How much time do you have to present? I beleive it is about 10 or 15 minutes, so you have 30 slides, that 30 seconds a slide. Way too many slides for time.

Reduce the UC slides and focus on context and planning issues. The Requirements are also a lot and as I pointed out many appear like repeats and need to be consolidated.

Studio Project

TEAM 2

2017.10.20

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- Project context
- Architectural drivers
  - Functional requirements
  - Quality attributes
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Not sure I saw this or the next identified.

You do have a huge section on use cases here.

Project context

- Project Name
  - Autonomous Maze Solving Robot

This looks reasonable for an early start. Check your spelling "Goad" -> "Goal"

Goal?

- Goad of project
  - Design a system that promotes education and experimentation using robots which use various distance sensors and computer vision to solve and map mazes

This is an odd phrase, it might be better to just say "sonar"

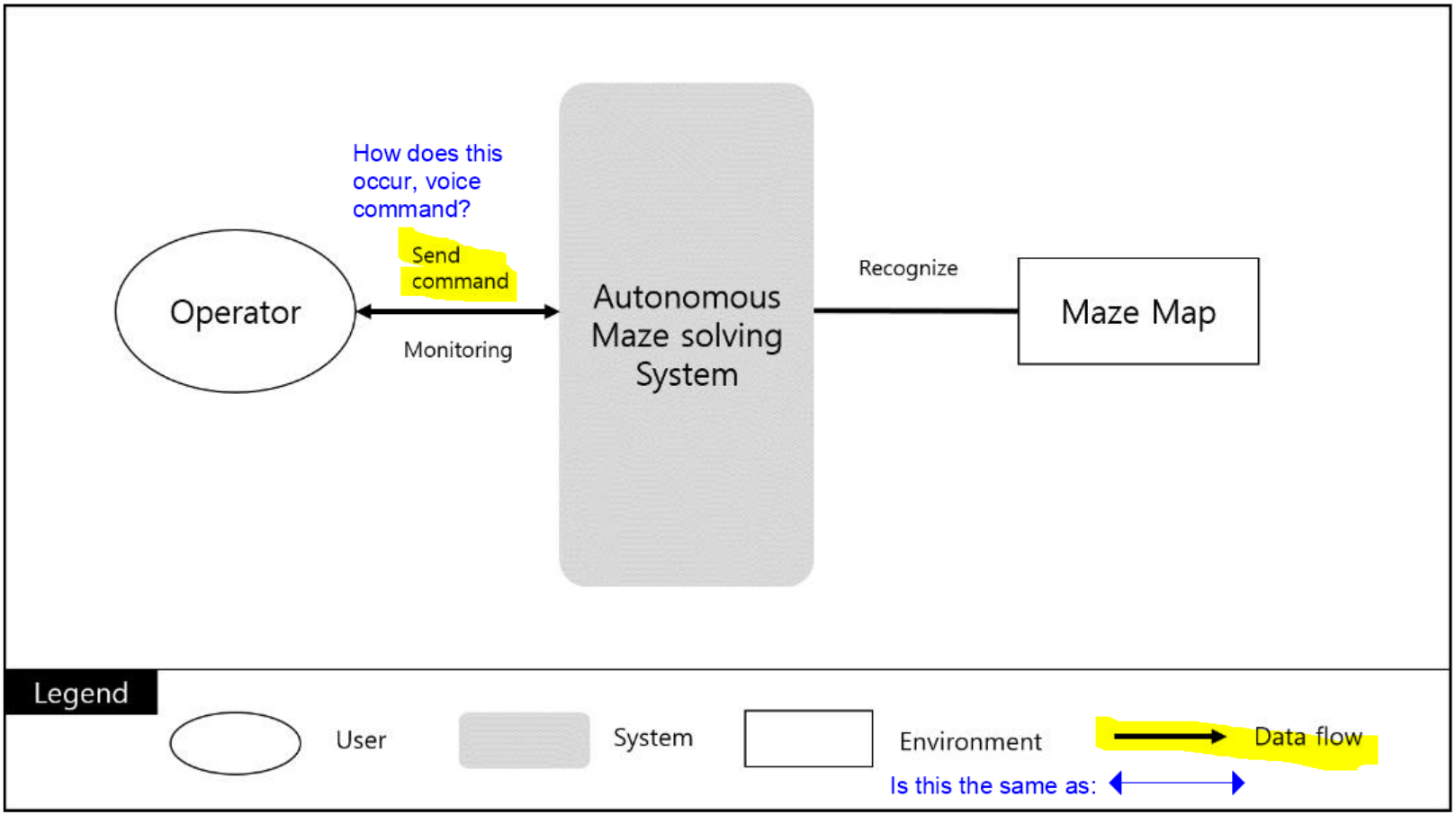
- Project sponsor
  - SolveIt Inc

- Key motivators
  1. SolveIt Inc. will select the best architecture/solution based on the results of this competition among the teams in this course
  2. Insure safe and reliable operation of the robot system
  3. Provide the ability to easily extend the features/behaviors of the robot system by users or third parties
  4. Provide the ability to easily add or replace algorithms that can solve and /or map mazes

Needs to say "by best time through maze" as measure of competition. Or finding goal, or finding all points of interest.

Isn't there a team and LG motivation of completing the program to be architectures at your home company?

System context diagram



Architectural drivers

- Functional requirements (1/4)

Req ID	Functional requirements
FR01	Robot shall solve and completely map a maze as fast as possible (without error) by utilizing sensors, the camera and computer vision
FR02	Robot shall operate without user intervention solving and mapping the maze by using sensor and camera in autonomous mode
FR03	Robot shall avoid obstacles(walls) and recognize red dot, signs on the maze wall, start & end squares
FR04	While in manual mode the robot shall utilize all sensor to the maximum extent possible to prevent the operator from running into or contacting walls in the maze.
