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Sweet heart

The ultimate coffee machine you've dreamed of

1001. Define Draft Plan

- Motivation
  - According to the statistics from the Seoul Economy, a person in South Korea consumes 312 cups of coffee in a year
  - Nowadays, more and more people consume coffee and they need smarter and more comfortable way of coffee break
  - But, there is no smart coffee machine which can serve personalized coffee in a comfortable way people would like to have

- Objectives
  - To develop a smart and comfortable coffee machine which provides below features
    - Suggest coffee and music based on the user's feeling
    - Personalization features by adapting users' experiences
    - Drive to the user by remote controller for user's convenience
  - The new product should be accessible and efficient

1001. Define Draft Plan

- Functional Requirement
    - Register product identification information
    - Save and update user's preferences about coffee
    - Reset saved records to initialize machine
    - Select coffee among regular coffee and recommended coffee
    - Select amount of coffee
    - Select portion of water to adjust the strength of coffee
    - Confirm ordered coffee
    - Cancel ordered coffee
    - Select music (Browse through the music lists)
    - Play music
    - Stop music
    - Change volume

1001. Define Draft Plan

- Functional Requirement
  - Change mode to drive
  - Select a camera
  - Change the direction of the machine
  - Change velocity

- Non functional requirements
  - The average response time is a second except when the system is serving coffee
  - The system should serve a cup of coffee in 2 minutes
  - The system should be expandable and maintainable

1001. Define Draft Plan

- Resource Estimation
  - Human Effort (M/M) : 4-1.5 M/M
  - Human Resources : 4
  - Duration : 6 weeks
  - Budget : $100,000 USD

- Other Information
  - Future version
    - Add Bluetooth or AdHoc devices to communicate in small area
    - More features to be a comfortable machine will be added

1002. Create Preliminary Investigation Report

- Alternative Solutions
  - Outsourcing
    - Outsourcing the whole system is undesirable since it is hard to open the concept of this machine because it is a sort of a novel machine.
  - Purchasing a similar product
    - There is no similar product in the market

- Project Justification
  - Cost : $100,000 USD
  - Duration : 6 weeks
  - Risk
    - Lack of time for the project because of the time conflict
    - Lack of experience about developing whole system
    - Team communication
  - Effect
    - Not only serve high quality coffee, but also give an extraordinary experience!

1002. Create Preliminary Investigation Report

- Risk Management

Risk	Probability	Significance	Weight
First adoption of OSP	4	4	16
Team communication	4	4	16
Lack of time for the project because of the time conflict	4	5	20
Lack of experience about developing whole system	3	4	12
Lack of domain knowledge	4	3	12

1002. Create Preliminary Investigation Report

- Risk Reduction Plan
    - Lack of time for the project because of the time conflict
        - Distribute tasks wisely and give penalties to a person who does not complete his work
    - First Adoption of OSP
        - Ask questions to a professor to get the right way
    - Team Communication
        - Arrange a team meeting on every Wednesday

- Market Analysis
    - A coffee business is sharply increasing
    - More and more people need high quality coffee with reasonable price
    - A cup of coffee is not just a drink, it is a way of leisure

1002. Create Preliminary Investigation Report

- Other Managerial Issues
  - The project should be completed by April, 2011
  - Plan to participate in a competition among students

1003. Define Requirements

- Functional Requirement
  - Register product identification information
    - Register remote controller and coffee machine's identification information to match and authorize an user and a machine
  - Save and update user's preferences about coffee
    - Save and user's preference about coffee to recommend coffee based on personal preferences
  - Reset saved records to initialize machine
    - Reset saved records such as ordered coffee history to initialize machine
  - Select coffee among regular coffee and recommended coffee
    - Show regular coffee menu with recommended coffee to give an user variety options
  - Select amount of coffee
    - Allow an user to choose size of coffee
  - Select portion of water to adjust the strength of coffee
    - Allow an user to adjust strength of coffee by changing amount of water in the coffee

10

1003. Define Requirements

- Functional Requirement
  - Confirm ordered coffee
    - Show all options an user has selected and make sure those options just before start to make a cup of coffee
  - Cancel ordered coffee
    - Cancel ordered coffee which might be in progress of making. If a machine received a cancel command, it stops producing immediately and give it to the user even if it is not finished.
  - Select music (Browse through the music lists)
    - Allow to select a music based on a genre or a musician by navigating lists
  - Play music
    - Play music to have a great time with coffee. This feature is going to serve a comfortable and romantic atmosphere during your coffee break
  - Stop music
    - Stop music and move on to the another user interface such as music selection page
  - Change volume
    - Adjust volume to make a good coffee break

1003. Define Requirements

- Functional Requirement
  - Change mode to drive
    - Change operation mode to drive machine to the user
  - Select a camera
    - This machine has four cameras, each camera serve the view of north, south, east and west direction. This command make an user select a camera among those four
  - Change direction of the machine
    - Allow an user to change machine's direction to drive to the user properly
  - Change velocity
    - Allow an user to move machine. In this machine, velocity can be changed from minus to plus which means a reverse direction and a forward direction

1003. Define Requirements

- Functional Requirements (Categorized Table)

