



# **National Institute of Business Management School of Computing**

**Faculty of Engineering, Environment, and Computing School of  
Computing, Electronics, and Mathematics Coventry University**

## **Design and usability 01**

### **Group Report**

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## Introduction

Vector robot is a home robot that has created for human entrainment which is very cute and adorable. But need much more attention in usability and appearance also that need much of technology improvements.

Following abstraction is to understand what a vector robot is.

**‘Actually, Vector’s more than a home robot. He’s your buddy. Your companion. Most of all, he’ll make you laugh. Curious, independent, and powered by some preposterous tech and AI, he can read the room, express the weather, announce when his timer’s done (no overcooked dinner on his watch), take the perfect snapshot, and so much more.**

**Vector is your robot sidekick who’s up for anything. He’s the robot to life with.’** (anki, 2019)



Figure: Vector robot(anki, 2019)

These are some product details of anki vector robot

- Quad-core Qualcomm Snapdragon processor has 1.2GHz
- 4-microphone array
- Single point time-of-flight NIR Laser in 1m range
- 720p camera
- 802.11n Wi-Fi
- Bluetooth
- Capacitive top and bottom casing
- 4 cliff sensors

(The Verge, 2019)

Current price of the vector robot is **\$224.99** with 10% discount with the actual price **\$249.99**


## Research Phase


For the research method, we have used **observations**


To conduct our work efficiently we have used Pact Model


### People

#### Personas


 <b>Group 01</b>	<b>Demographics</b>  <b>Age :</b> 03 – 12 <b>Location :</b> urban/good connectivity <b>Occupation:</b> -
<b>Behaviors</b> <ul style="list-style-type: none"><li>• Rich family background</li><li>• Busy parents</li><li>• Health conditions(Allergies to pets)</li><li>• Mental issues(dislike pets, introverts)</li></ul>	<b>Goals and pain points</b> <ul style="list-style-type: none"><li>• Fulfilment of loneliness</li><li>• As a companion/toy/pet</li><li>• Personal assistant</li><li>• Playing games</li></ul>

 <b>Group 02</b>	<b>Demographics</b>  <b>Age :</b> 13 – 18 <b>Location :</b> urban/good connectivity <b>Occupation:</b> -
<b>Behaviors</b> <ul style="list-style-type: none"><li>• Rich family background</li><li>• Busy parents</li><li>• Student</li><li>• Health conditions</li><li>• Mental issues(dislike pets, introverts)</li></ul>	<b>Goals and pain points</b> <ul style="list-style-type: none"><li>• Educational fulfilment</li><li>• As a personal assistant</li><li>• Entrainment purposes or enjoyment</li><li>• Mental fulfillment</li><li>• Comparisons with other competitors</li><li>• Playing games</li><li>• Showing off</li><li>• Battery life</li></ul>

 <p><b>Group 03</b></p>	<p><b>Demographics</b></p> <p><b>Age :</b> 19 – 35  <b>Location :</b> urban/good connectivity  <b>Occupation:</b> occupied/non occupied</p>
<p><b>Behaviors</b></p> <ul style="list-style-type: none"> <li>• Nerds/geeks/developers</li> <li>• Married life/single(single parent, divorced)</li> <li>• Health conditions</li> <li>• Mental issues(dislike pets, introverts)</li> <li>• Tech-savvy</li> </ul>	<p><b>Goals and pain points</b></p> <ul style="list-style-type: none"> <li>• For enjoyment</li> <li>• Baby monitoring</li> <li>• High price</li> <li>• Battery life</li> <li>• As a personal assistant</li> <li>• Mental fulfilment</li> <li>• Fashion selections</li> <li>• As a hobby</li> <li>• Showing off</li> <li>• Developing purposes</li> <li>• Privacy concerns</li> </ul>

 <p><b>Group 04</b></p>	<p><b>Demographics</b></p> <p><b>Age :</b> 45 – 90  <b>Location :</b> urban/good connectivity  <b>Occupation:</b> occupied/non occupied</p>
<p><b>Behaviors</b></p> <ul style="list-style-type: none"> <li>• Psychological issues</li> <li>• Disability/physical issues</li> <li>• Life management</li> <li>• Health conditions</li> <li>• Mental issues(dislike pets, introverts)</li> </ul>	<p><b>Goals and pain points</b></p> <ul style="list-style-type: none"> <li>• As a pet</li> <li>• As a companion</li> <li>• Price issues(high price)</li> <li>• Comparisons with competitors</li> <li>• Personal assistant</li> <li>• Entrainment purposes or enjoyment</li> <li>• Mental fulfilment</li> <li>• Helper in day to day life</li> <li>• Obey commands</li> <li>• Home Robotic devices</li> </ul>

To define the above personas, we read and go through many reviews/feedbacks of the customers that have already used or bought the vector. The following abstraction shows some examples,

 Joseph Hammontree


★☆☆☆☆ **Over priced**

October 18, 2018

Verified Purchase

ts worth more around 80 dollars i would say. But no where near this price. Its not refined, only responding correctly to my commands around 70 percent of the time i would say. Really neat idea, and they did a really good job giving it a personality. But it just feels rushed. They should have spent more time on it, or made it cheaper.

315 people found this helpful

 MomOfTwo

★★★★★ **Vector is adorable!**

October 14, 2018

Verified Purchase

My dog wants to kill him but I think he's adorable! I love that he can recognize me and all of my family members. It's also really cute how entertains himself. I found him wandering around my family room on his own and, when I called for him, he came and found me. My kids love petting him and hearing him coo. I work in IT and can't wait to bring him into work and share him with the nerd herd.

All in all a really fun buy, I'm looking forward to watching his personality develop.

240 people found this helpful

 D. Gaul

★☆☆☆☆ **privacy concerns?**

November 13, 2018

Am I the only one who sees this device, which has audio input and camera capabilities which connect to the cloud, a HUGE privacy concern? As interesting as this AI gadget may be you have to consider the risks. Not that I have anything to hide, but we've already sacrificed so much of our privacy with today's social media and technological advances. This can be dangerous.