FR05	Robot shall be the manual mode upon initialization with an established network connection between the user interface and the robot.

Solve is one requirement, map is another requirement.

Do you have to follow the grid lines or just follow the walls?

In previous drawing this does not exist.

Architectural drivers

- Functional requirements (2/4)

Req ID	Functional requirements
FR06	Robot shall stop movement and enter suspend mode if a sign cannot be located or recognized or if the robot cannot solve the maze. There are many functions that surround stop.
FR07	Robot shall prompt the operator on the remote user interface when going to suspend mode. Prompt for what?
FR08	Robot shall resume autonomous mode once the operator has indicated the desired action. Be more specific, robot can be placed in autonomous mode after suspend or anytime.
FR09	If the connection is lost then the robot shall suspend autonomous mode operation and stop movement and enter suspend mode. Robot shall stop, notifiy operator and await commands.

Architectural drivers

You have 3 or 4 requierments dealing with lost connection. Might be better to consolidate.

- Functional requirements (3/4)

Req ID	Functional requirements
FR10	If the network connection is lost, the operator shall not be permitted to perform any operation. Really? What about reset the network?
FR11	If the connection is lost then the remote user interface shall alert the operator and indicate the connection lost.
FR12	If the connection is reestablished then alert the operator on the remote user interface
FR13	Remote user interface shall control the robot's mode of operation Even in autonomous mode?
FR14	Remote user interface provide the operator the ability to monitor the following robot's state (Current map of the maze/Sensors Value/Camera video)

I think you need to simplify.

Architectural drivers

- Functional requirements (4/4)

Req ID	Functional requirements
FR15	Remote user interface shall support stopping robot movement and pause the robot's autonomous operation at anytime and enter a manual mode.
FR16	Remote user interface can pan and tile the camera in manual mode
FR17	Remote user interface can move the robot in manual mode

Think about hierachy, robot can stop for multiple reasons and be stopped. All arrive at the same state, robot stopped awaiting commands.