Ref. #	Function	Category
R1.1	Register product	Hidden
R1.2.1	Save personal preferences	Evident
R1.2.2	Update personal preferences	Evident
R1.2.2	Reset saved records	Evident
R1.3.1	Choose coffee to recommend	Hidden
R1.3.2	Show all menus with recommended coffee	Evident
R1.3.3	Select amount of coffee	Evident
R1.3.4	Select portion of water	Evident
R1.4.1	Confirm ordered coffee	Evident
R1.4.2	Cancel ordered coffee	Evident
R1.5	Show remained ingredients	Evident
R1.6.1	Show recommended music	Evident
R1.6.2	Select music	Evident

1003. Define Requirements

- Functional Requirements (Categorized Table)

Ref. #	Function	Category
R1.6.3	Play music	Evident
R1.6.4	Stop music	Evident
R1.6.5	Change volume	Evident
R1.7.1	Change mode to drive	Evident
R1.7.2	Select a camera	Evident
R1.7.3	Change direction of the machine	Evident
R1.7.4	Change velocity	Evident
R1.7.5	Detect obstacles	Evident
R1.8	Save user's decision	Hidden

1003. Define Requirements

- Performance Requirements
  - The average response time should be shorter than a second exc
    luding making coffee

- Operating Environments
  - Coffee machine
    - OS: Embedded Linux
    - CPU: ARM RISC CHOI
    - Memory: 128MB
    - HDD: 32GB
  - Remote controller
    - All kinds of cell phones which support web access
  - Web Server
    - OS: Debian Linux
    - CPU: Intel i7
    - Memory: 4GB
    - HDD: 500GB

1003. Define Requirements

- Development Environments
  - Hardware
    - Web server (Intel x86 PC)
    - Embedded Systems (ARM)
  - Software
    - Database: MySQL
    - Programming Language: C/C++, php, HTML
    - Programming Tools: KDevelop
    - UML Tools: StarUML

- Interface Requirements
  - All devices should support touch based input system
  - All features should be controlled by cell phones
  - Support direct input by buttons
  - Show progresses on the screen during working

1003. Define Requirements

- Other Requirements
  - The machine should maintain secure system during the operation

1004. Record terms in Glossary

Terms	Description	Remarks
Register product	Register information on product and remote controller to authorize those the machine	
Personal preferences	An user's preferences based on preferred coffee, age, sex of the person	
Records	Saved user's past decisions in the database in order to use it to the recommending process	
Amount of coffee	Amount of coffee which is expressed by cup size, Tall, Grande and Short.	
Portion of water	Amount of water to adjust strength of coffee	
Ingredients	Ingredients to make a cup of coffee such as sugar	
Mode to drive	Mode for driving in order to move machine to the user. If an user change the mode to drive, the screen show a scene from the camera to drive the machine properly	
Camera	Cameras attached the machine. The machine has four cameras to cover all directions by switching cameras	
Obstacles	Things that prevent going through the way such as books, chairs and desks	

1005. Implement Prototype

Basically, the system is implemented on a cell phone

Show amount of remained ingredients

Menu screens to show available coffee menus to the user

Touch here to change the mode to drive

Indicate what menu is selected now
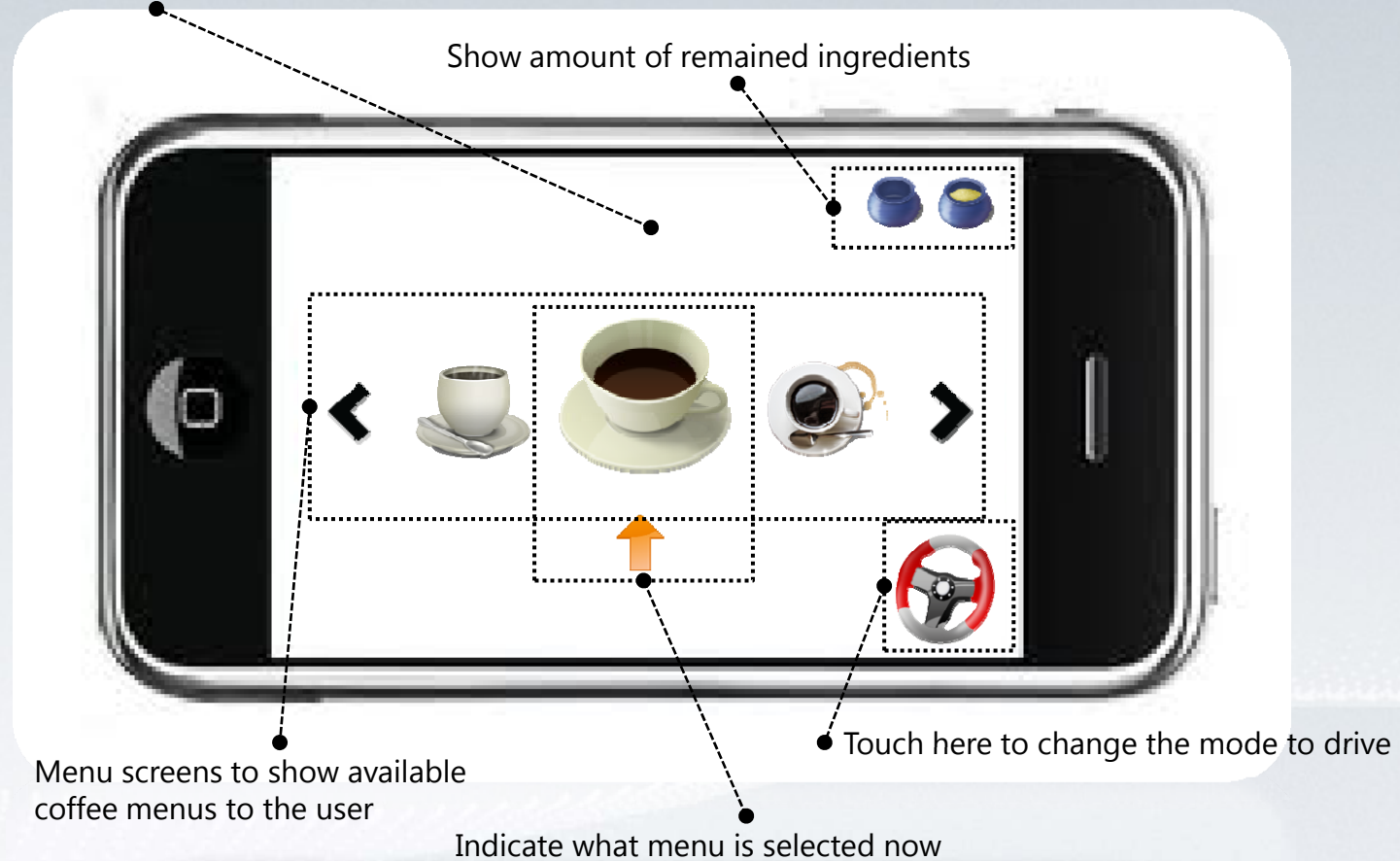
1006. Define Business Use-cases