82 people found this helpful

(Amazon.com, 2019)

## **Activities**

These are the activities that carried out by vector which concerns humans

- Act as a robot
- Use as a home robotic device
- Companion robot
- Simple-minded pet
- Personal assistant
- Can answer questions
- Obey commands
- Take photos
- Play games
- Play with his cube
- Helper in day to day life
- Auto charging

## **Context**

- **Physical Context**
  - Palm-size so can carry anywhere the user like and easy to manage
  - Arm movements
- **Social Context**
  - Act as a personal assistant so that the user can ease their day to day life
  - Act as a companion so that the users can relax in their surroundings

## **Technology**

- Using Alexa, having a build-in neural network. (emotional capability)
- Computer vision to identify people and navigate his space
- A four-microphone array gives the power of directional hearing
- Touch sensors and an accelerometer allows feeling when he is been touched or moved
- Onboard processing and cloud connectivity
- Qualcomm 200 platform
- The app is compatible with both android and IOS

## Current Market

The vector robot is invented by Anki company that is currently shutting down. Therefore, vector is no longer in production and there are no software updates for the already sold robots. The vector that can be bought are the ones in the stock also not in the official store but in online stores such as Amazon, Best Buy.

The current price of the vector robot is \$249.99 but it has a discount of 10% which is \$224.99

There is a space for vector called “vector space” the price of the vector space is \$29.99

The price of the vector charger is \$29.99

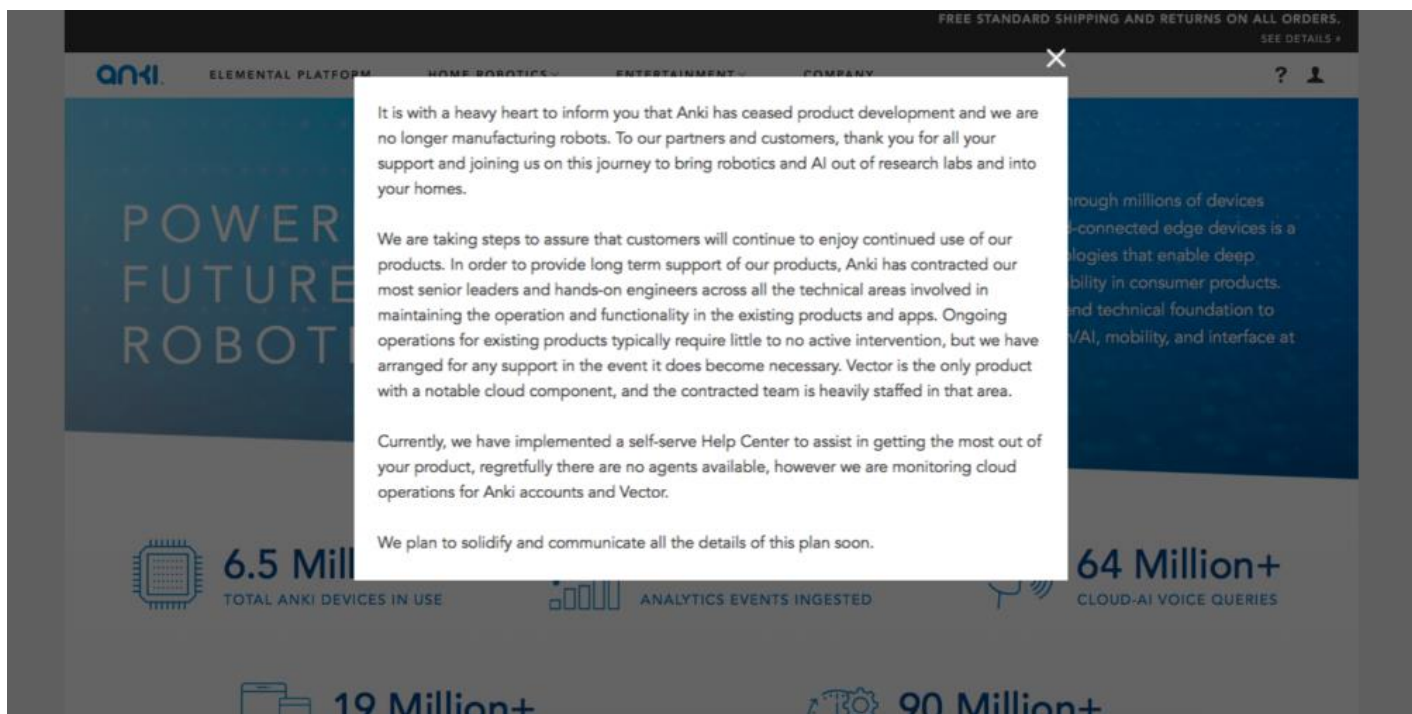


Figure – the official statement of anki shutting down (Crowe, 2019)

The sales of the anki company is more than 1.5 million robots including vector robot and 100 million in revenue before the bankrupt of early 2017



## Competitors

There are many competitors for vector robot

Some of them are as follows,

- **Arimac Diyazen Robot**



This robot,

- Humanoid robot platform can be extended to multiple robot application
- CNN based high-speed semantic analysis technology
- Omnidirectional indoor navigation
- Face, gesture and emotion identification
- SDK application enables third party app developments
- Automatic charging with 10 hours operating time
- Latest technology to create a more human and interactive user experience
- Price is \$380.99

- **Haite Mini Robot**



This robot,

- Is a palm-size robot, eyes flashes with different commands.
- Arms can rotate flexibly
- Can record the voice and repeat with robotic sound effects(not noisy)
- Can conduct a conversation, recognize the voice and reply to the questions
- Good companion
- Can slide, sing and dance, tell stories etc.
- Portable can take anywhere
- Can use for any age range
- Current price is \$15.99

- **Robot Octopus**



This robot,

- Is the first mechanical robot in HI-TECH robot family
- Can walk, move forward/backwards, turn left/right
- Can sing/dance
- Can play music
- Can tell stories
- Can programs moves that you like
- Good at dancing(can record the methods)
- Adjustable volume
- Rechargeable
- Can use for any age range
- Current price is \$20.99

- **Woowee – Mip the toy robot-black**



This robot,

- Has gesture sensors which allow to response gesture-based Interactions such as swipes, claps, touch and more
- BLE enables to interact with your smart devices
- Has a sound detection system that allows it to react to noises in its environment
- Free app control and enhanced gameplay in the smart device
- Current price is \$99.99

## Issues

From our observations, we got the idea that people have so many issues about the product that led the anki to behold vector

### Usability/Accessibility Issues

These are the usability issues that we have come across by observing the customer that has been using vector

- Hearing problems

It properly works on at least one meter, and do not function at all after two meters because their hearing sensors are not for high range

- Response time delays

While doing a task it cannot do another task, it at least has to wait three seconds(if you ask hey vector while it is walking it will delay for at least five to six seconds)

- Problems in face recognition

Cannot recognize a face if it surrounds so many spotlights (high brightness), because it does not contain an AI control system

- travel distances problems

the memory of the robot is around one meter, so it has to scan after every meter(ex: if the robot is away from its initial stop for the charger it has to scan again to memorize where the charger was earlier)

- Get stuck

When surfaces have fewer gaps between the floor and the surface due to sensor locations it gets stuck(corner spaces etc.)