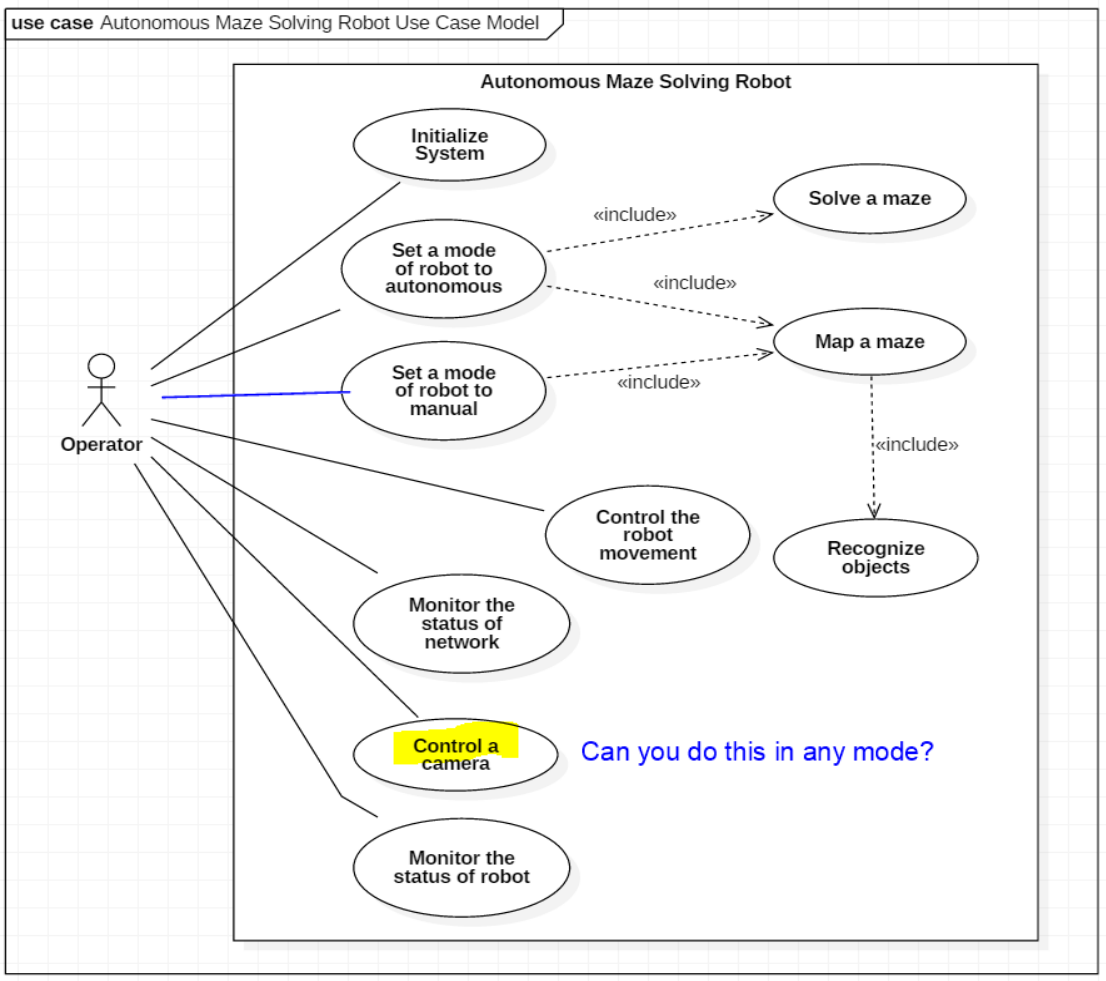
Not "tile" "tilt", or side to side movement and up and down movement.

I think you have two FR's dealing with this.

Which of these are KEY drivers which will dominate the architecture? You might even think in terms of "goals" for the project followed by requirements to support the goals. Movement, safety, control, etc.

Architectural drivers

- Functional requirements – Use Case Diagram



Architectural drivers

- Functional requirements – Use Case Scenario (1/10)

UC01	Description
Title	Solve a maze
Primary Actor	Operator
Preconditions	Remote U₩user interface and robot are connected via wireless network and remote user interface can monitor state of the robot
Main Scenario	1. Operator places the robot on start square. 2. Operator sets robot mode to Autonomous Mode in Remote User Interface. 3. Robot starts self-driving. 4. Robot searches for a sign if it recognizes red dot. 5. Robot searches all the mazes and moves to end sqaure. 6. Remote User Interface informs the operator that the search for the maze is over.
Post condition	Robot completes solving a maze
Alternative Scenario	None
Alternative post condition	None