- Define System boundary

Owner

Sweet heart
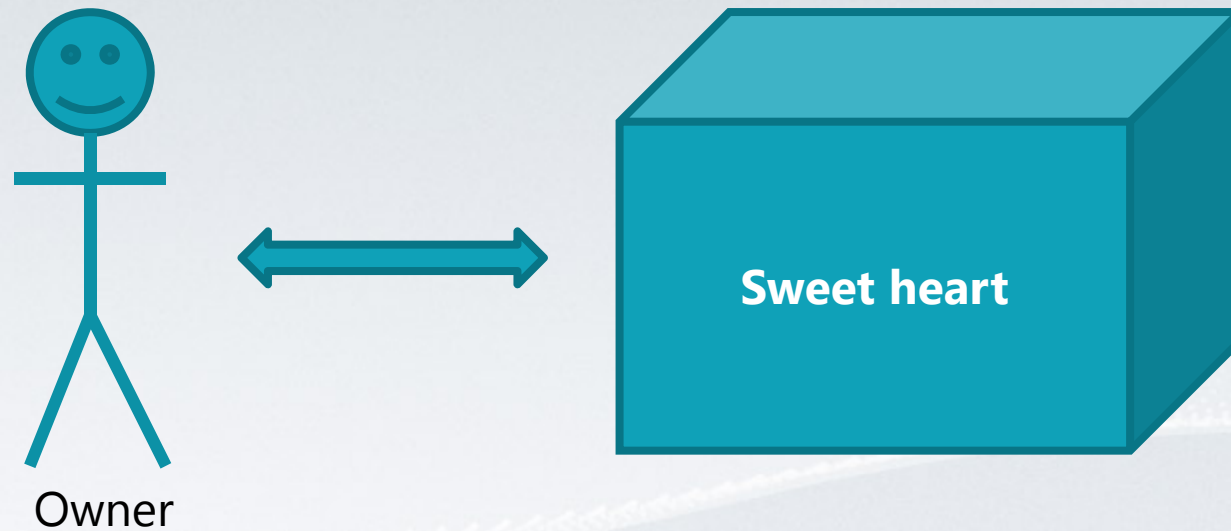
1006. Define Business Use-cases

- Identify and Describe Actors
  - Owner
    - A person who owns coffee machine.
    - The owner is able to order coffee and access privileged commands

