

Mobile and Ubiquitous Computing – Midterm Presentation

# NutriSeeON

## virtual eyes to consume healthy groceries

### Team 3

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# **Project Idea & Scope**

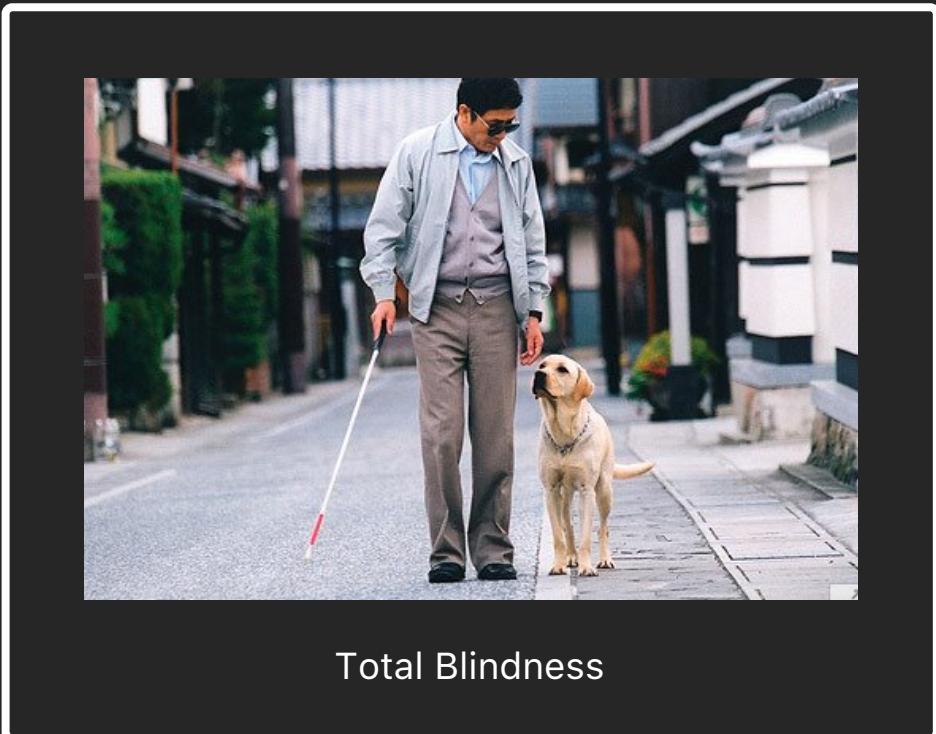
# Project Idea

- Many consumers check and choose the food considering their health.
  - such as weight control, disease(diabetes, high blood pressure), allergies.
- Checking “**nutrition facts**” is one of the easiest ways to choose appropriate food.

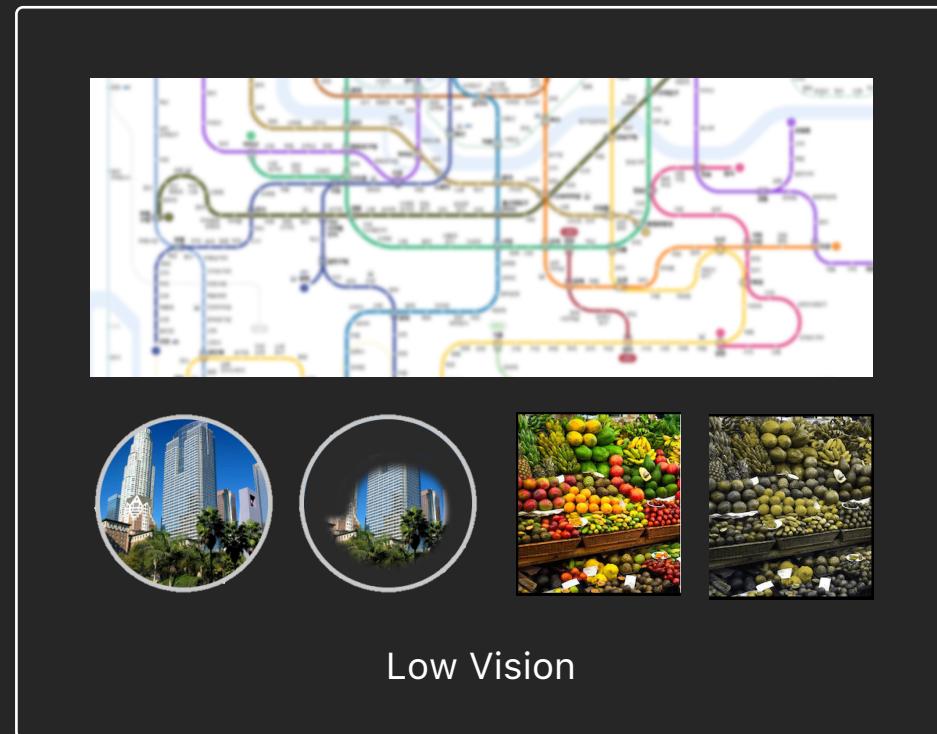


# Target User

- Is it possible for people with impaired vision(particularly, total blindness) to purchase products by checking nutrition facts?