Architectural drivers

- Functional requirements – Use Case Scenario (2/10)

UC02	Description
Title	Map a maze
Primary Actor	Operator
Preconditions	Remote User Interface and Robot are connected via wireless network and remote user interface can monitor state of the robot
Main Scenario	1. Operator places the robot on start square. 2. Operator sets robot mode to autonomous mode in Remote User Interface. 3. Robot starts self-driving 4. Robot searches for a sign if it recognizes red dot. 5. Robot make a map completely. 6. Robot have to move to end square after all map is revealed.
Post condition	Robot map a maze completely
Alternative Scenario	4a. Robot cannot recognize a sign 4a1. Robot shall suspend movements and ready to receive a proper command from remote user interface.
Alternative post condition	None

Architectural drivers

- Functional requirements – Use Case Scenario (3/10)

UC03	Description
Title	Initialize the system
Primary Actor	Operator
Preconditions	The Robot was powered on. Operator placed the robot in the starting square of maze. IP address of robot is already configured in Remote UI application.
Main Scenario	1. When the Robot was powered on, the Robot changes its initial mode to manual. 2. Operator starts the Remote UI application. 3. Remote UI application starts and it tries to establish network connection with the robot 4. After establishing network connection, Remote UI application displays success message and the Robot switches itself to manual mode. 5. Remote UI application displays video from the Robot's camera, state of sensors, current map of the maze. furthermore, Remote UI application displays selectable mode buttons(i.e, autonomous and manual). and, robot's current mode(manual mode) is already selected. 6. Operator elects to initialize the robot. 7. As the initialization progresses, the robot clears the stored map information so far. 8. After initialization, Remote UI application display success message.

Architectural drivers

- Functional requirements – Use Case Scenario (4/10)

UC03	Description
Post condition	At the conclusion of the use case, Robot and Remote UI application are initialized to start operation, and Operator can select autonomous mode to make robot solve the maze or select manual mode to control the robot manually.
Alternative Scenario	2a. Remote UI application can not establish network connection with the robot. 2b. Remote UI application display error message. 2c. Robot stays in manual mode. 2d. Remote UI application tries to connect with the robot repeatedly. 2e. When Operator elects to stop trying connection, Remote UI application stop trying and display the related text message.
Alternative post condition	None

Architectural drivers

- Functional requirements – Use Case Scenario (5/10)

UC04	Description
Title	Set a manual mode of robot
Primary Actor	Operator
Preconditions	The Robot is confused. The network connection between Remote UI application and Robot is lost.
Main Scenario	1. Operator elects to change manual mode on the Remote UI application. 2. After changing manual mode, Remote UI application displays success message. 3. At the conclusion of changing manual mode, Operator controls the robot movement and camera manually. 4. While Operator controls the robot in manual mode, Robot utilizes all sensors to the maximum extent possible to prevent Operator from running into walls.
Post condition	At the conclusion of the use case, Operator can control the robot movement manually.
Alternative Scenario	None
Alternative post condition	None

Architectural drivers

- Functional requirements – Use Case Scenario (6/10)

UC05	Description
Title	Set a autonomous mode of robot
Primary Actor	Operator
Preconditions	The network connection between Remote UI application and Robot is established. The Robot and Remote UI application is already initialized.
Main Scenario	1. Operator elects to change autonomous mode on the Remote UI application. 2. After changing autonomous mode, Remote UI application displays success message. 3. At the conclusion of changing autonomous mode, Robot starts solving maze and mapping the maze automatically. 4. While in autonomous mode, Remote UI application displays video from the Robot's camera, state of sensors and current map of the maze.
Post condition	At the conclusion of the use case, Operator can control the robot movement manually.
Alternative Scenario	3a. When the Robot can not locate or recognize a sign on the autonomous mode, Robot suspends autonomous mode operations, stop robot movement and enter suspend mode. 3b. Remote UI application displays that the current mode is changed to suspend mode 3c. Operator does the corrective action. 3d. Operator elects to resume autonomous mode on the Remote UI application.
Alternative post condition	At the conclusion of the use case, Robot resumes solving maze and mapping the maze.