1006. Define Business Use-cases

- Identify Use cases
  - Use cases by actor-based
    - Owner

Register product

Save personal preferences

Update personal preferences

Reset saved records

Select size of coffee

Select portion of water

Confirm ordered coffee

Cancel ordered coffee

Select music

Stop music

Change volume

Change driving mode

Select a camera

Change direction of the machine

Change velocity
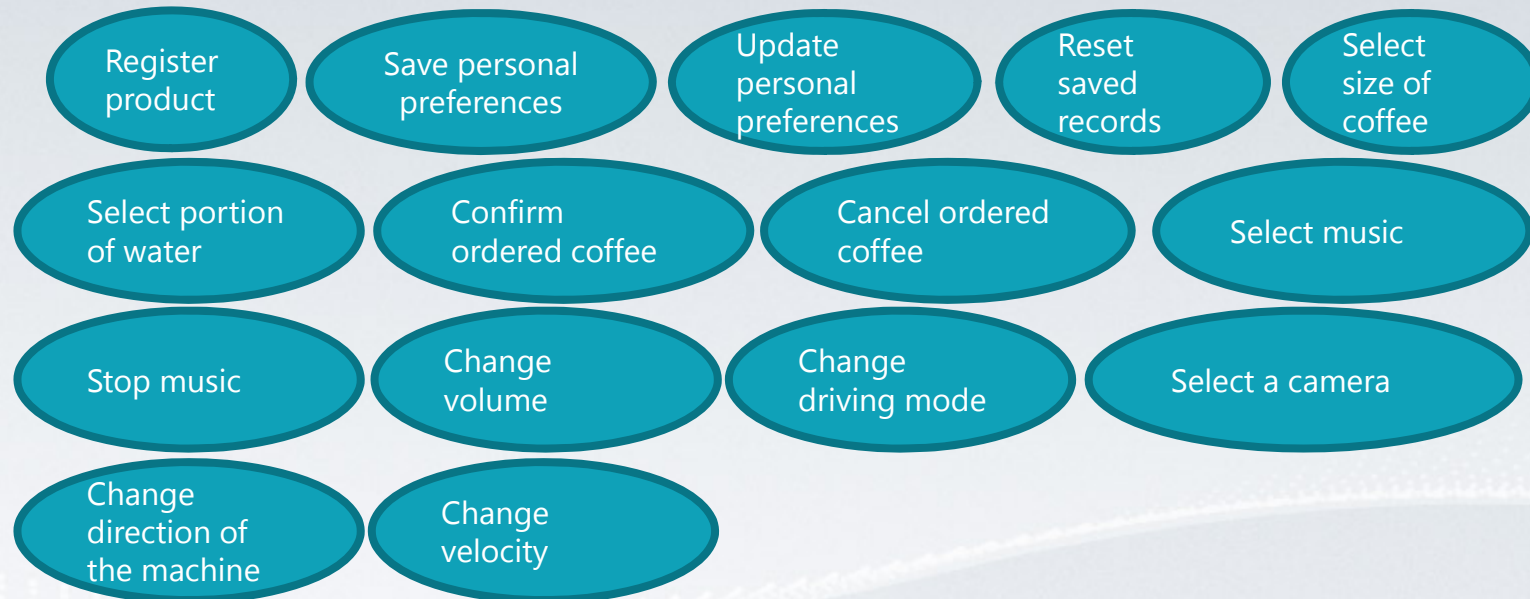
1006. Define Business Use-cases

- Identify Use cases
  - Use cases by event-based
    - Owner

Choose coffee to recommend

Show all menus with recommended coffee

Show remained materials

Show recommended music

Detect obstacles

Save user's decision

Play music
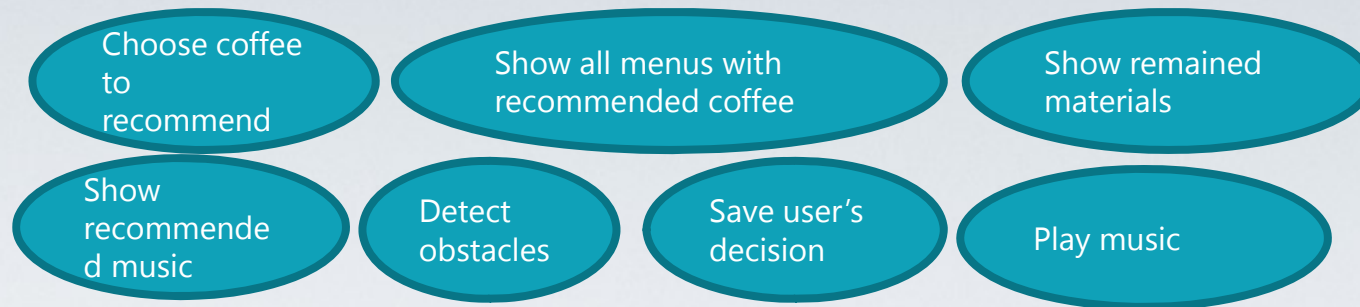
1006. Define Business Use-cases

- Allocate System Functions into Related Use-Cases (1/2)

Ref. #	Function	Use-case Number and Name
R1.1	Register product	1. Register product
R1.2.1	Save personal preferences	2. Save personal preferences
R1.2.2	Update personal preferences	3. Update personal preferences
R1.2.2	Reset saved records	4. Reset saved records
R1.3.1	Choose coffee to recommend	5. Choose coffee to recommend
R1.3.2	Show all menus with recommended coffee	6. Show menu
R1.3.3	Select size of coffee	7. Select size of coffee
R1.3.4	Select portion of water	8. Select portion of water
R1.4.1	Confirm ordered coffee	9. Confirm ordered coffee
R1.4.2	Cancel ordered coffee	10. Cancel ordered coffee
R1.5	Show remained materials	11. Show remained materials
R1.6.1	Show recommended music	12. Show recommended music
R1.6.2	Select music	13. Select music

1006. Define Business Use-cases

- Allocate System Functions into Related Use-Cases (2/2)

| Ref. #	Function	Use-case Number and Name
R1.6.3	Play music	14. Play music
R1.6.4	Stop music	15. Stop music
R1.6.5	Change volume	16. Change volume
R1.7.1	Change mode to drive	17. Change mode to drive
R1.7.2	Select a camera	18. Select a camera
R1.7.3	Change direction of the machine	19. Change direction
R1.7.4	Change velocity	20. Change velocity
R1.7.5	Detect obstacles	21. Detect obstacles
R1.8	Save user's decision	22. Save user's decision

1006. Define Business Use-cases

- Categorized use cases (1/2)

