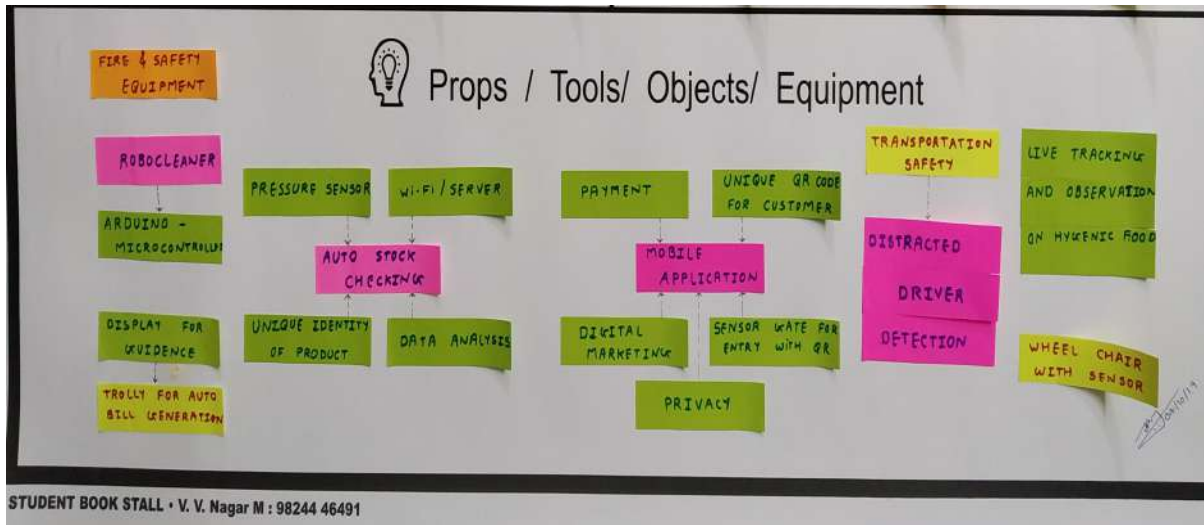
We get Props like Wheel chair with sensor, Rob-cleaner, Trolley for auto bill generation, Distracted driver detection for safety transportation, Live tracking and observation in higenic food, Mobile Application for payment, Auto Stock Checking and many more.

2.5 Product Development Canvas
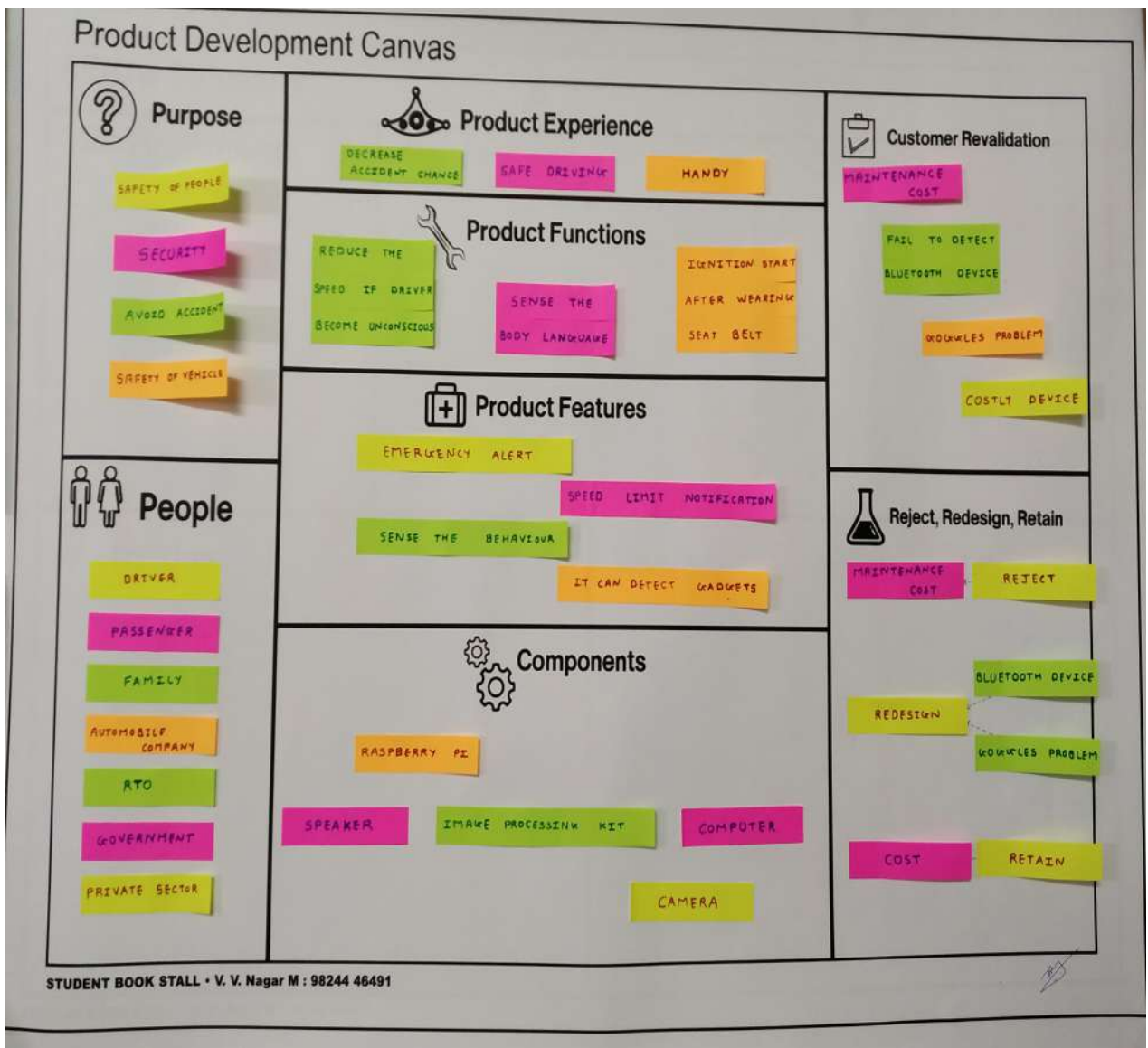
Product development canvas can give you insights to these problems when creating a product, factors such as Purpose, people, product experience, product functions, product features, and components. Use this Product development canvas template to create your own diagram.
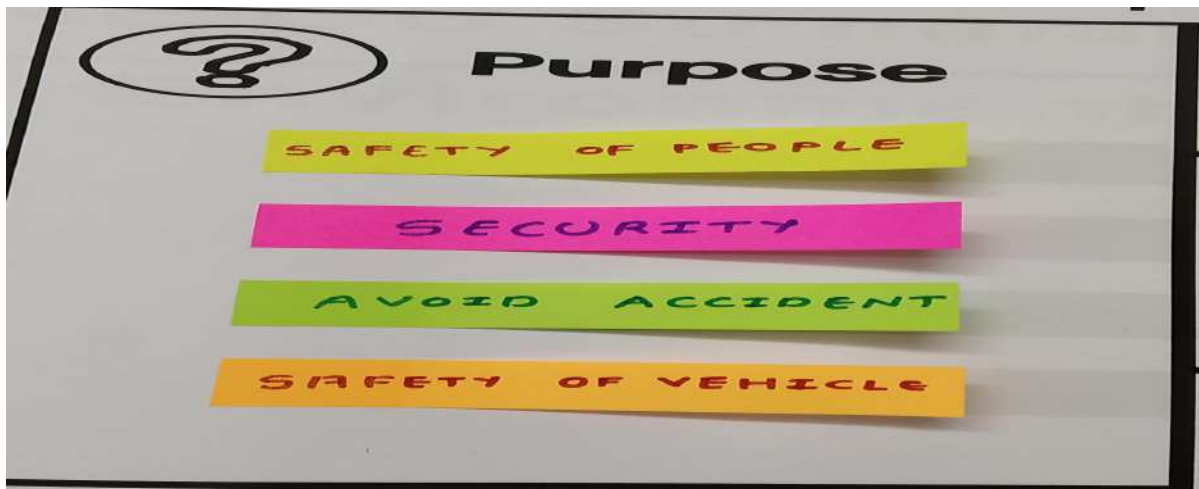
The Product purpose is to make safety of People, Security, Avoid Accident, Safety of Vehicle.