Architectural drivers

- Functional requirements – Use Case Scenario (7/10)

UC06	Description
Title	Monitor the status of network
Primary Actor	Operator
Preconditions	None
Main Scenario	1. System monitors network connection between remote user interface and robot 2. Remote user interface shows network connection status to operator
Post condition	User interface shows current network status
Alternative Scenario	1a. Network disconnection 1a1. Robot stops movement 1a2. Robot enters suspend mode 1a3. Remote user interface alert the operator and indicate connection lost 1a4. Remote user shows message that operation is not permitted 1a5. When connection is reestablished, remote user interface alert the operator and indicate connection is reestablished
Alternative post condition	Remote user interface alerts the operator

Architectural drivers

- Functional requirements – Use Case Scenario (8/10)

UC07	Description
Title	Monitor the status of robot
Primary Actor	Operator
Preconditions	None
Main Scenario	1. System monitors robot's state 2. Remote user interface shows robot state to operator
Post condition	User interface shows current robot status
Alternative Scenario	1a. prompt error status 1a1. Robot stops movement 1a2. Robot enters suspend mode 1a3. Remote user interface prompt operator to recognize suspend mode
Alternative post condition	Remote user interface prompts operator to recognize suspend mode

Architectural drivers

- Functional requirements – Use Case Scenario (9/10)

UC08	Description
Title	Control a Camera
Primary Actor	Operator
Preconditions	The robot shall be the manual mode
Main Scenario	1. The robot is in the manual mode. 2. In the remote user interface, the button to move the camera is activated. 3. The operator uses the button to pan & tile the camera.
Post condition	The panning & tilting image should be shown in the remote user interface
Alternative Scenario	None
Alternative post condition	None

Architectural drivers

- Functional requirements – Use Case Scenario (10/10)

UC09	Description
Title	Control robot movement
Primary Actor	Operator
Preconditions	The robot shall be the manual mode
Main Scenario	1) The robot is in the manual mode. 2) In the remote user interface, the button to move the robot is activated. 3) The operator uses the button to move the robot.
Post condition	The robot must move according to the instructions of the operator
Alternative Scenario	N/A
Alternative post condition	N/A

Architectural drivers

- Quality attributes - Availability

Q.A	Description
Scenario	If the Robot system receives a message format not recognized or a message that can not be processed by the current operation, it notifies the remote user interface and continues the operation in progress without interrupting the system
Source	Remote user interface
Stimulus	Abnormal Message
Artifact	The Robot system
Environment	run time
Response	The Robot system notifies the remote user interface
Response Measure	The Robot system operates in progress without interrupting the system

Architectural drivers

- Quality attributes - Performance

Q.A	Description
Scenario	The remote user interface receives the user input and sends the command to the robot system. The robot system recognizes the received command within TBD ms and performs the designated operation
Source	User
Stimulus	receive the command from the remote user interface continuously
Artifact	The Robot system
Environment	run time
Response	The time it takes to recognize the received command
Response Measure	The Robot system recognizes the received command within TBD ms

Architectural drivers

- Quality attributes - Usability

Q.A	Description
Scenario	According to the robot status, it is required to enable / disable the buttons available in the remote user interface to prevent malfunction of the user, so that only the intended function of the user should be performed 100%.
Source	Remote user interface
Stimulus	User wants to minimize the impacts of errors
Artifact	Remote user interface
Environment	run time
Response	Activate only the available buttons according to the state of the robot.
Response Measure	The intended function of the user should be performed 100%.

Architectural drivers

- Quality attributes - Modifiability

Q.A	Description
Scenario	Users or Third Parties want to extend the features/behaviors of the Robot system without disrupting operations. New features/behaviors can be implemented and tested within 1 week.
Source	Users and Third parties
Stimulus	Add new features/behaviors to the Robot system
Artifact	The Robot system
Environment	run time
Response	New features/behaviors should be added without disrupting operations
Response Measure	New features/behaviors can be implemented and tested within 1 week.