Ref. #	Function	Use-case Number and Name	Category
R1.1	Register product	1. Register product	Primay
R1.2.1	Save personal preferences	2. Save personal preferences	Primary
R1.2.2	Update personal preferences	3. Update personal preferences	Primary
R1.2.2	Reset saved records	4. Reset saved records	Primary
R1.3.1	Choose coffee to recommend	5. Choose coffee to recommend	Primary
R1.3.2	Show all menus with recommended coffee	6. Show menu	Primary
R1.3.3	Select size of coffee	7. Select size of coffee	Primary
R1.3.4	Select portion of water	8. Select portion of water	Primary
R1.4.1	Confirm ordered coffee	9. Confirm ordered coffee	Primary
R1.4.2	Cancel ordered coffee	10. Cancel ordered coffee	Primary
R1.5	Show remained materials	11. Show remained materials	Primary
R1.6.1	Show recommended music	12. Show recommended music	Primary
R1.6.2	Select music	13. Select music	Primary

1006. Define Business Use-cases

- Categorized use cases (2/2)

Ref. #	Function	Use-case Number and Name	Category
R1.6.3	Play music	14. Play music	Primary
R1.6.4	Stop music	15. Stop music	Primary
R1.6.5	Change volume	16. Change volume	Primary
R1.7.1	Change mode to drive	17. Change mode to drive	Primary
R1.7.2	Select a camera	18. Select a camera	Primary
R1.7.3	Change direction of the machine	19. Change direction	Primary
R1.7.4	Change velocity	20. Change velocity	Primary
R1.7.5	Detect obstacles	21. Detect obstacles	Primary
R1.8	Save user's decision	22. Save user's decision	Primary