Total Blindness



Low Vision

Type of visually impaired

# Solution Summary

- NutriSeeON will act as the eye of total blindness users, helping them to consume healthy groceries.

We will implement the system by leveraging

Image sensing by mobile camera , tactile/auditory feedback, and deep learning based data processing



Find out nutritional facts label  
as if they had a full vison

Consider their health concern

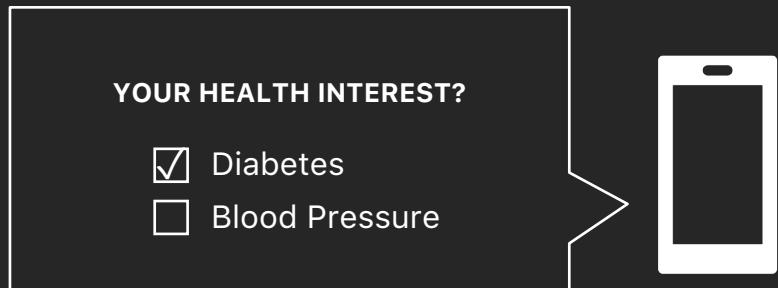
Access to interesting information

# Usage Scenario

# Usage Scenario

## Step 1

Set user health concerns.  
(e.g., Diabetes, high blood pressure, weight loss, ...)



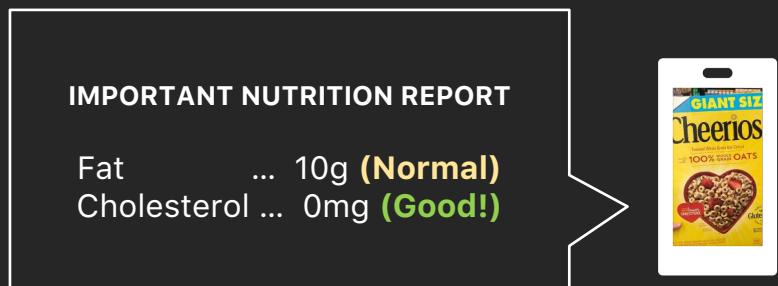
## Step 2

Pick up food and take a picture of it.  
It helps user to take photos of the food.



## Step 3

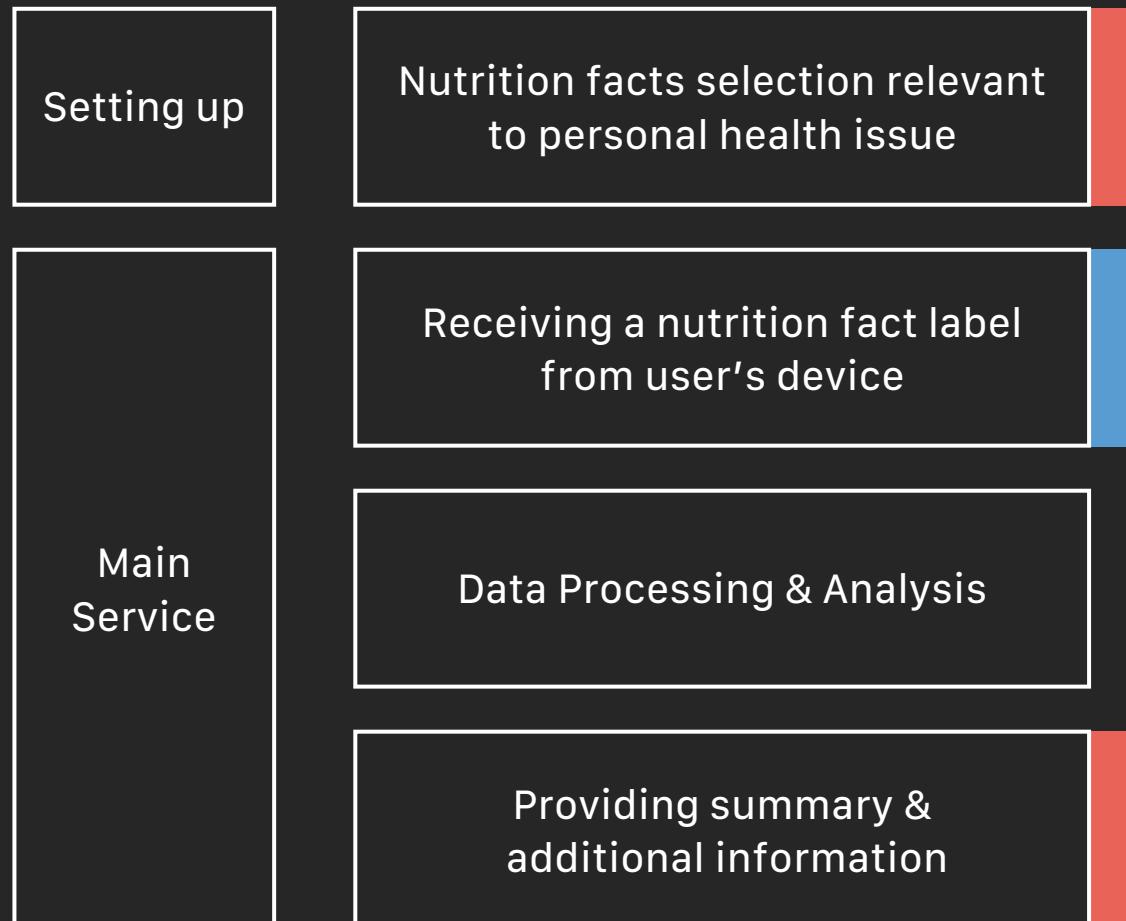
It collects nutritional information from photos and  
informs the information that suits the user's interest.