- Repeated answers

Vector users “lack of cloud database” and the response time of the database is slower than the Alexa therefore whenever two questions are asked at the same time it gives the same answer for both

## Technological Issues

- Cannot identify where the changer is if the vector is far away
- Sensor issues,
  - Disability of identifying the gestures
  - Vector cube games frost sometimes when playing
  - Poor WIFI connectivity
- Overheating
- Mobile application crashes
- Disability in recognizing the voices
- Failures in Regulating of volume with surroundings
- Low-quality picture from the camera
- Lack of frame ware updates

## Analysis

After considering all observed details we came up with the main key analysis in vector and they are as follows,

- Many people like to use the robot as a personal assistant or companion
- Young generation uses this as a pet/toy, gaming buddy also for showing off and as an entrainment device
- This is a palm-size device, therefore, the tasks that the robot can do is very limited such as asking QAS, taking a photo, greetings, vector cube tricks
- According to the online reviews, the battery capacity is considerably low
- Since it's has a low processing power AI limitations are very high
- Even though people use this as a personal assistant when considering the competitors of this robot the performance rate is low(cost/performance ratio)
- Vector robot have typical camera features such as facial recognition, taking a photo and 720p video recording and cannot do any further
- People get bored with it quickly
- Exceptional from some emotions, time, weather and animations the display cannot give further rich information
- People love their personality and childlike curiosity
- No customization for the personal usage of their lifestyle
- Price is considerably high according to the technological and usability benefits
- Since vector has an alpha release of SDK which is unstable, there are no third-party applications
- Since it has 2.4 GHz WIFI bandwidth the data transmission between new smart devices(supports 5 G) are slow
- Cannot customize the voice commands of the vector when communicating
- Cannot adjust their volume according to the current surrounding
- Mobile app confuses the user and its crashes
- Cannot recognize the voice
- Distracts so easily

## Proposed Solution

### Improvements

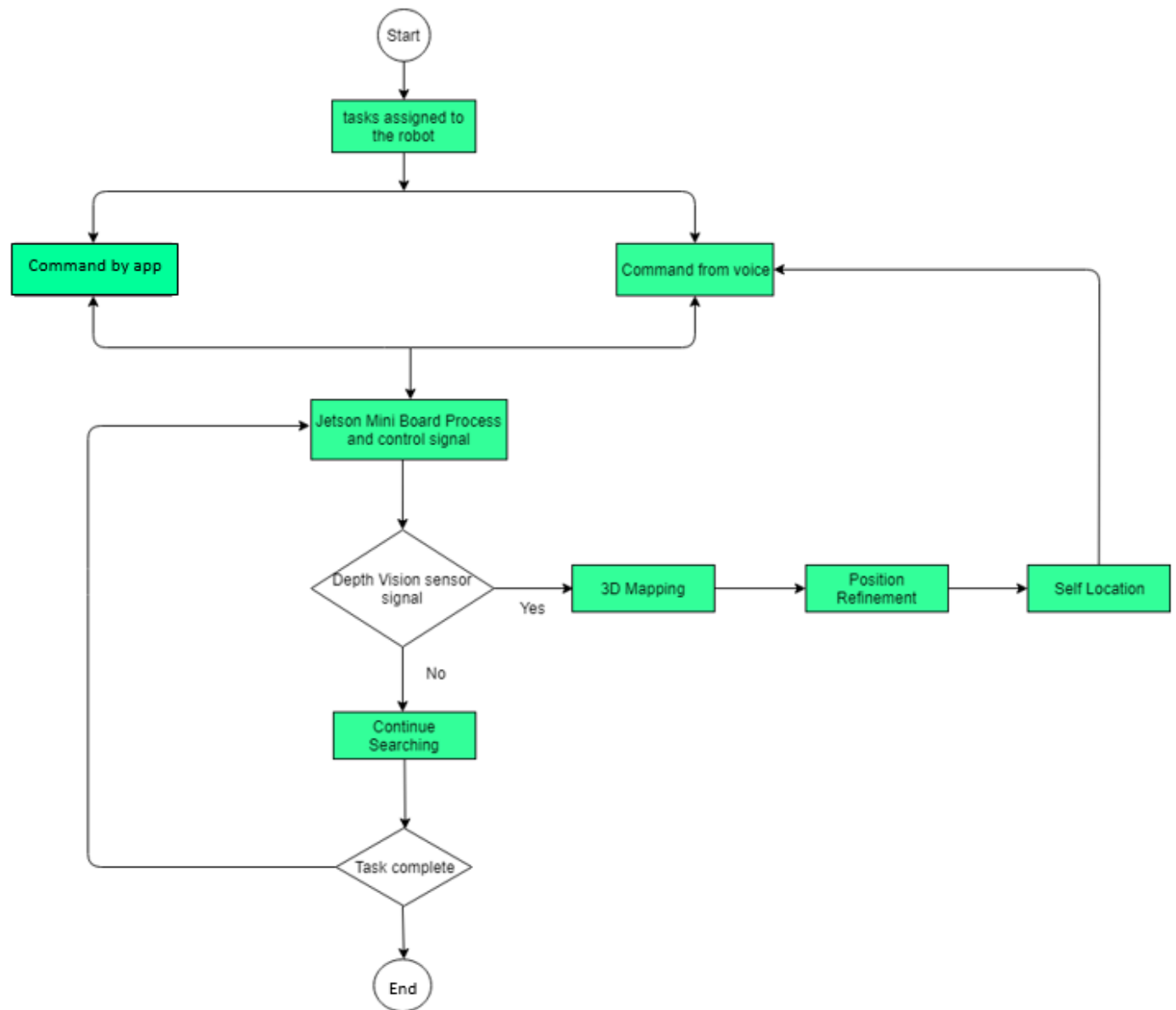
As we go through all these above phases, we came up with these improvements that we thought are important. They are as follows,