Product is Handy, Make Safe Driving and it is Decrease Accident Chance.
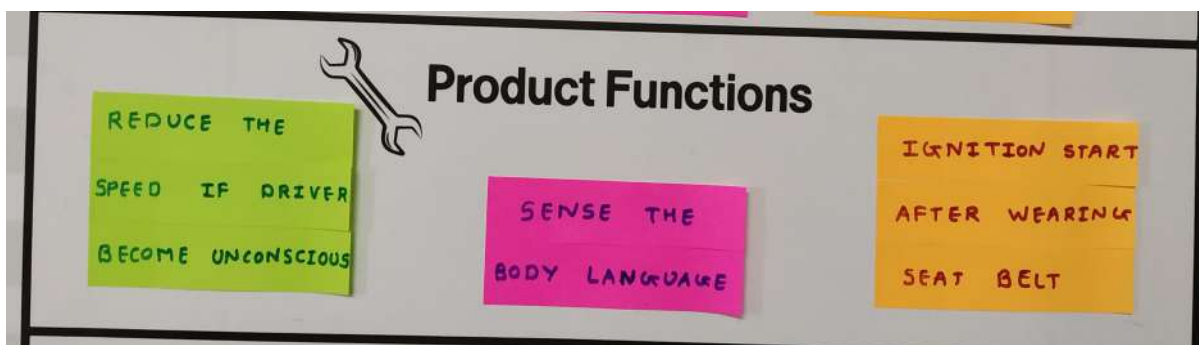
The Product Function like it reduce the speed if driver become unconscious, Sense the body language, Ignition start after wearing seat belt.