# System Overview

# System Overview & Main Functions

## System Overview



## Main Functions



Tactile/Auditory based  
Nutrition Facts  
Recognition Guide Module

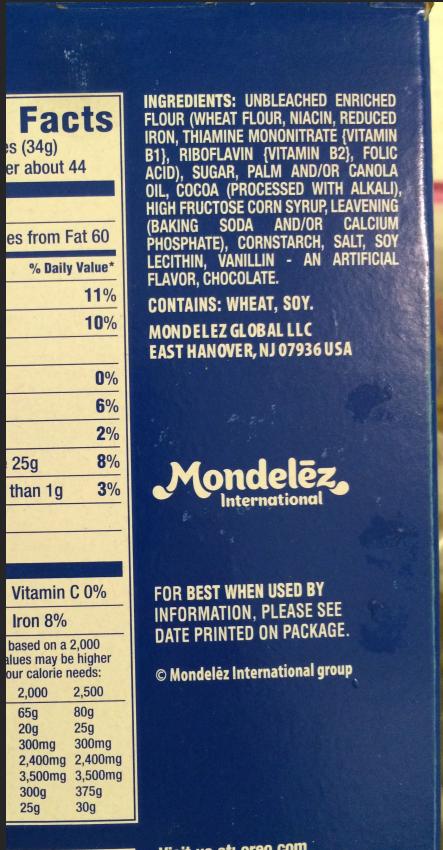


Auditory support  
for interaction



Vibration board with  
directional expression

# Main Service



Nutrition Facts  
Recognition



Tactile feedback  
to adjust camera



To locate phone



To locate object



Crop



# Main Service



OCR request

Nutrition Facts Serving Size  
3 cookies (34g) Servings Per  
Container about 44 Amount  
Per Serving Calories 160  
Calories from Fat 60 % Daily  
Value \* Total Fat 7g 11%  
Saturated Fat 2g 10% Trans  
Fat 0g Cholesterol 0mg 0%  
Sodium 135mg 6% Potassium  
55mg 2% Total Carbohydrate  
25g 8% Dietary Fiber Less  
than 1g 3% Sugars 14g  
Protein 1g