1006. Define Business Use-cases
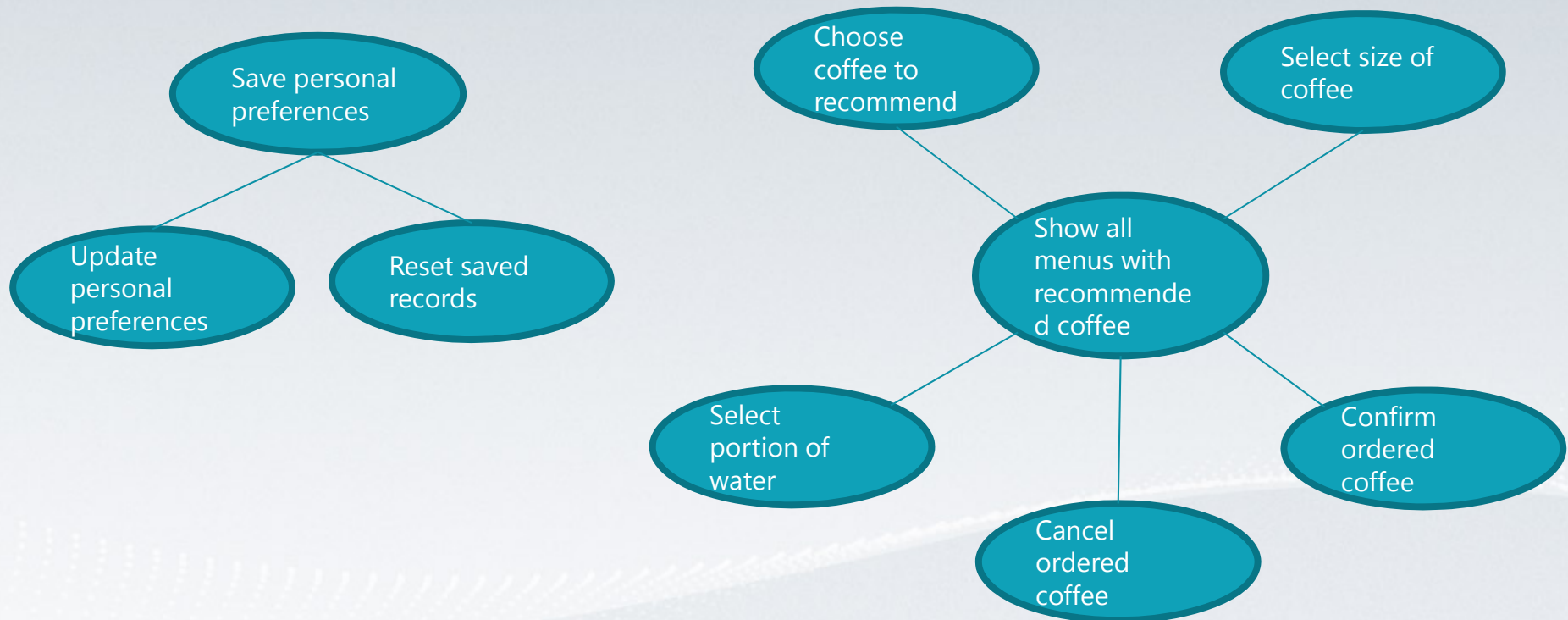
- Identify the relationships between Use-Cases

1006. Define Business Use-cases

- Identify the relationships between Use-Cases

```
Show recommended music          Change volume

        Select music

Play music          Stop music
```

```
Select a camera          Change direction of the machine

        Change driving mode

Detect obstacles          Change velocity
```
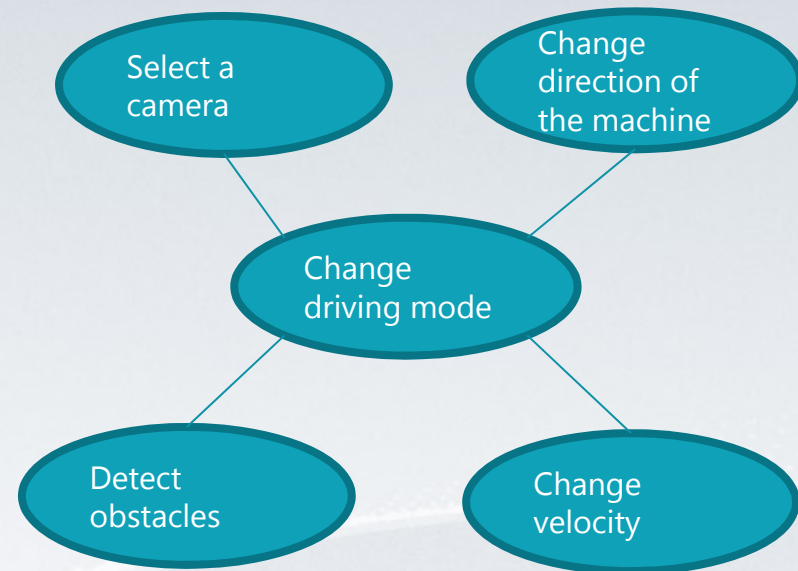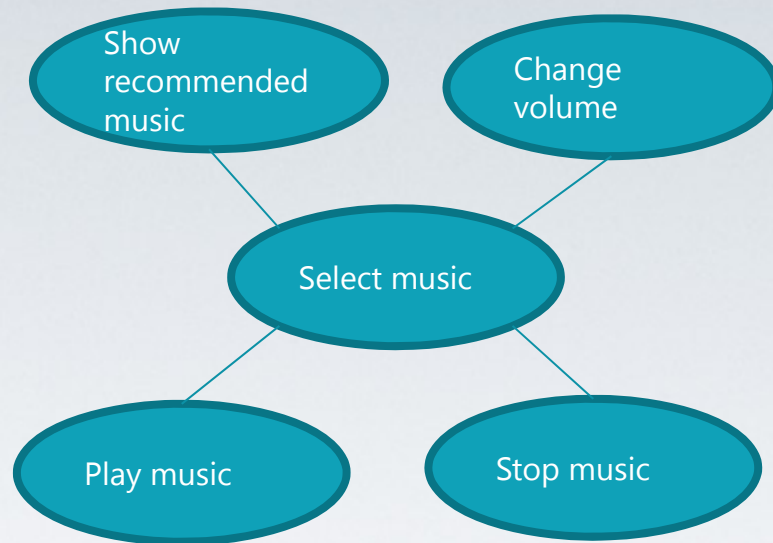
1006. Define Business Use-cases

- Draw an use-case diagram
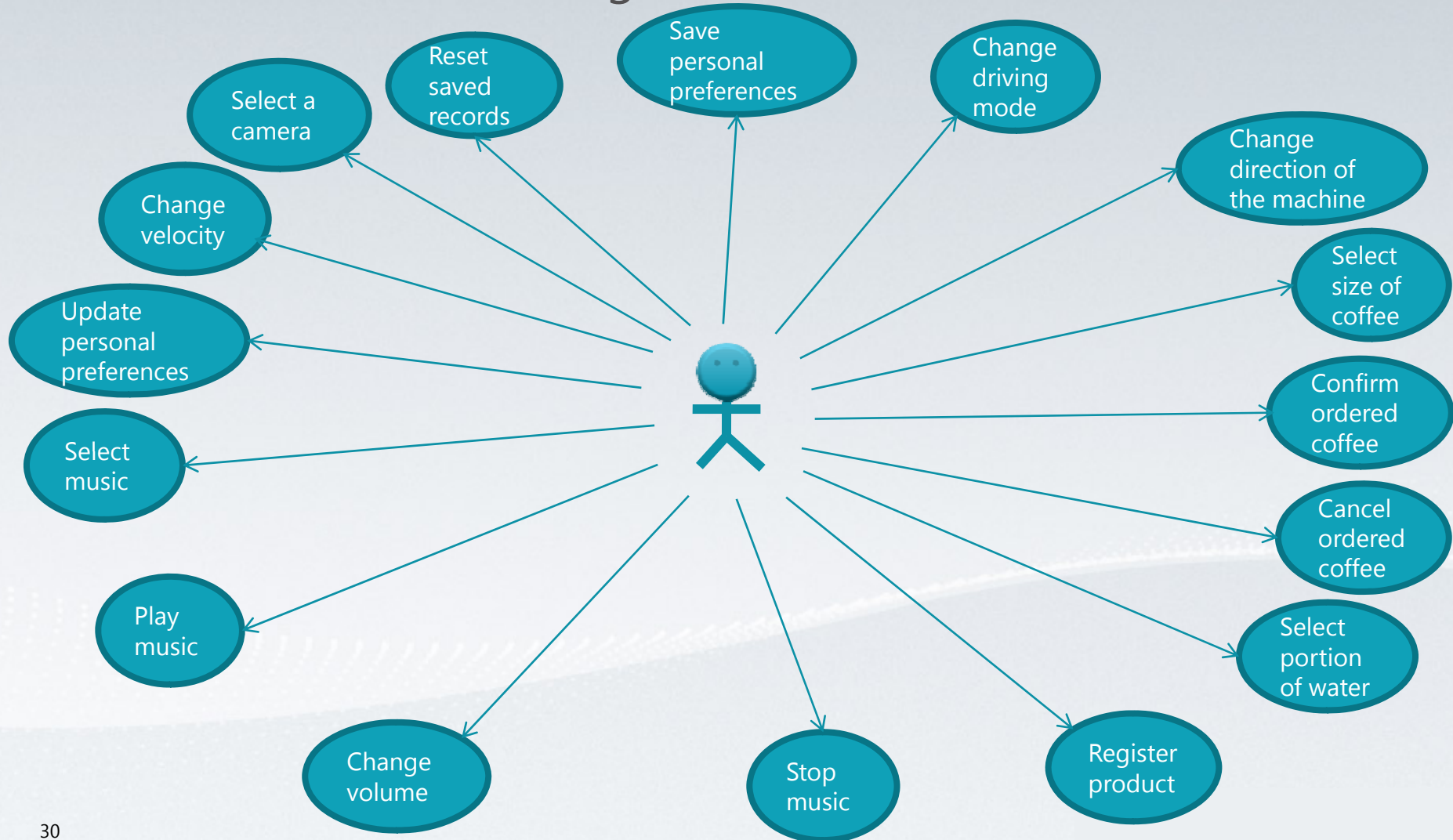
1006. Define Business Use-cases