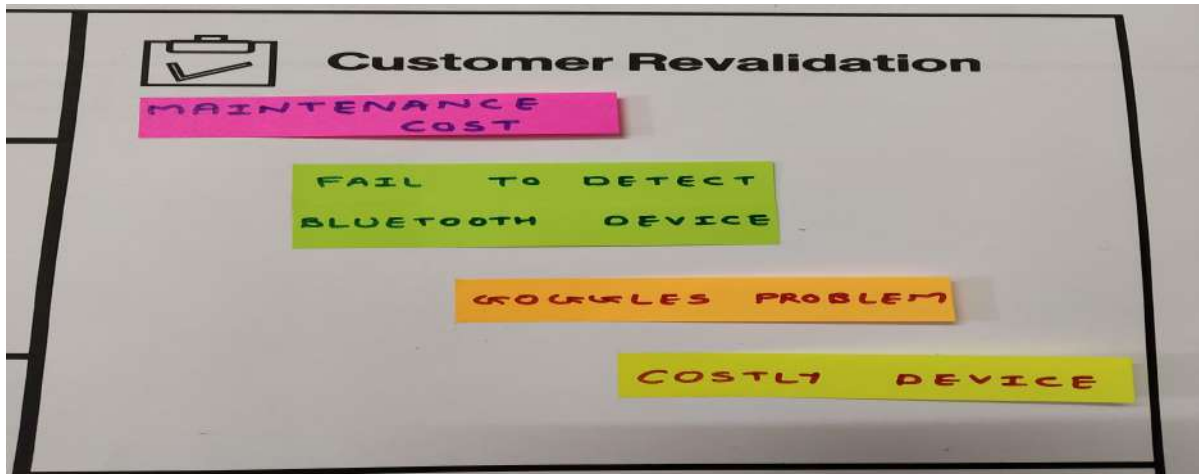**Customer Revalidation**

MAINTENANCE COST

FAIL TO DETECT BLUETOOTH DEVICE

GOGGLES PROBLEM

COSTLY DEVICE

Customer Revalidation like Maintenance Cost, Fail to detect Bluetooth device, Goggles Problem, Costly Device.

People

DRIVER

PASSENGER

FAMILY

AUTOMOBILE COMPANY

RTO

GOVERNMENT

PRIVATE SECTOR

The different type of people use our product like Driver, Passenger, Family, Automobile Company, RTO, Government, Private Sector.

Product Features

EMERGENCY ALERT

SPEED LIMIT NOTIFICATION

SENSE THE BEHAVIOUR

IT CAN DETECT GADGETS

Product Feature like Emergency Alert, Speed limit Notification, Sense the behaviour of driver, It can detect Gadgets.
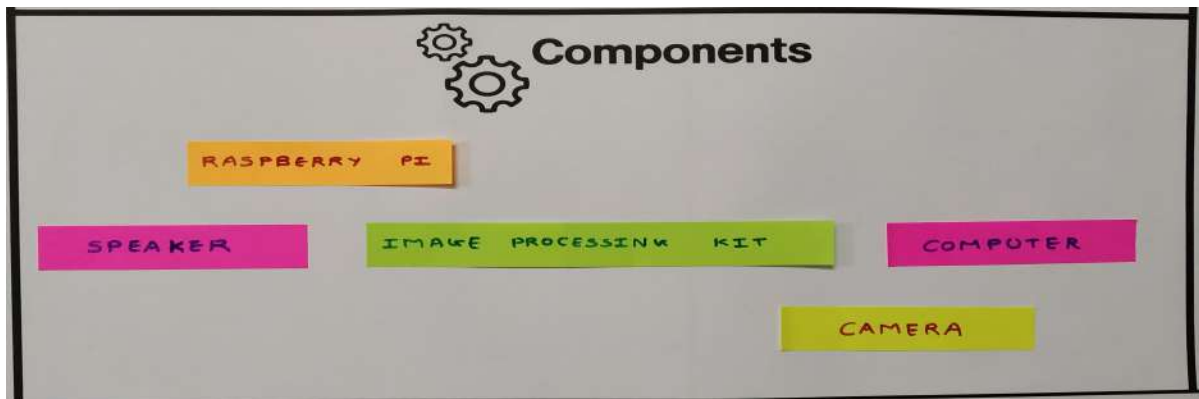
Require component to make product like Raspberry pi Board, Speaker, Image Processing Kit, Camera, Computer.
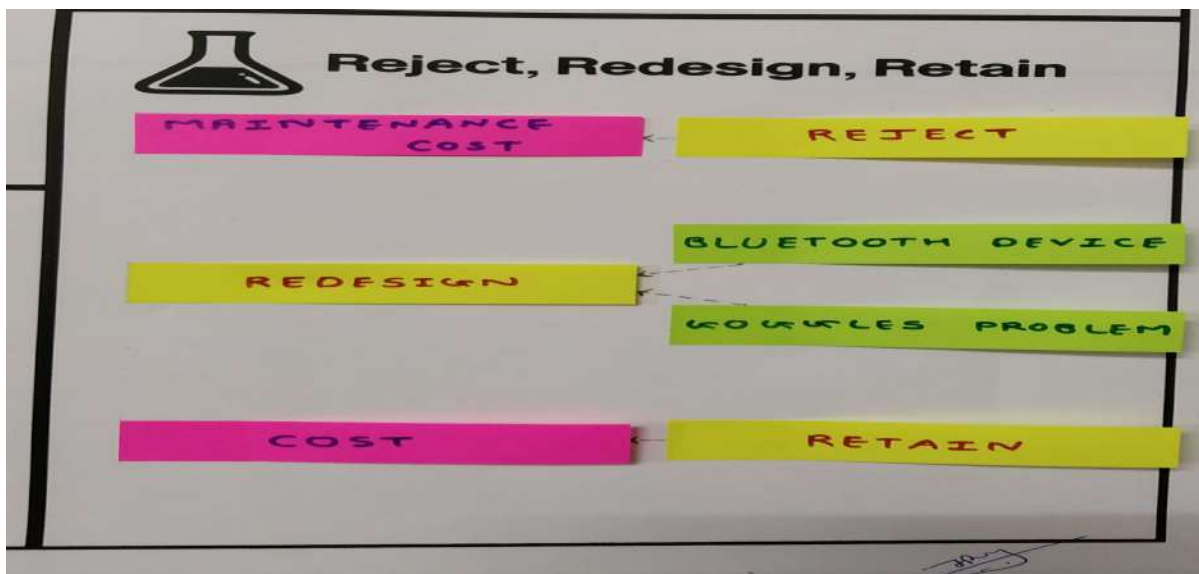
We Reject Maintenance Cost because, Product Redesign for detection of Bluetooth Device and Goggles Problem and Retain Cost.