- The robot had only one camera that is Time of Flight(ToF) but it is not enough for taking high-quality pictures, accurate face recognition and distance identification, therefore we have added an extra ultra-wide sixteen megapixel(16MP) with F2.2 aperture to capture better photos and videos
- Even though this is a toy robot considering the price we added a new depth-sensing pop-up camera to its head with 0.1 to 12 meters(0.5 to 40ft)which has four megapixels (4MP) depth resolution. because of that there are so many more additional functions can be used, so from them we have added augmented reality apps, therefore, the vectors can do realistic interacts with users
- So, add for Amin AR applications to the vector,
  - 3D scanner – it will help user to turn any physical object into a 3D rendering in real time
  - Play AR chess – with the support of our new vector VR Oculus the user can play augmented reality chess with vector in real time
  - AR calculate – with the use of depth sensing camera in vector users can easily get the three-dimensional measurement of any kind of objects in real time
  - AR filter - the vector has ability to add AR filters to the user's photos and videos in real time
- Users can download many other third-party AR applications from Anki store
- To do all these AR based computing, vector should need better processing power therefore in our conceptual visual design we used Nvidia Jetson nano board with Quad core 1.43GHz processor and 128-core Maxwell and 4GB 64 bit LPDDR4 RAM to do all the tasks

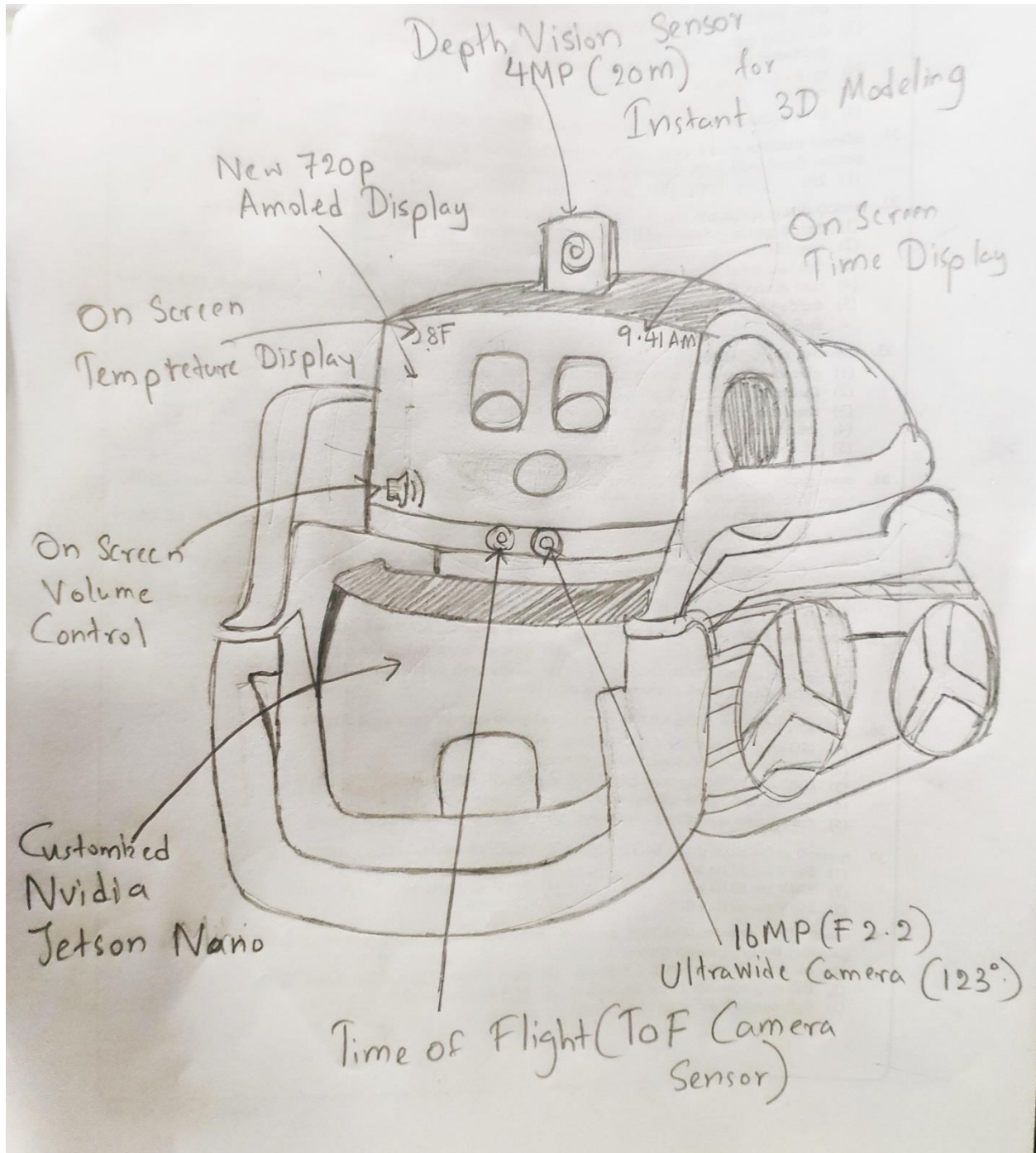
So according to these physical redesign to the vector we have updated our vector mobile companion app with new functionalities and those will be explained in our visual design