- Describe use-cases

Name	Description
1. Register product	- This use case registers identification information of product and remote controller on the web server to authorize the user when they try to access the machine.
Actor	
Owner	

Name	Description
2. Save personal preferences	- This use case saves personal preferences on the coffee by storing preferred coffee, sugar portion in the coffee on the web server.
Actor	
Owner	

1006. Define Business Use-cases

- Describe use-cases

Name	Description
3. Update personal preferences	- This use case updates personal preference saved at use case number 2.
Actor	
Owner	

Name	Description
4. Reset saved records	- This use case deletes all and initialize the saved user's past decision on the database.
Actor	
Owner	

1006. Define Business Use-cases

- Describe use-cases

Name	Description
5. Choose coffee to recommend	- This use case makes a decision on the recommended coffee. - The recommended coffee is selected based on saved owner's preference, weather, bio-rhythm, special day.
Actor	
Owner	

Name	Description
6. Show all menus with recommended coffee	- This use case show all available menus with the recommended coffee chosen by use-case number 5.
Actor	
Owner	

1006. Define Business Use-cases

- Describe use-cases

Name	Description
7. Select size of coffee	- This use case selects size of coffee. - The size of coffee in this machine should be one of the following list, Short, Tall and Grande.
Actor	
Owner	

Name	Description
8. Select portion of water	- This use case adjusts amount of water in the coffee. - User can increase and decrease based on the default amount of water in the coffee.
Actor	
Owner	

1006. Define Business Use-cases

- Describe use-cases

Name	Description
9. Confirm ordered coffee	This use case makes a cup of coffee based on the selected options.
Actor	
Owner	

Name	Description
10. Cancel ordered coffee	- This use case cancels ordered coffee.
Actor	
Owner	

1006. Define Business Use-cases

- Describe use-cases

Name	Description
11. Show remained materials	- This use case shows amount of remained ingredients. - If one of the ingredient is insufficient, shows the alarm message to the user.
Actor	
Owner	

Name	Description
12. Show recommended music	- This use case recommends the music to play during the coffee break.
Actor	
Owner	

1006. Define Business Use-cases

- Describe use-cases

Name	Description
13. Select music	- This use case selects the music - Lists are shown by genres and generations.
Actor	
Owner	

Name	Description
14. Play music	- This use case plays selected music.
Actor	
Owner	

1006. Define Business Use-cases

- Describe use-cases

Name	Description
15. Stop music	- This use case stops the music which is playing now
Actor	
Owner	

Name	Description
16. Change volume	- This use case changes the system volume.
Actor	
Owner	

1006. Define Business Use-cases

- Describe use-cases

Name	Description
17. Change driving mode	- This use case changes the mode to drive. - If the mode has changed, the machine, the Sweet heart, stops serving the features related to the coffee maker and protects the coffee during the driving activities.
Actor	
Owner	

Name	Description
18. Select a camera	- This use case selects the camera on the Sweet heart during the driving. - The cameras are attached on the forward, backward, left and right size of the machine. It will covers north, south, east and west size of the machine.
Actor	
Owner	

1006. Define Business Use-cases

- Describe use-cases

Name	Description
19. Change direction of the machine	- This use case changes the direction of the Sweet heart during the driving - The direction can be changed to forward, backward, left and right.
Actor	
Owner	

Name	Description
20. Change velocity	- This use case adjusts the velocity of the Sweet heart during the driving. - The velocity can be changed from minus to plus. - The machine has a speed limit to be a secure machine.
Actor	
Owner	

1006. Define Business Use-cases

- Describe use-cases

Name	Description
21. Detect obstacles	- This use case detects obstacles which prevents the machine from going through. - If the machine detects obstacles, it will immediately stop to prevent crash to the obstacles.
Actor	
Owner	

Name	Description
22. Save user's decision	- This use case saves decisions from the Owner to the database on the web server. - The following information will be saved. Selected coffee, size of coffee, amount of water in the coffee and information of chosen music.
Actor	
Owner	

1006. Define Business Use-cases

- Rank use-cases

Rank	Use-case Number & Name
High	1. Register product
High	2. Save personal preferences
High	3. Update personal preferences
High	4. Reset saved records
High	5. Choose coffee to recommend
High	6. Show all menus with recommended coffee
High	7. Select size of coffee
High	8. Select portion of water
High	9. Confirm ordered coffee
High	10. Cancel ordered coffee
High	11. Show remained materials
High	12. Show recommended music
High	13. Select music