Architectural drivers

- Quality attributes - Testability

Q.A	Description
Scenario	The developer should be able to test the functionality of the Robot system by performing an automated sanity check through the test driver and verify within 5 minutes whether the basic function is working normally.
Source	Developer
Stimulus	Test function of robot system through test driver
Artifact	The Robot system
Environment	run time
Response	The test result of the Robot System
Response Measure	The developer verify within 5 minutes whether the basic function is working normally

Architectural drivers

- Quality attributes - Security

Q.A	Description
Scenario	To prevent sniffing on network the communication channel between the robot and the remote user interface shall be encrypted.
Source	User
Stimulus	Communication between the remote user interface and the robot.
Artifact	Remote user interface
Environment	run time
Response	Message channel is secured.
Response Measure	Messages between the remote user interface and the robot cannot be sniffed with well-known attack.

Architectural drivers

- Quality attributes - Modifiability

Q.A	Description
Scenario	Developer can provide the ability to easily add or replace algorithms that can solve and map mazes
Source	Developer
Stimulus	Change new algorithm to the Robot system
Artifact	The Robot system
Environment	run time
Response	New algorithm should be added or replaced without disrupting operations.
Response Measure	New algorithm can be added or replaced within 1 day.

Architectural drivers

- Technical Constraints

ID	Constraint	Description
TC01	Hardware System	Raspberry Pi 3 Model B 1GB RAM Single Board 2 rotation servos & wheel Color pan-tilt camera with 2 servos HC-SR04 Ultrasonic Range Sensor 2 VL53L0X Time of Flight Distance Ranging Sensors
TC02	Programming Language	For the robot system : C++ & C For the remote user interface : Java
TC03	Network	Wi-Fi
TC04	Power of hardware	Buzzing Universal Battery Elimination Circuit (6 AA batteries)
TC05	System Software	For Computer Vision : OpenCV should be used For Controlling Camera : RaspiCam should be used To drive multiple servos : ServoBlaster should be used OS : Raspbian Jessie Lite
TC06	Servo Control	It is required to send control signal for servo to rotate continuously before the idle timeout
TC07	Servo positional limit	Servo shaft can only rotate 180 degrees

Architectural drivers

- Business Constraints

ID	Constraint	Description
BC01	Delivery	The Robot system and remote user interface should be delivered within 5 weeks.
BC02	Availability of workforce	The team is consist of 5 members.
BC03	Targeted market	Solvelt Inc., want to launch a new product line of robot k its for educators and DIY experimenters

Project plan

- Schedule

Are these weeks?

Do you define these somewhere?

Task		Start Date	Due Date	September					October					November		
				1	2	3	4	5	1	2	3	4	5	1	2	3
Deliverable																
	ADS	2017-09-19	2017-11-10													
	ADD	2017-10-16	2017-11-10													
	Detailed Design	2017-10-18	2017-11-01													
	Test Case	2017-11-02	2017-11-08													
	Initial presentation	2017-09-19	2017-10-20													
	Midterm presentation	2017-10-30	2017-11-03													
	Final presentation	2017-11-04	2017-11-17													
Iteration 1																
	Analysis	2017-10-16	2017-10-20													
	Design	2017-10-18	2017-10-20													
Iteration 2																
	Analysis	2017-10-23	2017-10-26													
	Design	2017-10-23	2017-10-27													
	Implementation	2017-10-23	2017-10-27													
Iteration 3																
	Design	2017-10-30	2017-11-01													
	Implementation	2017-10-30	2017-11-01													
	Integration & Testing	2017-11-02	2017-11-03													
Iteration 4																
	Implementation	2017-11-06	2017-11-08													
	Integration & Testing	2017-11-09	2017-11-10													
Iteration 5																
	Implementation	2017-11-13	2017-11-16													
	Integration & Testing	2017-11-13	2017-11-16													

You take 5 weeks for presentation 1 and 2 weeks for end?

How will you know you are done here?

Project plan

- Team assignment

Good.

Member	Role
Sangcheol Cha	• Team leader • Integrates robot sw
Taehee Youn	• Develops maze solving module
Jiseong Kim	• Develops remote user interface sw
Seungwan Yang	• Develops sensor control module
Yunsik Jung	• Develops module related with camera and OpenCV

Time logs

Good.