RAW OCR Text



Postprocessing

**IMPORTANT NUTRITION REPORT**  
Sugar 14g (**Caution**)  
Cholesterol 0mg (**Good!**)

Extract personalized  
nutrition information

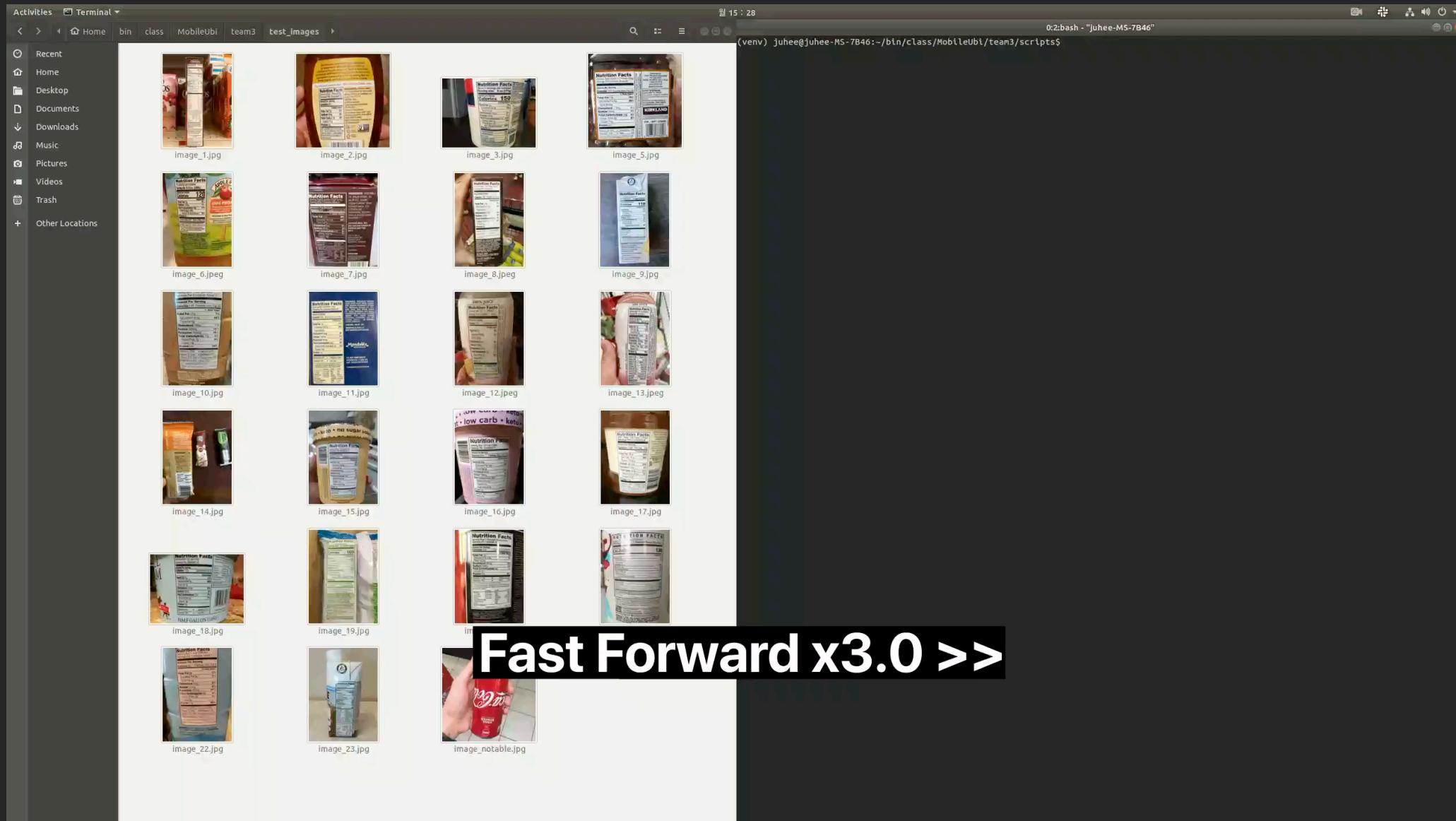
🔊 With auditory feedback

Cropped Image

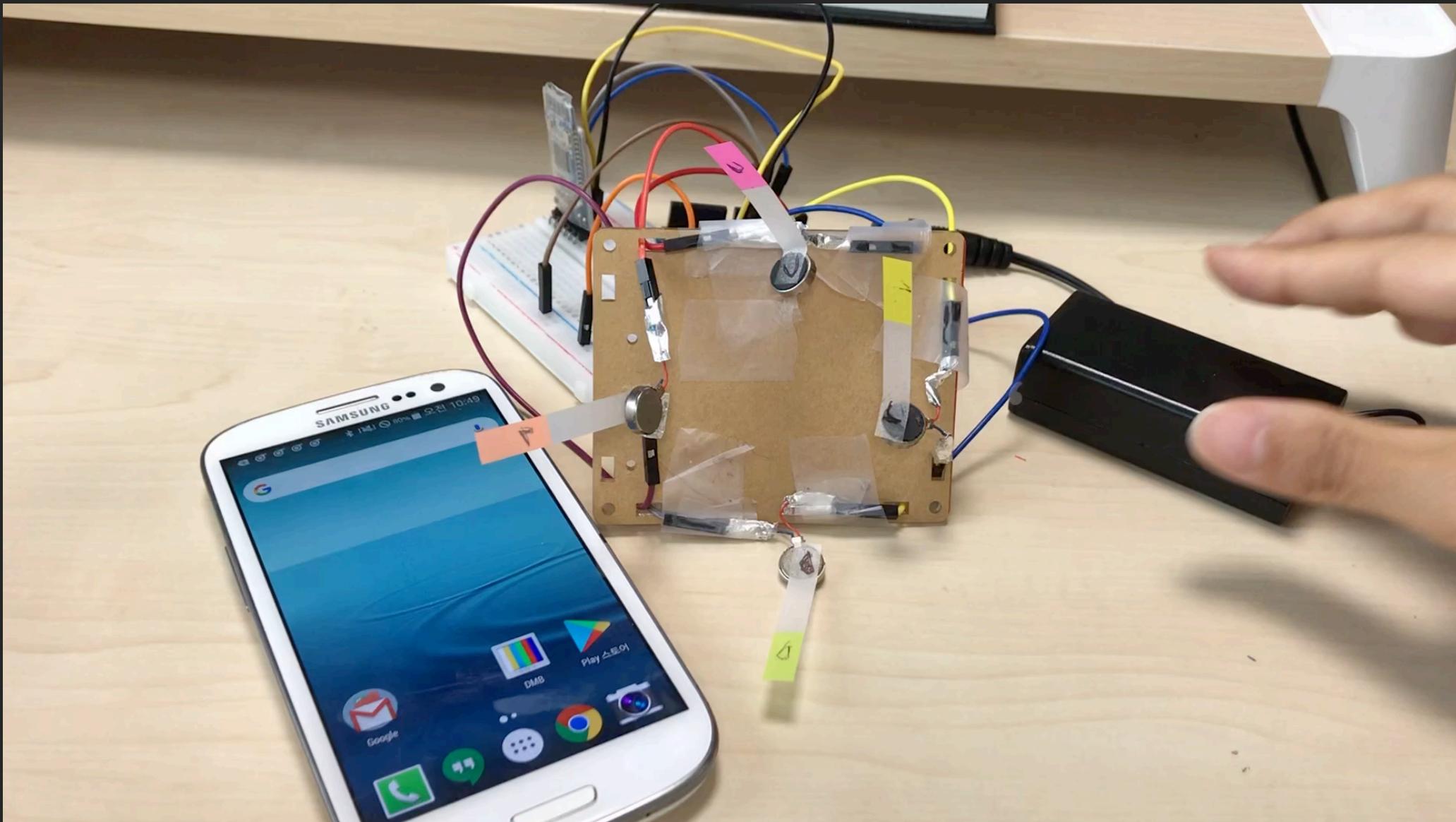
# Demo

# Demo – Nutrition Facts Recognition

Including Nutrition Facts Detection and OCR



# Demo – Tactile Feedback Module



# Technical Challenges & Solutions

# Expected Challenges

Done

In Progress

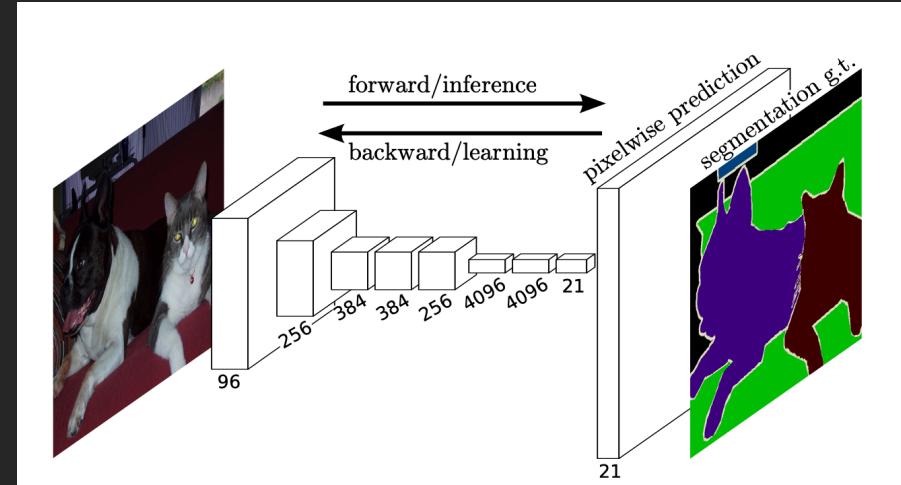
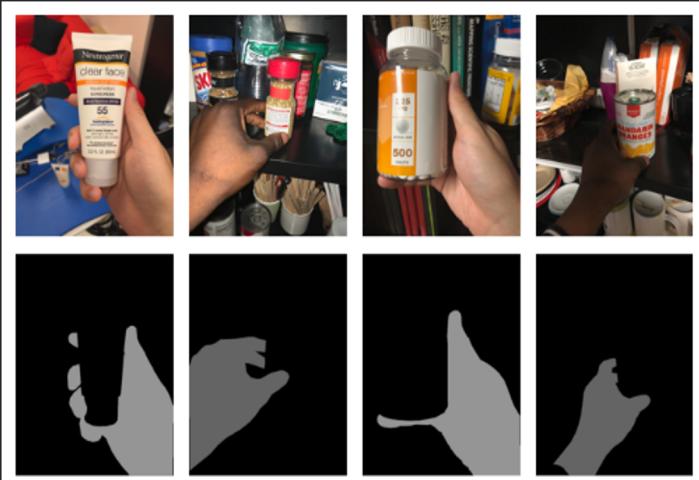
1. Recognizing target object in wild environment
2. Providing intuitive feedback for target users to find nutrition facts label
3. Gathering nutritional information from photos taken in real-world
4. Effectively delivering nutritional information to visually impaired user



# Solution ideas for challenges

1. Recognizing target object in wild environment (e.g., grocery shop)

- Hand-holding object detection [1]  
: Public hand-annotated dataset and hand-held object recognition model
- We will use semantic segmentation to get hand-object position