3. Prior Art Search

3.1 Research Paper Summary

ABSTRACT

The number of road accidents due to distracted driving has been on a rise in the recent years. As per the Union Road Transport and Highways Ministry Report 2016, 17 people were killed each hour in India due to road accidents. This makes it imperative to take measures to curb the number of road fatalities. The major cause of these accidents is driver error. This paper proposes solution to detect the distraction of driver, thus averting the possible accidents. The use of different Convolutional Neural Network (CNN) models namely: Small CNN, VGG16, VGG19, Inception for classification of distracted drivers according to State Farm Distracted Driver Detection challenge on Kaggle are depicted in this paper. The deep learning library used for the purpose is Keras running on top of TensorFlow. Our best result is a categorical cross entropy loss of 0.899 on the validation set Keywords- Classification, CNN, Keras, Transfer Learning, VGG.

DATASET

State Farm is a large group of insurance and financial services companies throughout the United States.They released their dataset of 2D dashboard camera images for a Kaggle challenge.The dataset had 22400 training images and 79727 testing images.Resolution was 640 x 480 pixels.The training images had corresponding labels attached. Labels belonged to one of the ten classes as mentioned below:

c0: normal driving
c1: texting - right
c2: talking on the phone - right
c3: texting - left
c4: talking on the phone - left
c5: operating the radio
c6: drinking
c7: reaching behind
c8: hair and makeup
c9: talking to passenger

The training set consists of 22400 images which are split into 2 parts i.e. train and validation sets. The images are split in such a manner that the same driver will not appear in both train and test set.This is due to the fact that the images are highly correlated to each other. In our initial approach, we randomly selected 150 images from each class to form the validation set consisting of 1500 images.However, this resulted in false high validation accuracy due to the

high correlation between the images. Thus, we had to select images belonging to specific drivers to be a part of validation set such that the same drivers will not be part of the training set. The training set was thus split in this manner to ensure that validation set is not related to the training set.The evaluation metric used for all the models is categorical cross-entropy or log loss. This is given as logloss.The logloss was used as the metric to judge the efficiency of the models. Here N stands for number of predictions and M is the number of classes which is 10 in our case. The value of yij is 1 if the image i belongs to class j with the probability value of pij.

REFERENCES

[1] Report on Road Accidents in India 2016- Ministry of Road Transport & Highways (MoRTH), Government of India pp. 1-2 **http://morth.nic.in/showfile.asp?lid=2904**

[2] Kaggle.A brief summary **https://www.kaggle.com/c/state-farm-distracted-driver-detection**

[3] Yehya Abouelnaga, Hesham M. Eraqi, and Mohamed N. Moustafa, "Real-time Distracted Driver Posture Classification", arXiv preprint arXiv:1706.09498

[4] T. H. N. Le, Y. Zheng, C. Zhu, K. Luu and M. Savvides, "Multiple Scale Faster-RCNN Approach to Driver"s Cell-Phone Usage and Hands on Steering Wheel Detection," 2016 IEEE Conference on Computer Vision and Pattern Recognition Workshops (CVPRW), Las Vegas, NV, 2016, pp. 46-53

[5] Hssayeni, Murtadha D; Saxena, Sagar; Ptucha, Raymond; Savakis, Andreas,"Distracted Driver Detection: Deep Learning vs Handcrafted Features", Society forImaging Science and Technology, Imaging and Multimedia Analytics in a Web andMobile World 2017, pp. 20-26(7)

[6] dImageNet: VGGNet, ResNet, Inception, and Xception with Keras **https://www.pyimagesearch.com/2017/03/20/imagenet-vggnet-resnet-inceptionxception-keras/**

[7] CS231n Convolutional Neural Networks for Visual Recognition **http://cs231n.github.io/convolutional-networks**

[8] Karen Simonyan, Andrew Zisserman, "Very Deep Convolutional Networks for Large-Scale Image Recognition", arXiv preprint arXiv:1409.1556

ABSTRACT
Driver distraction is a leading factor in car crashes. With a goal to reduce traffic accidents and improve transportation safety, this study proposes a driver distraction detection system which identifies various types of distractions through a camera observing the driver. An assisted driving testbed is developed for the purpose of creating realistic driving experiences and validating the distraction detection algorithms. The authors collected a dataset which consists of images of the drivers in both normal and distracted driving postures. Four deep convolutional neural networks including VGG-16, AlexNet, GoogleNet, and residual network are implemented and evaluated on an embedded graphic processing unit platform. In addition, they developed a conversational warning system that alerts the driver in real-time when he/she does not focus on the driving task. Experimental results show that the proposed approach outperforms the baseline one which has only 256 neurons in the fully-connected layers. Furthermore, the results indicate that the GoogleNet is the best model out of the four for distraction detection in the driving simulator testbed.