1006. Define Business Use-cases

- Rank use-cases

Rank	Use-case Number & Name
High	14. Play music
High	15. Stop music
High	16. Change volume
High	17. Change driving mode
High	18. Select a camera
High	19. Change direction of the machine
High	20. Change velocity
High	21. Detect obstacles
High	22. Save user's decision

1007. Define Business Concept Model

- Identify 'Concepts' in Domain

Product ID	Coffee	Size	Water
preference	beans	sugar	cream
milk	music	volume	drive
Genre (music)	velocity	obstacle	weather
seasons	degree	Special day	Bio rhythm
sex	age	recommendation	direction

1008. Define Draft System Architecture

- Identify 'Concepts' in Domain

Sweet heart is connected to the user by using wireless networks

User (Remote Controller)

Web Server

Sweet heart

The user makes Sweet heart move by using a cell phone to serve a cup of coffee.

Sweet heart reports every tasks he did and Web Server saves reported tasks on Database server in order to serve those information to Personalization components

Web server serves features about Personalization and Emotional

Database Server

Has a separated database server to build more secure system

45

1009. Refine Plan

- Project Scope
  - According to the statistics from newspaper(Seoul Economy), a person consumes 312 cups of coffee in a year
  - Nowadays, more and more people consumes coffee and they need smarter and more comfortable way of coffee
  - But there is no smart coffee machine which can serve personalized coffee in a comfortable way

- Project Objectives
  - To develop a smart and comfortable coffee machine which provides below features
    - Suggest coffee and music based on the user's feeling
    - Personalization features by adapting users' experiences
    - Find and move to the user automatically for user's convenience
  - The new product should be accessible and efficient

1009. Refine Plan

- Functional Requirements

Ref. #	Function	Category
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R1.3.4	Select portion of water	Evident
R1.4.1	Confirm ordered coffee	Evident
R1.4.2	Cancel ordered coffee	Evident
R1.5	Show remained ingredients	Evident
R1.6.1	Show recommended music	Evident
R1.6.2	Select music	Evident

1009. Refine Plan

- Functional Requirements

Ref. #	Function	Category
R1.6.3	Play music	Evident
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R1.6.5	Change volume	Evident
R1.7.1	Change mode to drive	Evident
R1.7.2	Select a camera	Evident
R1.7.3	Change direction of the machine	Evident
R1.7.4	Change velocity	Evident
R1.7.5	Detect obstacles	Evident
R1.8	Save user's decision	Hidden

1009. Refine Plan

- Performance Requirements
  - The average response time should be shorter than a second excluding making coffee

- Operating Environments
  - Coffee machine
    - OS: Embedded Linux
    - CPU: ARM RISC CHOI
    - Memory: 128MB
    - HDD: 32GB
  - Remote controller
    - All kinds of cell phones which support web access
  - Web Server
    - OS: Debian Linux
    - CPU: Intel i7
    - Memory: 4GB
    - HDD: 500GB

1009. Refine Plan

- User Interface Requirements
    - All devices should support touch based input system
    - All features should be controlled by cell phones
    - Support direct input by buttons
    - Show progresses on the screen during working

- Other Requirements
    - The machine should maintain secure system during the operation

1009. Refine Plan

- Resources
    - Human Effort (M/M) : 4-1.5 M/M
    - Human Resources : 4
    - Duration : 6 weeks
    - Budget : $100,000 USD

1009. Refine Plan

- Scheduling

Phase(00x0)/Activity(000x)	Schedule(week)											
	1	2	3	4	5	6	7	8	9	10	11	12
1001.DefineDraft Plan	—											
1002. Create Preliminary investigation Report	—											
1003. Define Requirements	—											
1004. Record Terms in Glossary	—											
1005. Implement Prototype	—											
1006. Define Use Cases		—										
1007. Define Draft Conceptual Model		—										
1008. Define Draft System Architecture		—										
1009. Refine Plan		—										
2010. Revise Plan			—									
2020. Synchronize Artifacts			—									
2030. Analyze												
2031. Define Essential Use Case				—								
2032. Refine Use Case Diagrams				—								
2033. Refine conceptual Model				—								
2034. Refine Glossary				—								
2035. Define System Sequence Diagrams					—							
2036. Define Operation Contracts					—							
2037. Define State Diagrams					—							
2040. Design												
2041. Define Real Use Cases						—						
2042.Define Reports, UI and Storyboards						—						
2043. Refine System Architecture							—					
2044. Define Interaction Class Diagrams								—				
2045. Define Design Class Diagrams								—				
2046. Define Database Schema									—			
2050. Construct												
2051. Implement Class & Interface Definition									—			
2052. Implement Methods										—		
2053. Implement Windows										—		
2054. Implement Reports											—	
2055. Implement DB Schema											—	
2056. Write Test Code												—
2060. Test												
2061. Unit Testing												—
2062. Integration Testing												—
2063. System Testing												—
2064. Performance Testing												—
2065. Acceptance Testing												—
2066. Documentation Testing												—

1009. Refine Plan

- Quality Assurance Plan
    - Formal Technical Review(FTR) : Inspection & Work-through
        - Should be applied to each activity
    - Define Quality Assurance Metrics