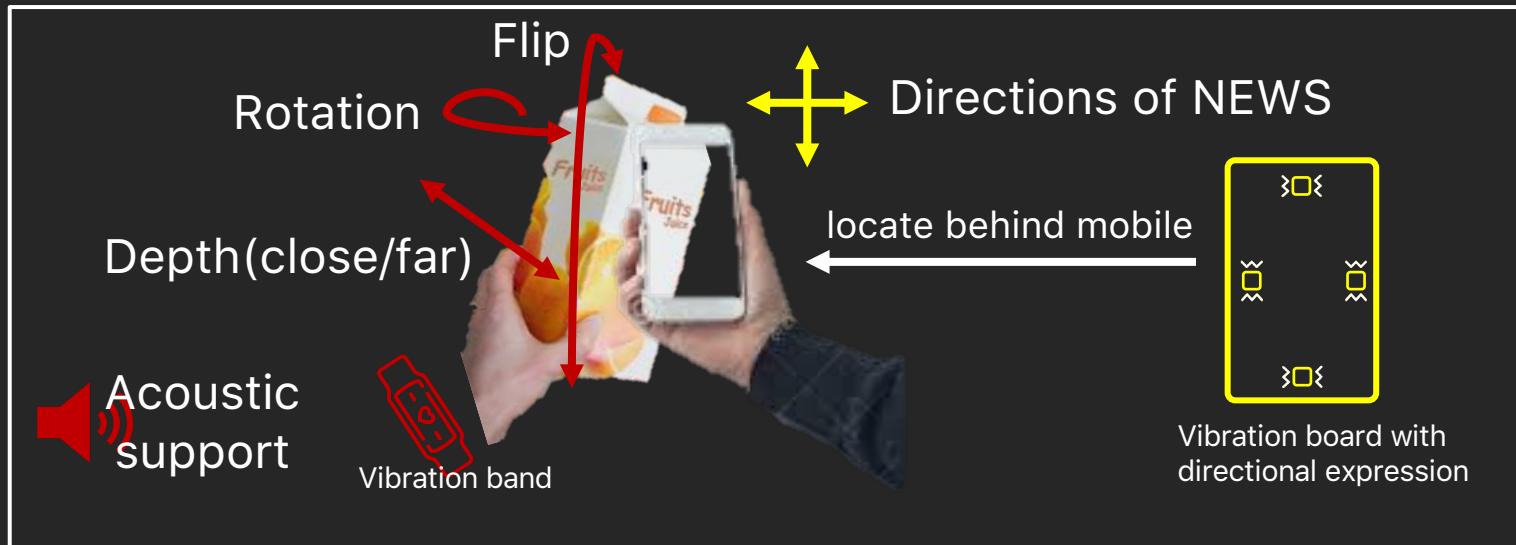


[1] Lee, Kyungjun, and Hernisa Kacorri. "Hands Holding Clues for Object Recognition in Teachable Machines." *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*. 2019.

[2] Long, Jonathan, Evan Shelhamer, and Trevor Darrell. "Fully convolutional networks for semantic segmentation." *Proceedings of the IEEE conference on computer vision and pattern recognition*. 2015.