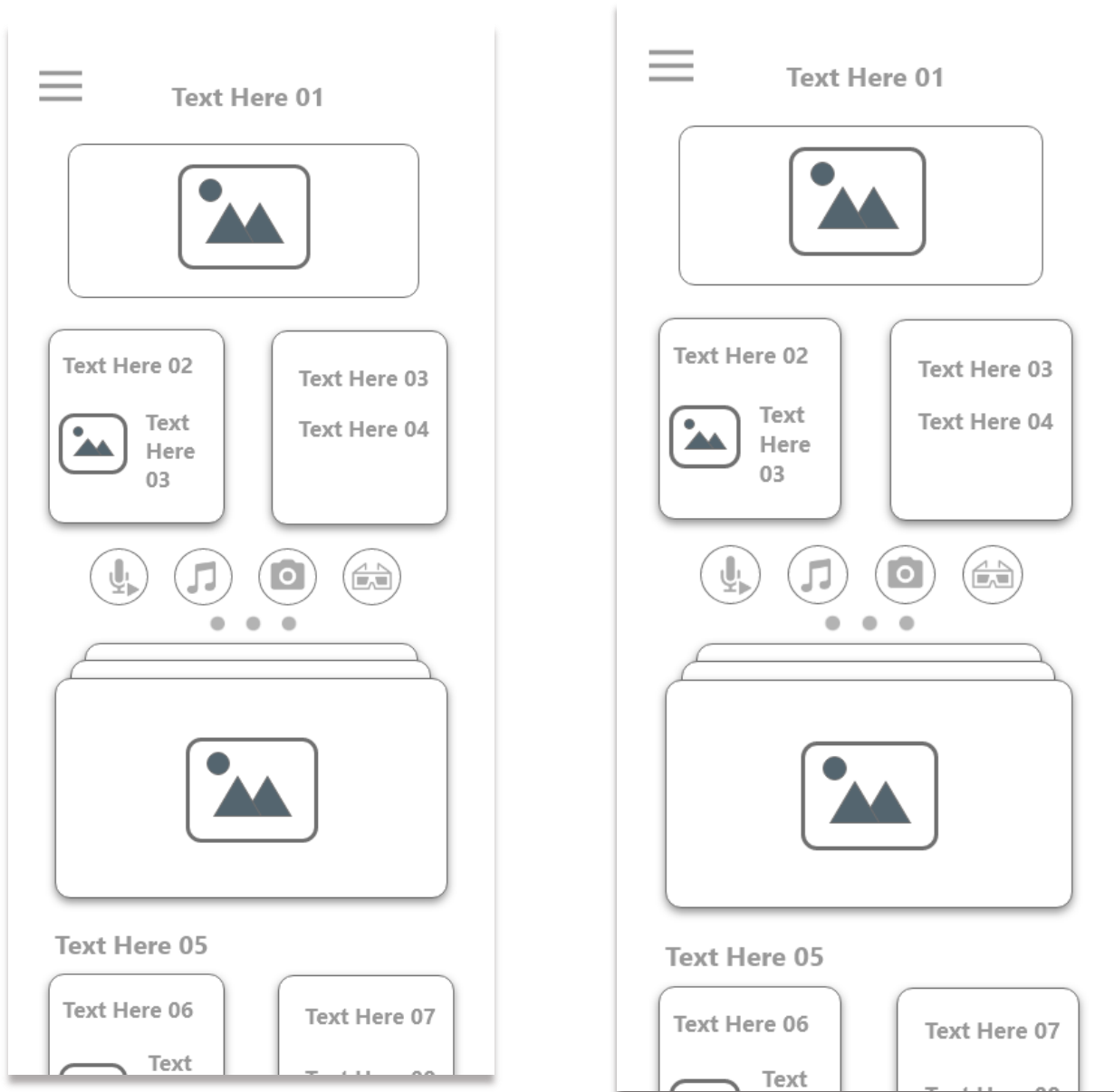
## Process Flow Diagram

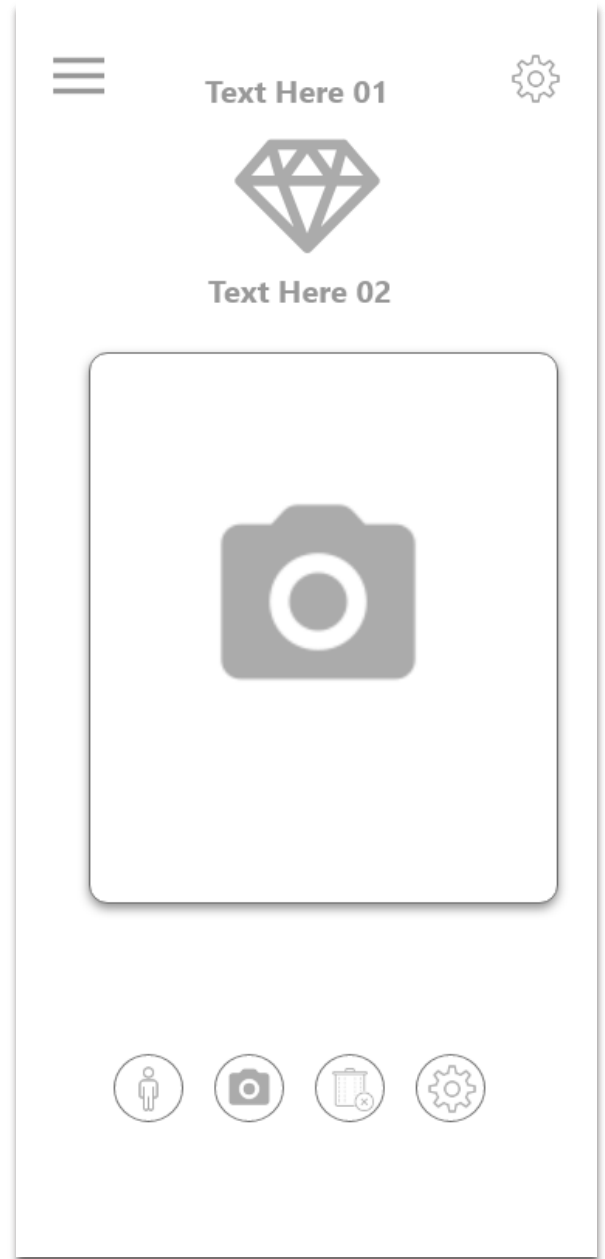
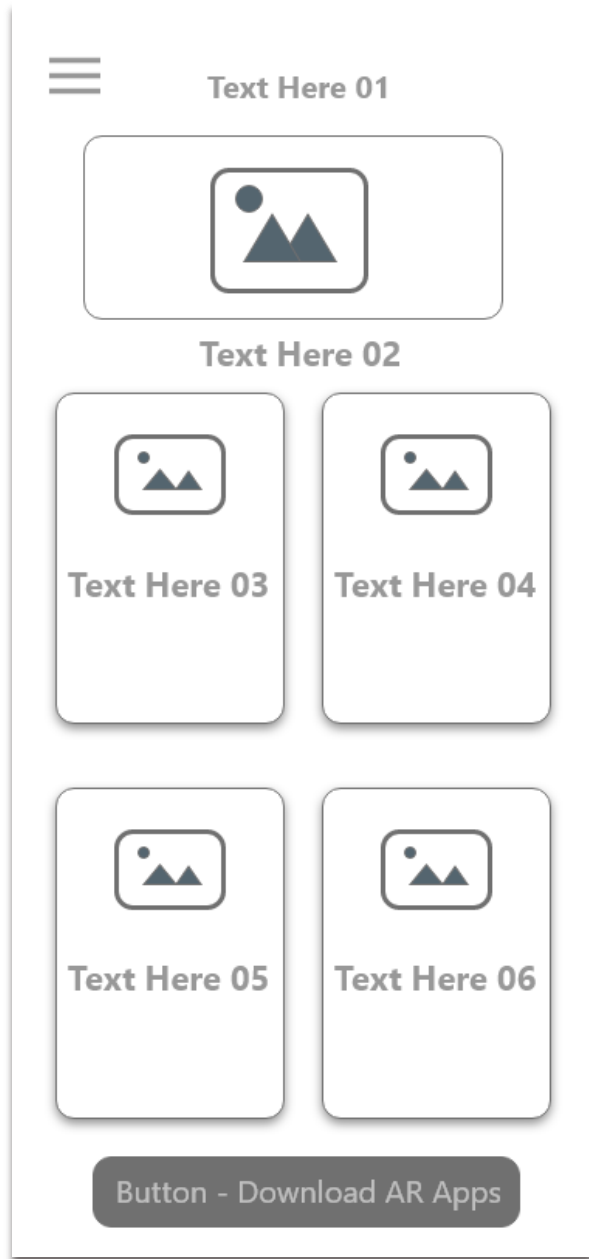