DISTRACTION DETECTION
There are many types of distracted driving behaviours in real world scenarios. In this study, we consider the following ten normal and distracted driving behaviours:
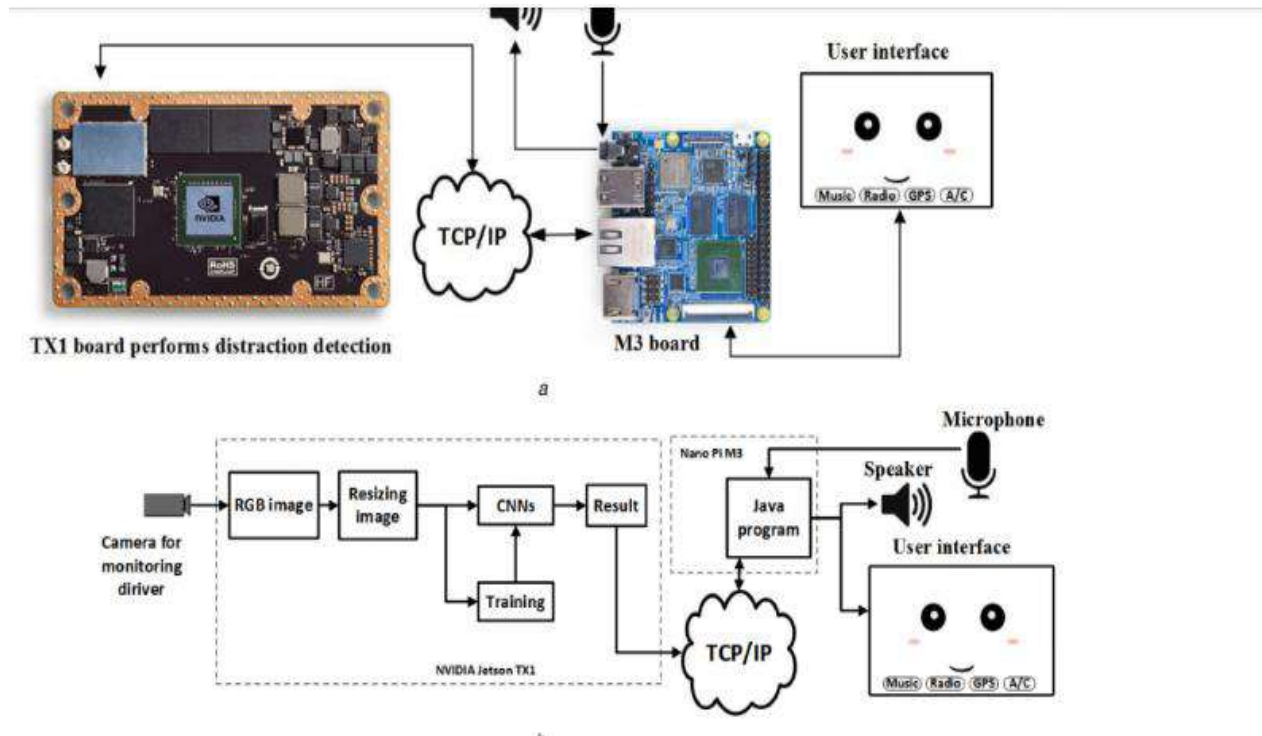• Safe driving
• Texting on the phone using the right hand
• Talking on the phone using the right hand
• Texting on the phone using the left hand
• Talking on the phone using the left hand
• Operating the radio
• Drinking
• Reaching behind
• Doing hair and makeup

EXPERIMENTS AND RESULTS
To validate and evaluate the CNN models in distraction detection,we conducted experiments on the assisted driving simulator.Under shows the complete setup of the simulator, which consists of multiple cameras for driver monitoring and environment monitoring. In the experiments, for the purpose of distraction detection, we only use the side camera to observe the driver's hand and body movement. Ten subjects were asked to drive the car and conduct the ten activities mentioned in Section 2. For each activity, we recorded 5 min of video. Since the images are taken from the video clip, there exist similar postures that belong to the same activity. Therefore, we only selected one image per second fromthe videos. Hence, we have about 35,000 images. Then we performed data augmentation by shearing, rotating, width shifting, height shifting, and zooming the original images. Then we have about 200,000 images for the dataset. The four CNN models were trained on a computer with the following configuration: Intel i7 4790 CPU, 16 GB RAM and NVIDIA GeForce GTX 970

GPU. To reduce overfitting on the training data, the following methods are applied during the training stage.

The Module Setup As Under Follow:

REFERENCES

[1] US Department of Transportation – National Highway Traffic Safety Administration: **https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812318?ga=1.78055380.110 4132544.1489526594**

[2]US Department of Transportation – National Highway Traffic SafetyAdministration: 'Distracted driving'. Available at: **https://www.nhtsa.gov/riskydriving/distracted-driving**

[3] Esurance:'3 types of distracted driving', 2016.At:**https://www.esurance.com/info/car/3-types-of-distracted-driving**, accessed October2017

[4] Just, M.A., Keller, T.A., Cynkar, J.: 'A decrease in brain activation associatedwith driving when listening to someone speak', Brain Res., 2008, 1205, pp.70–80

[5] Ameen, L.: 'The 25 scariest texting and driving accident statistics'. Availableat **http://www.icebike.org/texting-and-driving/**