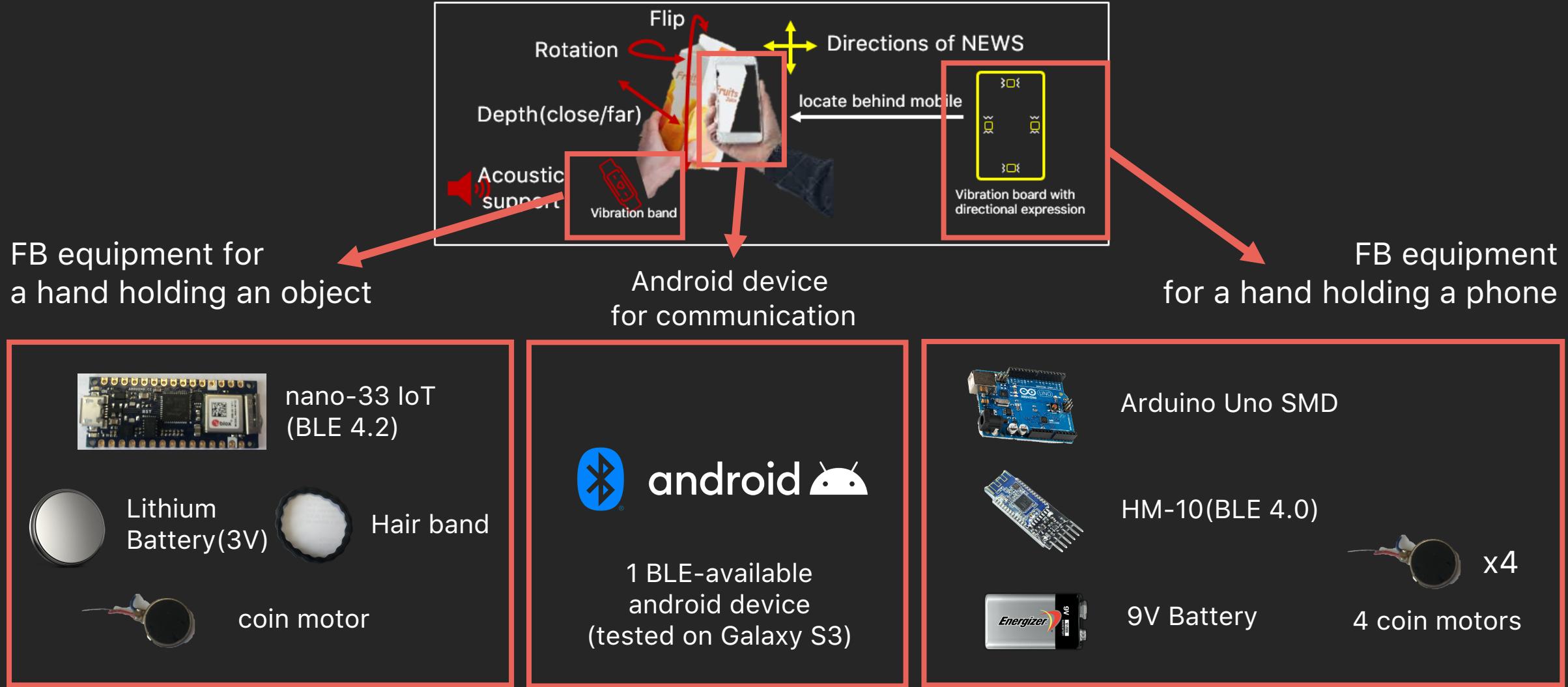
# Solution ideas for challenges

2. Providing intuitive feedback for target users to find nutrition facts label
  - We devised a new design for the intuitive feedback module.
    - [ Idea 1 ] Divide into 2 types feedback : moving objects & mobile
    - [ Idea 2 ] Deliver proper tactile & auditory feedback directly for each hand

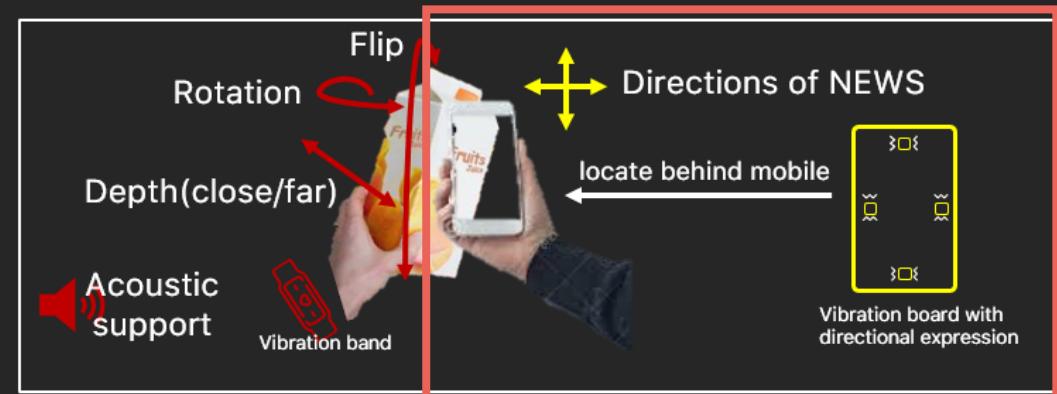
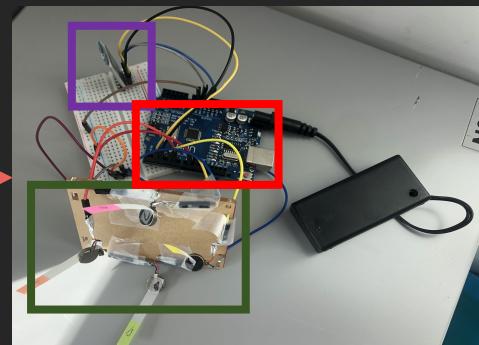
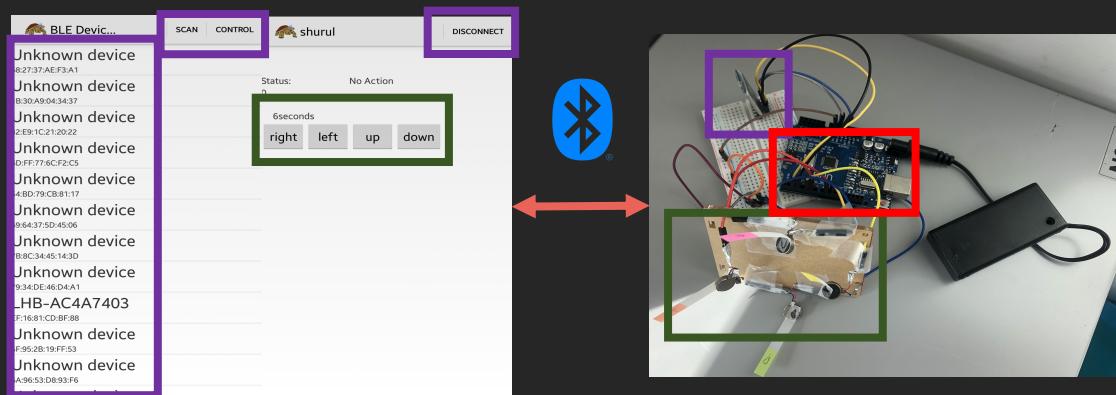


Tactile Flow [1]