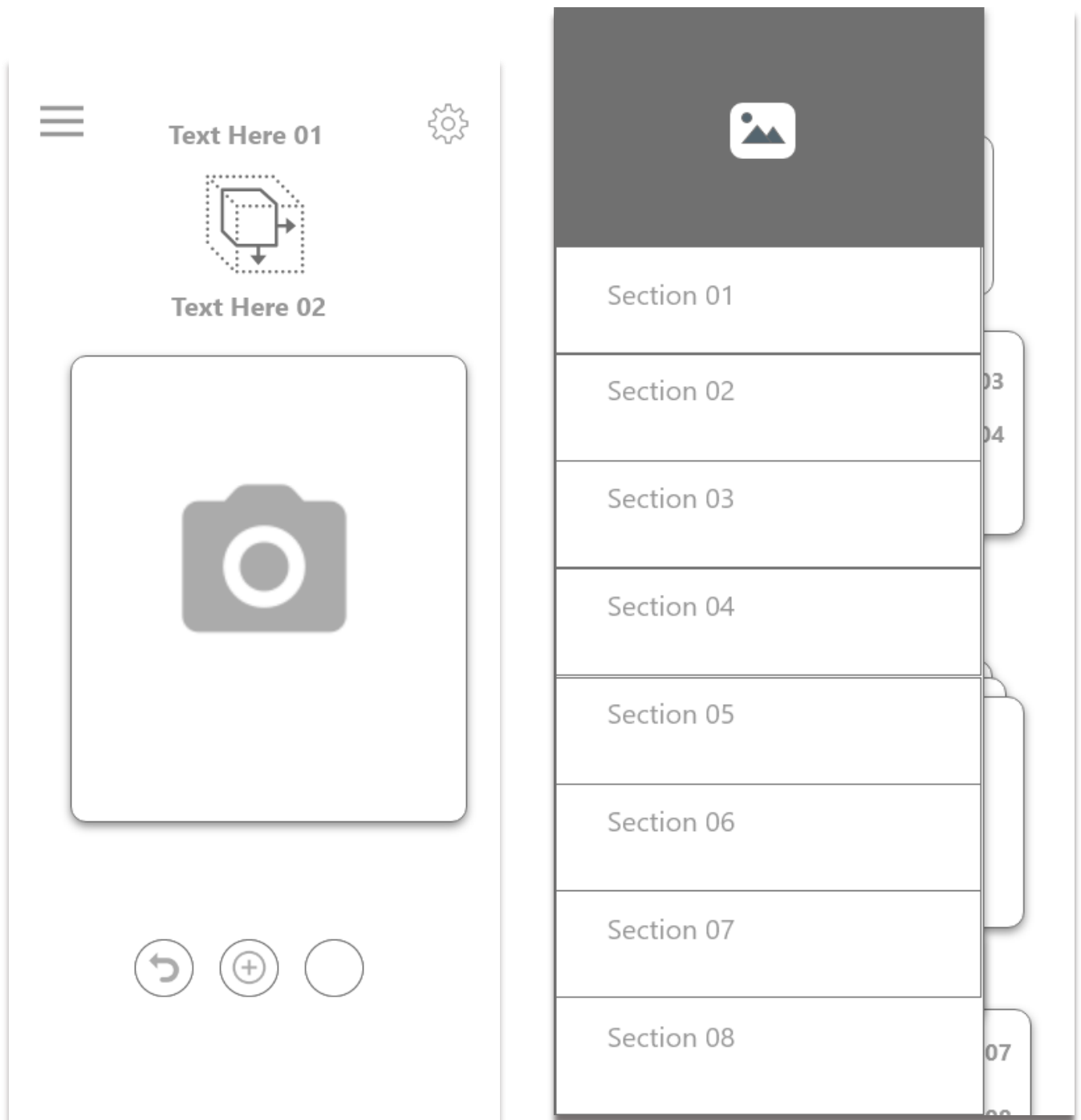
**Visual Design**  
**For Vector**

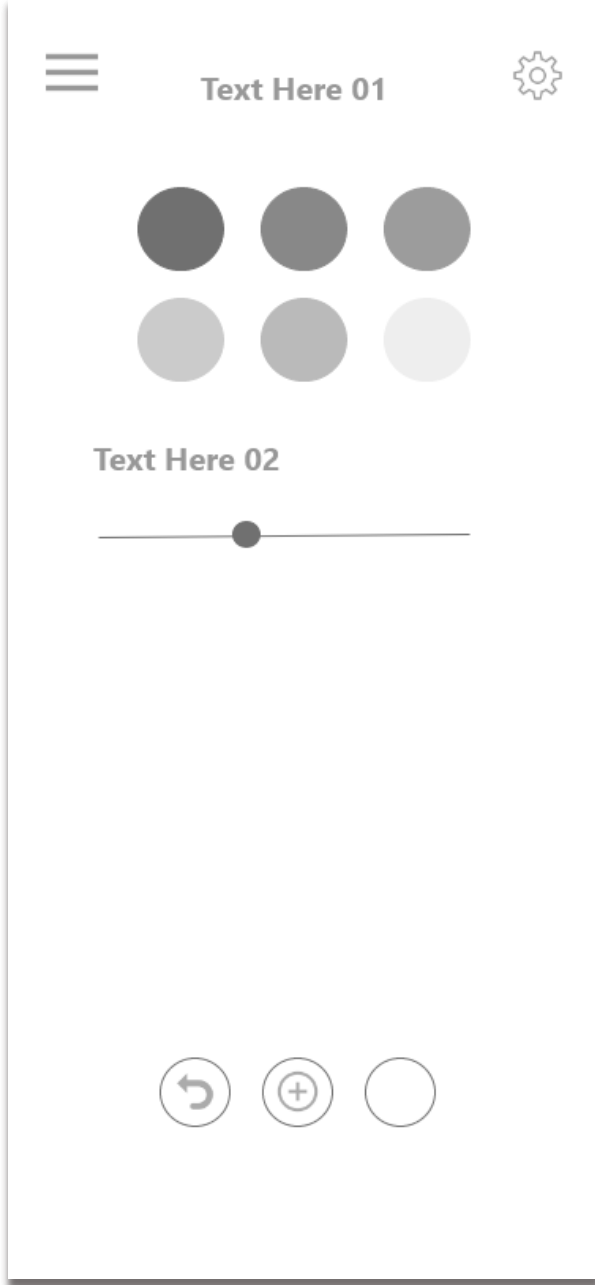


**For Vector App**  
**Low Fidelity Prototyping**

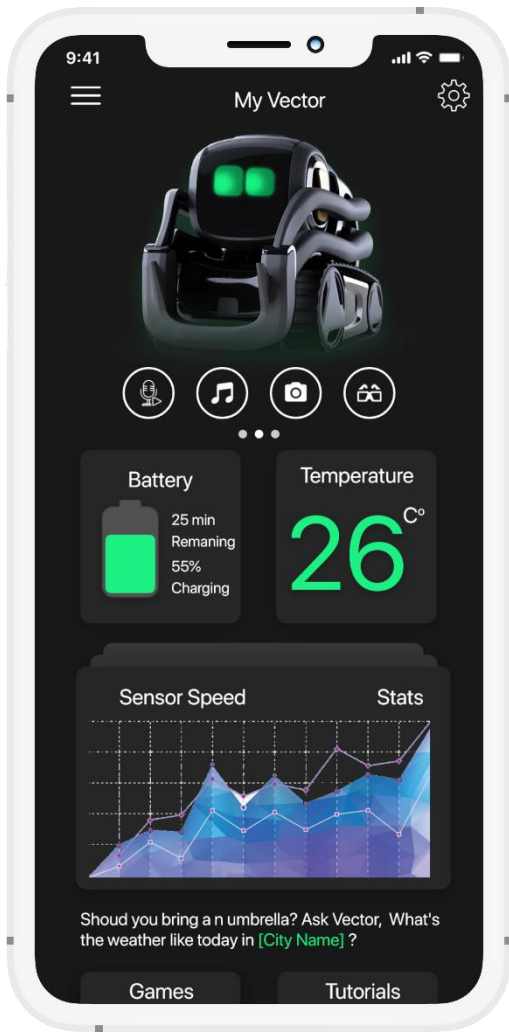