4. Pre-Design

4.1 LNM
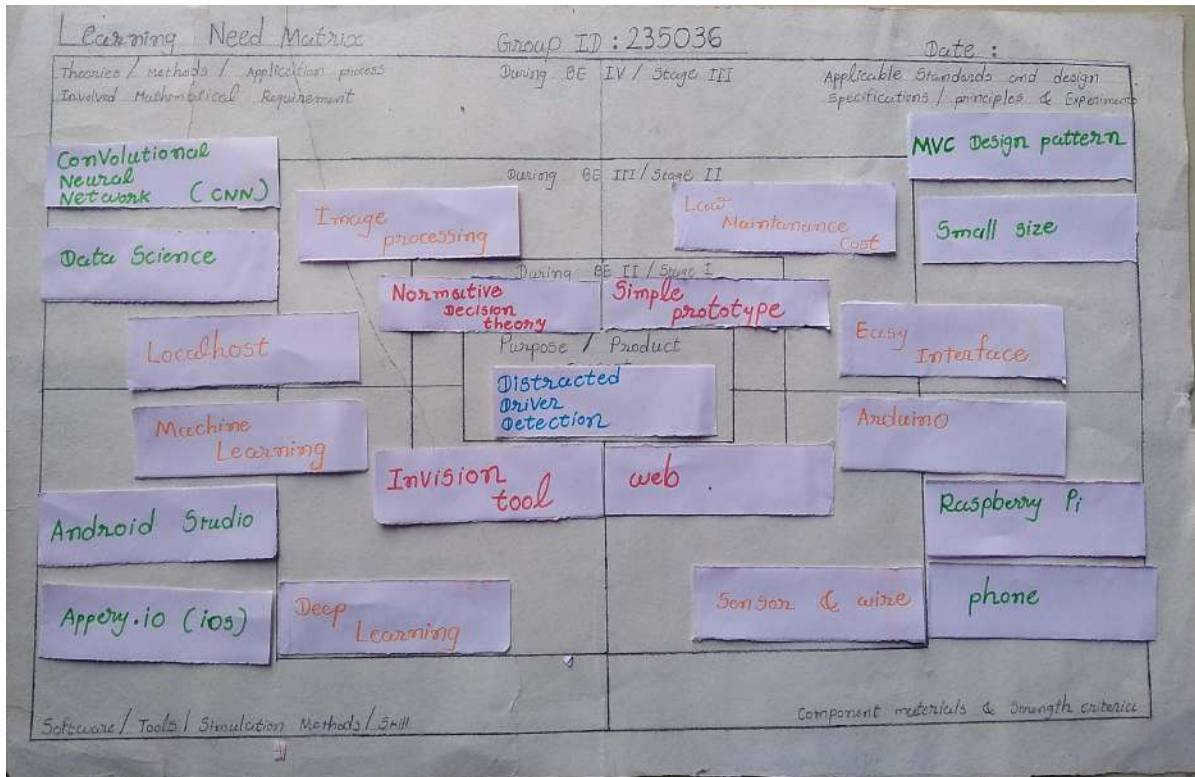
The purpose of LNM is to identify the requirements of learning among the team members. While a new product/process is under development based on a unique idea (to reduce the level of difficulty faced by a user), the team members need to learn and explore a lot of new skills and documents, methods and guidelines.
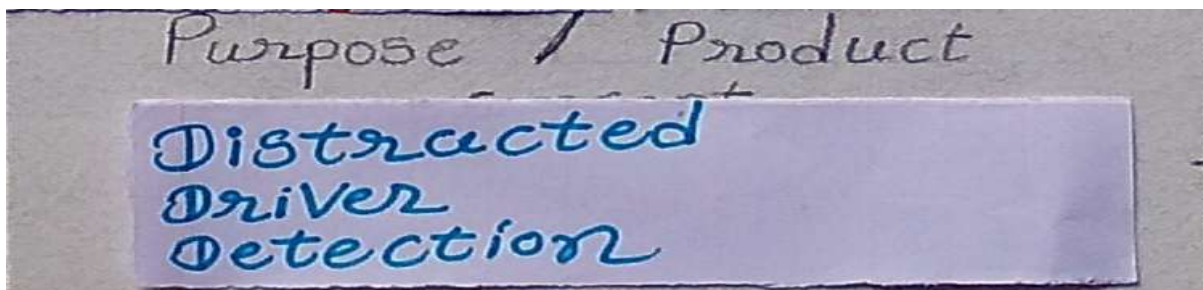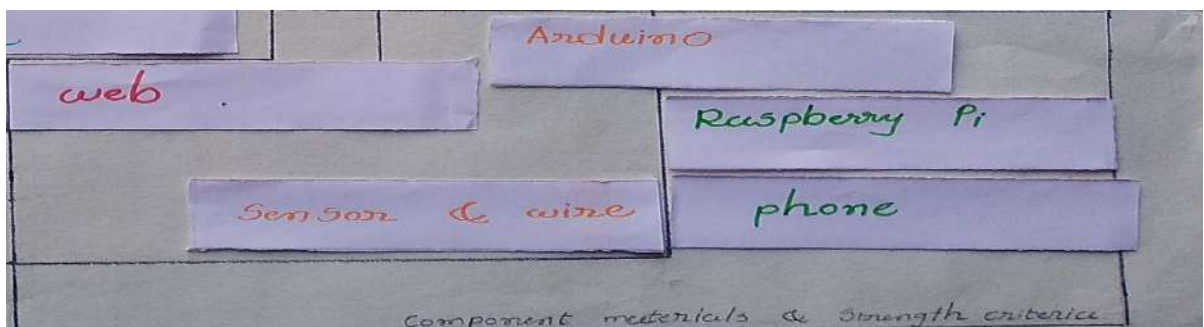