# Feedback Module : Main HW Components



# Feedback Module : Present Prototype



## Android Application

1. BLE communication  
(scan device connection, data transmission)
2. FB module remote control

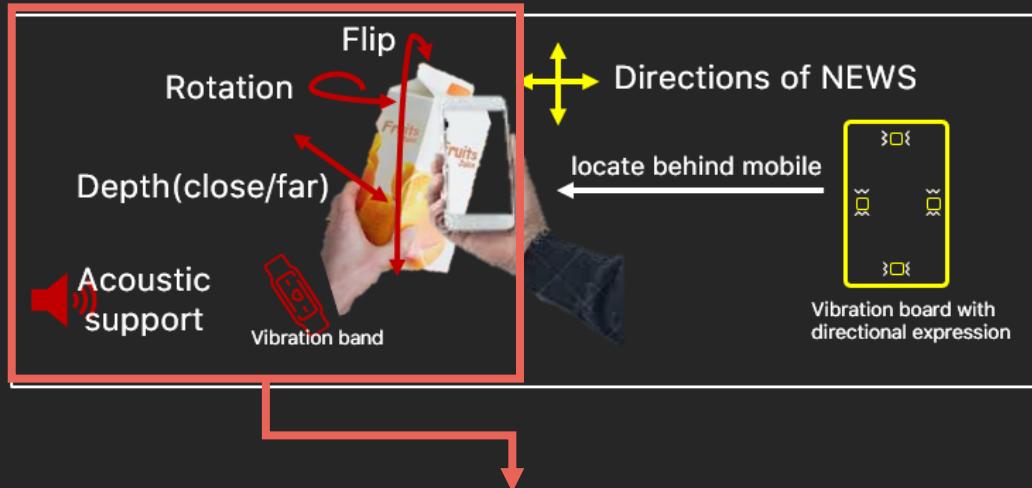
## 4 directional feedback module

: Prototype (HW components & SW)

1. BLE communication  
(scan connection, data reception)
2. Tactile feedback by received data

Complete

# Feedback Module : TODO



FB module for a hand holding an object

- One more remote-control prototype of a coin motor (similar with previous prototype)
- Auditory feedback support (flip, rotation, close/far ) in android

Additional Features

- Control 2 connection (connection switching or advertising mode)
- Usability improvement (make wearable!)

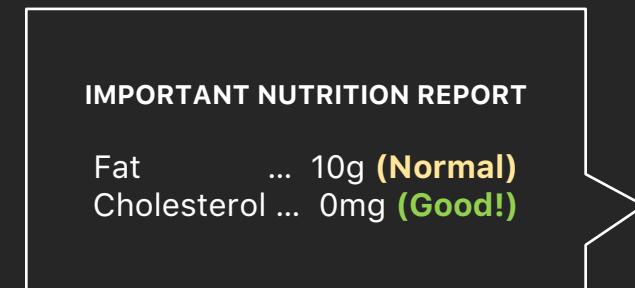
# Solution ideas for challenges

## 3. Gathering nutritional information from photos taken in real-world

- Optical Character Recognition (OCR)
- Additional optimizations to effectively extract nutritional information
- Heuristics to get nutritional facts label from curved or crumpled surface

## 4. Effectively delivering nutritional information to visually impaired users

- [ Idea 3 ] Provide personalized nutritional information based on user's health concern  
:Prioritize information that user will consider important



# **Project Schedule**

# Overall Plan

Done     In Progress



## Project Set-up

- Development environment setting (Client)
- Development environment setting (Server)
- Specifying Application design

## Core Function Implementation

- Tactile feedback
- Nutrition Facts Recognition
- OCR Postprocessing
- Hand-holding Object Detection
- Client Implementation (Mobile + Wearable)
- Server Implementation (Network, Data Processing)

## Application Development

Field Test  
Evaluation

## Test and Evaluation

# TODO

<b>Week 9</b>	 Multi Bluetooth Connection	 OCR Postprocessing	 Server Environment Setting
			 Eunsu
			 Juhee
			 Seokhyeon
<b>Week 10</b>	 Hand-hold Object Detection Model Development	 Preset UI & Personalized Data Processing	
			 Server-Client Connection
<b>Week 11</b>	 Overall Application Integration	 Wearable Haptic feedback with images	
			 Server-Client Connection
			 Auditory Feedback
<b>Week 12</b>	Evaluation		
	Field Test		
	Wrap-up		

# **Final Deliverable & Success Criteria**

# Final Deliverable & Success Criteria

## Final Deliverable



Mobile Application



Intuitive Feedback Module



Server

Application  
that effectively helps blind people to discover nutritional facts  
and easily get customized information.

## Success Criteria

- Based on Evaluation, Task Completion Time and Accuracy of Each Task
- 
- Does this app help user to find the nutrition facts label and recognize them correctly?
- 
- Does this app provide the proper nutrition information for customized user preference?
- 
- Can the tactile/auditory module provide accurate feedback to the user?

# Potential Threats

# Potential Threats

## Heat

Bluetooth tactile feedback modules can be overheated.

## Battery

Continuous camera use and power supply to the feedback module may drain the battery quickly.

## Privacy

There may be a privacy concerns with the camera image being sent to the server.

# Thank you