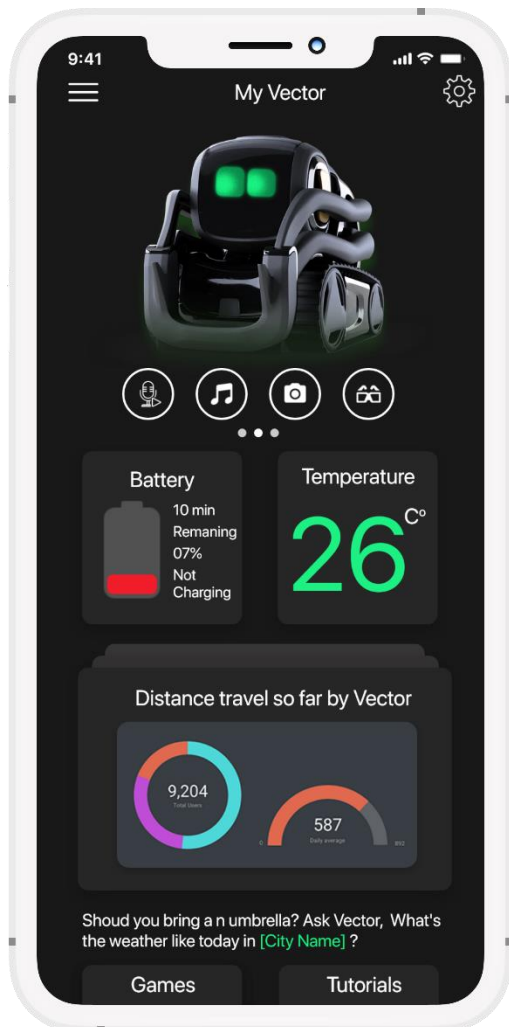




## High Fidelity Prototyping

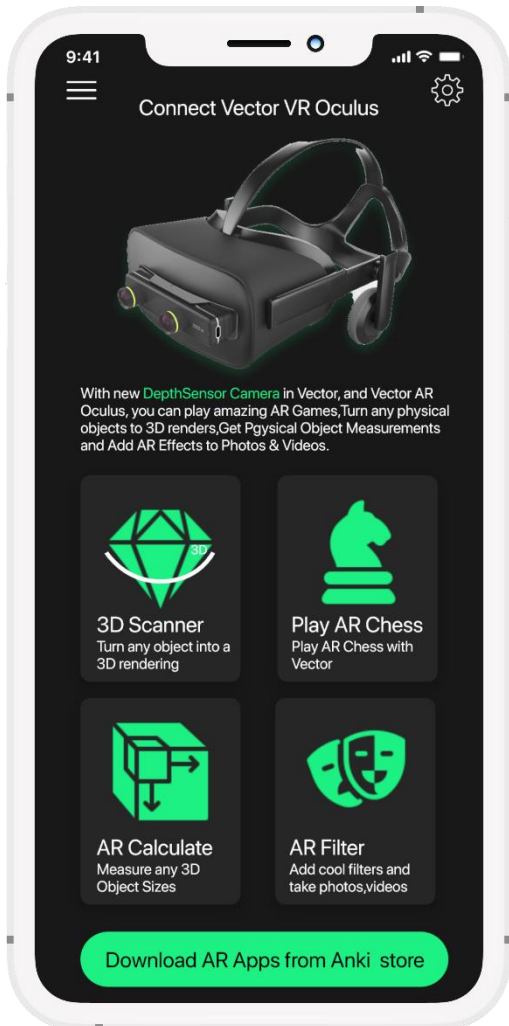


- Anki Vector mobile app main dashboard with modern UI functionalities where user can see robot battery and temperature as tiles.