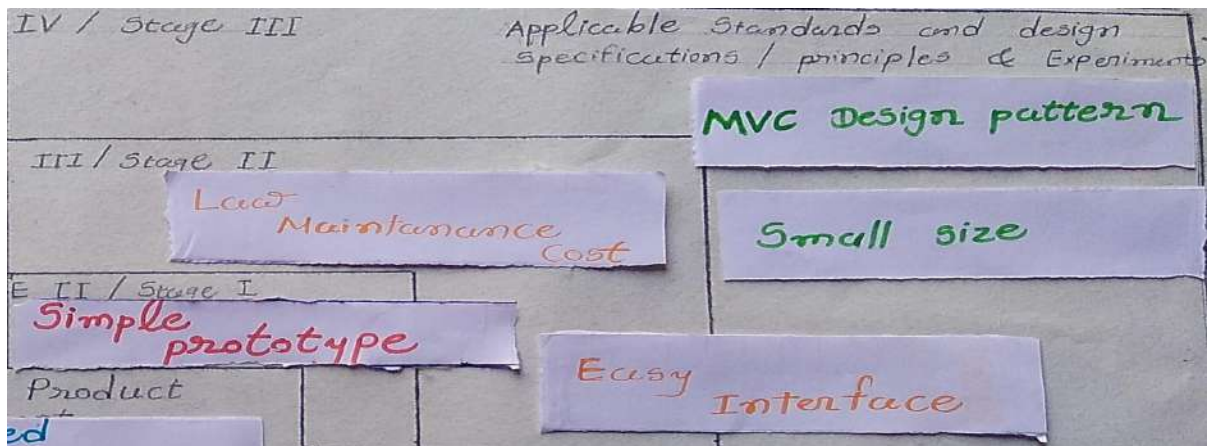Our Purpose to make Distracted Driver Detection Device.
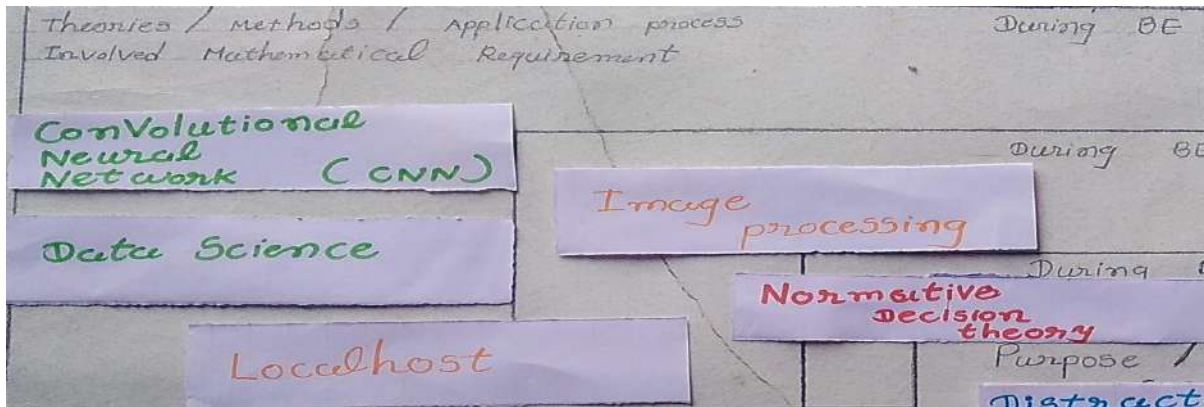
Theory need to Understand for the Product is Normative Decision theory, Image Processing, Data Science, Convolution Neural Network.
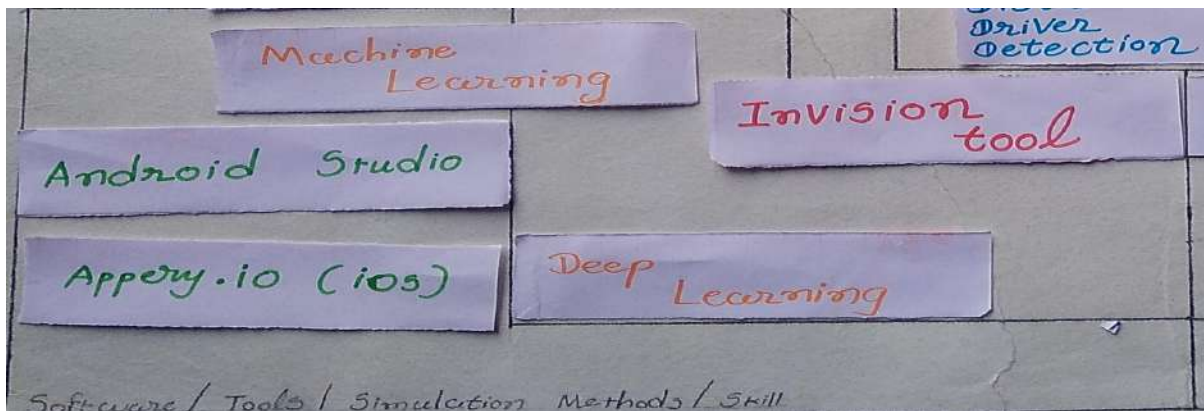
Software like Invision tool for Prototype, Android Studio, Appery.IO is require for the Product.


Component Require like Arduino foe basic Practical, Raspberry pi for Actual Practical, Sensor & Wire, Phone, Web.

IV / Stage III — Applicable Standards and design specifications / principles & Experiments

MVC Design pattern

III / Stage II — Law Maintanance Cost

Small size

E II / Stage I — Simple prototype

Easy Interface

Product

ed

Product Design Simple Prototype, Small Size, Easy interface, Law Maintanance Cost, MVC Design Pattern is final Design Pattern for the Product.

4.2 Prototype

DISTRACTED DRIVER DETECTION APP
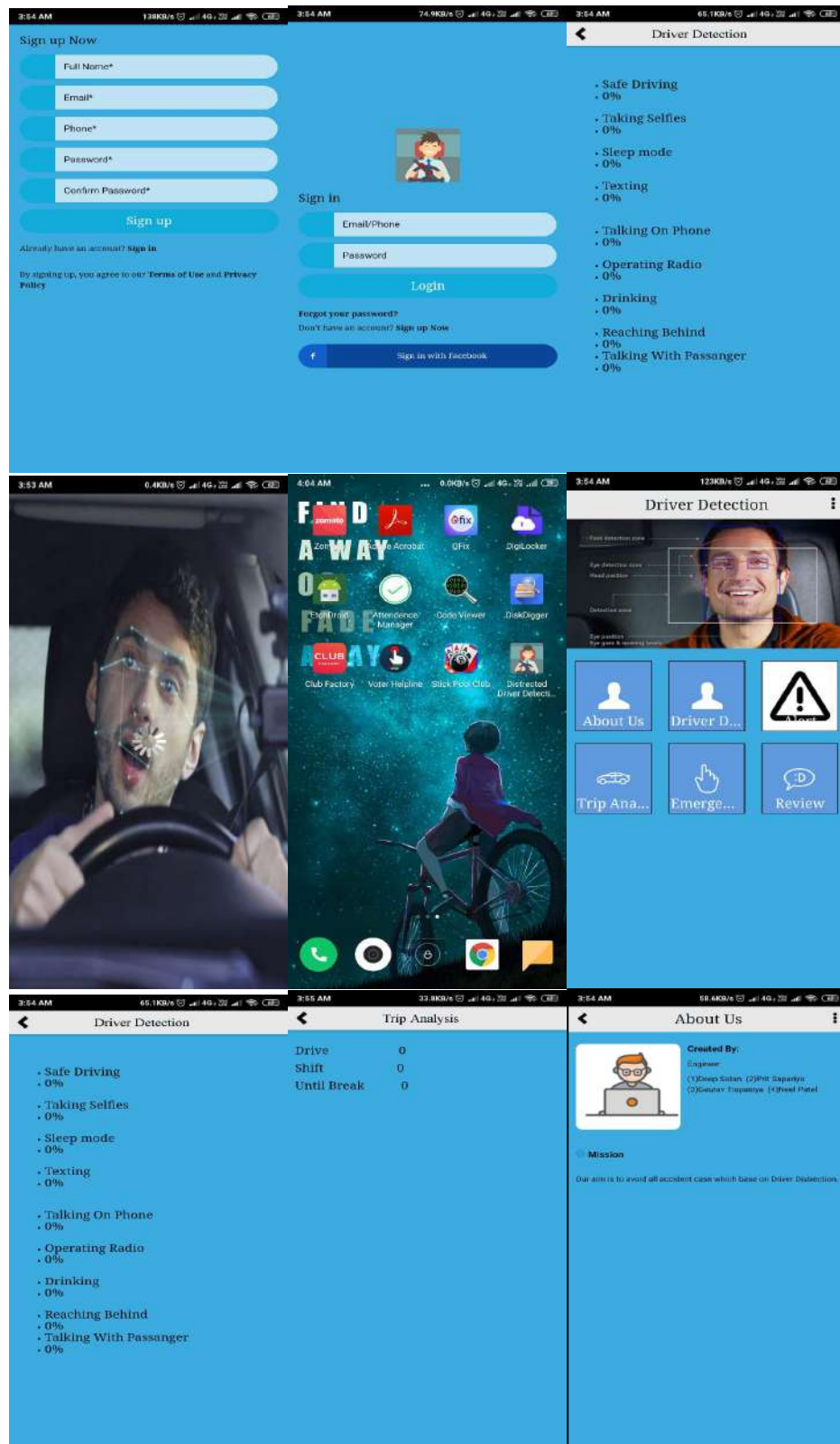
4.3 Pre-Design Calculations

4.3.1 Technological

It is like **Detective,** It Detect all the distraction motion of driver and through Alert message where needed, Which is really important for safe driving. It is like eagle Eye, Another name like 007 (Smart).

4.3.2 Aesthetics

It is handy, Very small in size, Small Square type of size, MVC Design Pattern.

4.3.3 Ergonomics

The human interface is very easy, All function is easy to understand by all type of age People.

4.3.4 Environment

It is not affect to environment because all the component made by chips and it is eco-friendly product or green product. Because all the process happen digitally through internet.

4.3.5 Cost

It has very low-cost because it is just app and also all the function work on Phone so it is very low cost-effective. Maintenance Cost is high because it is made up of Expensive Electronics Chip.So Product Maintenance cost is high.

5. Summary

One way engineers learn about technology is by reverse engineering. Engineers can take apart gadgets to see how they work. Understanding how gadgets function can lead to suggestions for improvement or ideas for new products. The process requires careful observation and analysis.

6.References

1.http://gtuinnovationcouncil.ac.in/blog/category/design-engineering/

2.https://www.researchgate.net/publication/326416658_Distracted_Driver_Detection_and_Classification

3.https://www.hindawi.com/journals/jat/2019/4125865/

4.https://www.google.com/search?client=firefoxbd&q=Summary+of+the+learning+from+Reverse+Engineering+activity