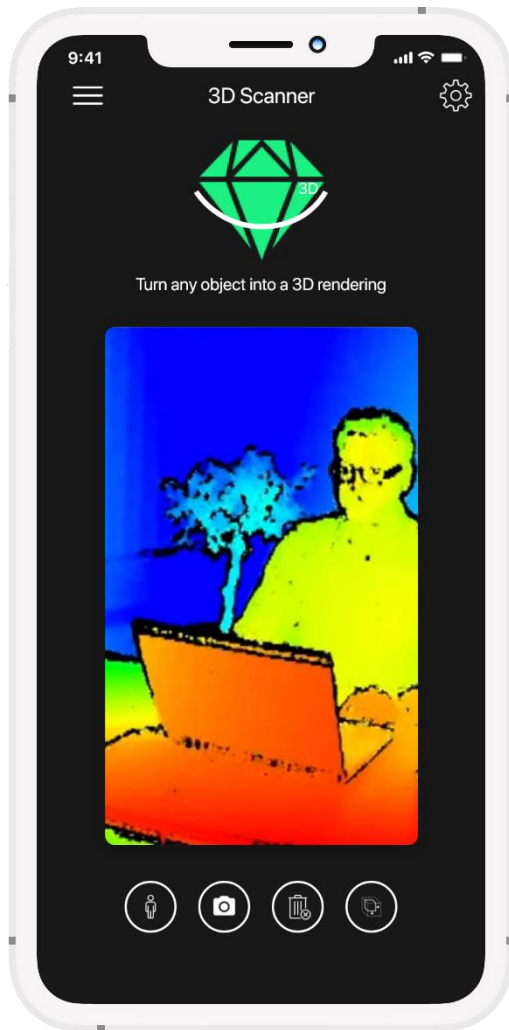


- Through modern UI functionalities this dashboard will show the battery percentage and the temperature of the environment to the user, and the distances that the vector robot has traveled so far.

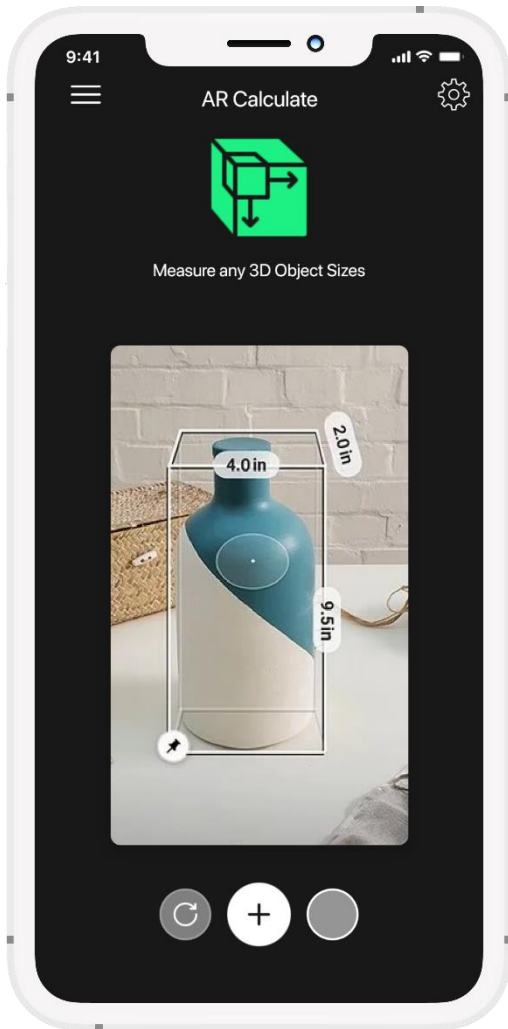




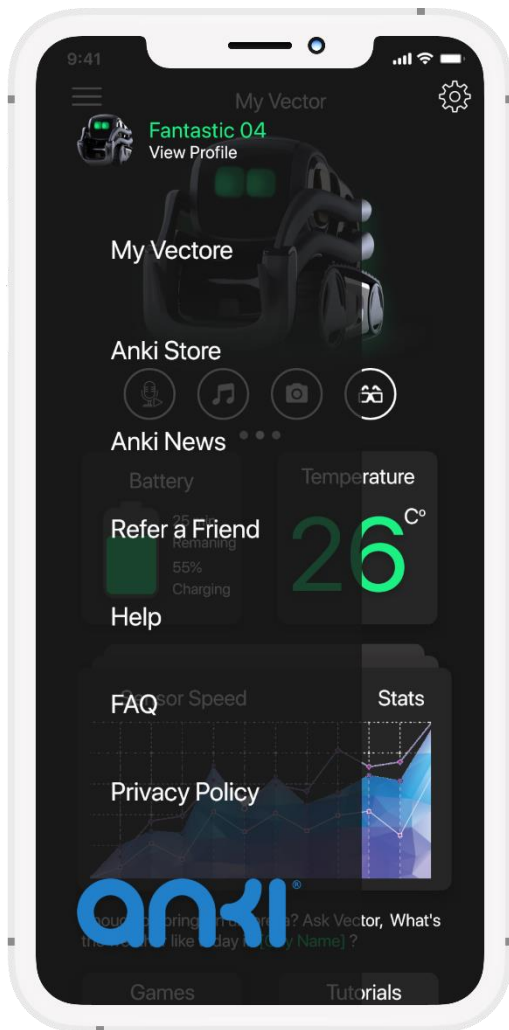
- Given dashboard will show the details of how to connect to the vector AR Oculus to do all the AR capability activities with vector.



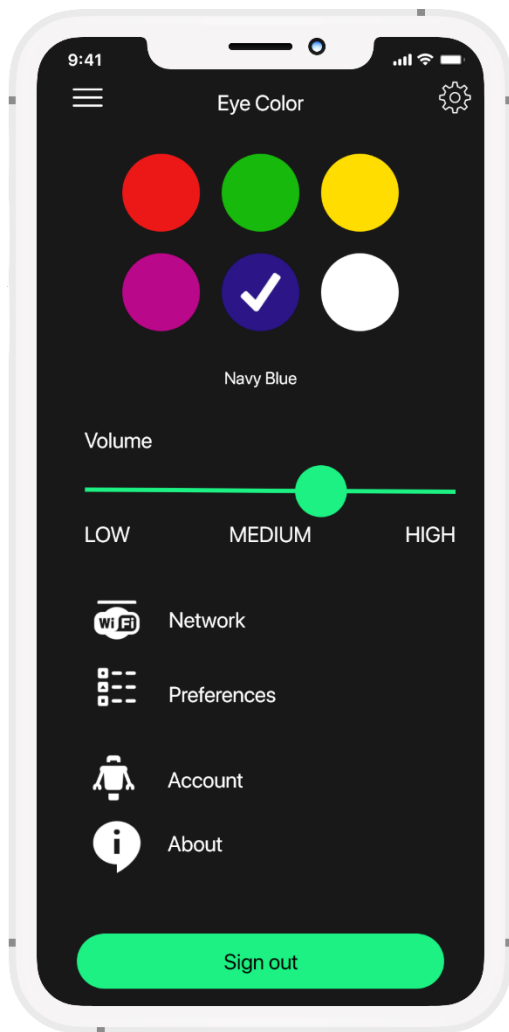
- User can convert any physical object into a 3D rendering using the depth vision camera on vector



- User can get any measurement of objects using Augmented Reality.



- User app navigation drawer



- User can change the eye color of the vector and do the basic changes to the vector app using this interface.

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