Use Case [0: Pairing]

GENERAL CHARACTERISTICS	
Intent	Set up a connection between the controller and the car
Last Update:	2020-01-30
Primary Actor	User
Secondary Actors	Control device, car, wifi/IR module
Preconditions	1. Control device ready 2. Car ready 3. Both secured
Assumptions	1. No active connection has been established 2. Signal receiver on board the car is powered on
Trigger	User presses the connection button on the car. After the indicator light on the car starts blinking, user presses the connection button on the control device.
Success Post Condition	The indicator light on the car stop blinking and shows a green light. A "connection established" message appears on the control device interface.
Failed Post Condition	The indicator light on the car continuous to blink. Control device does not receive any confirmation signal and time out with a warning.
< Models>	user-device interaction
Operations Concepts	Utilize the wifi/IR module to establish a initial connection.
Overview	The car enters "pairing" mode after the user presses the connection button. The car's chip will activate the wifi/IR module with a specific signal. The control device remotely sends a signal through its wifi/IR module (external IR device) after the user presses "connect". The signal will either get received by the car's connection module or lost its target. The car will then verify that signal and send back a message agreeing the connection (a handshake). At last, the control device will decode the message from the car and record its name.

Use Case [1: Navigating]

GENERAL CHARACTERISTICS	
Intent	Manually control the car to move along the wall
Last Update:	2020-01-30
Primary Actor	User
Secondary Actors	Control device, car
Preconditions	1. Connection established

	2. Car's staying on the wall, stationary
Assumptions	1. Connection is stable for over 10s 2. Car's stayed on the wall for over 10s 3. The wall is smooth enough
Trigger	User moves the maneuvers on the control device interface
Success Post Condition	The car follows the user's intent to move, accelerate, and turn without falling from the wall
Failed Post Condition	The car fall from the wall. The car lost connection without falling. The car stays stationary with a stable connection.
< Models>	user-device interaction
Operations Concepts	Directly control the motors of the car
Overview	The control device decodes the maneuver's signal. The user's intended direction and acceleration is determined by the maneuver's relative angular rotation / perpendicular displacement.

Use Case [2: Drawing]

GENERAL CHARACTERISTICS	
Intent	Manually control the car to draw on the wall
Last Update:	2020-01-30
Primary Actor	User
Secondary Actors	Control device, car
Preconditions	1. Car's on the wall, stationary 2. Connection is stable 3. The drawing mechanism is reset
Assumptions	1. Connection is stable for over 10s 2. Car's stayed on the wall for over 10s 3. The wall is smooth enough
Trigger	User presses the drawing button on the control device interface
Success Post Condition	The indicator light on the car shows blue color. The drawing mechanism releases.
Failed Post Condition	The indicator light remains green. The drawing mechanism does not move. The drawing mechanism's movement caused the car to fall off the wall.
< Models>	user-device interaction
Operations Concepts	Move the brush down and that the user can draw by navigating the car on the wall
Overview	The control device sends a drawing signal to the car after the user presses the "draw" button. The car will respond

	by releasing the drawing mechanism so that the brush touches the walls' surface. The car will later follow the user's navigating command and draw on the wall.

Use Case [3: Stop Drawing]

GENERAL CHARACTERISTICS	
Intent	Manually control the car to stop drawing on the wall
Last Update:	2020-01-30
Primary Actor	User
Secondary Actors	Control device, car
Preconditions	1. Car's in drawing mode 2. Connection is stable 3. The drawing mechanism is released
Assumptions	1. Connection is stable for over 10s 2. Car's stayed on the wall for over 10s 3. The wall is smooth enough
Trigger	User presses the drawing button again on the control device interface
Success Post Condition	The indicator light on the car shows green color. The drawing mechanism resets.
Failed Post Condition	The indicator light remains blue. The drawing mechanism does not move. The drawing mechanism's movement caused the car to fall off the wall.
< Models>	user-device interaction
Operations Concepts	Move the brush back and that the user can navigate the car without drawing on the wall
Overview	The control device sends a drawing signal to the car after the user presses the "draw" button. Given the car is already in drawing mode, it will interpret the signal as an instruction to stop drawing. The car will stop despite the user's navigation. The car will reset its drawing mechanism so that the brush is off the wall. The car will respond to the user's navigation after the reset process is complete.

Use Case [4: Planned Drawing]

GENERAL CHARACTERISTICS

Intent	The car will automatically draw on the wall according to planned shape
Last Update:	2020-01-30
Primary Actor	User
Secondary Actors	Control device, car
Preconditions	1. Car's on the wall, stationary 2. Connection is stable 3. The drawing mechanism is reset 4. A planned shape was pre-loaded into the control device 5. The shape's decoded into drawing path
Assumptions	1. Connection is stable for over 10s 2. Car's stayed on the wall for over 10s 3. The wall is smooth enough 4. The remaining battery life in the car is long enough for it to complete the drawing
Trigger	User presses the planned drawing button on the control device interface
Success Post Condition	The indicator light on the car shows yellow blinking light. The drawing mechanism releases / resets as needed. The car navigates on the drawing path accordingly to the signal from the control device.
Failed Post Condition	The indicator light remains green. The drawing mechanism does not move. The drawing mechanism's movement caused the car to fall off the wall. The car moves to fast and the car fall off the wall. The car hits the boundaries of the wall.
< Models>	Inter-device interaction
Operations Concepts	Planned route replaces human input to control the car
Overview	The control device sends a navigation and drawing signal to the car after the user presses the "planned draw" button. The car will respond by following the command from the control device. In each time slot (<1ms) the control device will send a package to the car asking it to navigate with a specific speed in a specific direction. Also, the control device will ask the car to either draw or stop drawing. The automatically send command is identical to the command under user-controlled mode. The indicator light on the card will blink yellow light until the whole shape is complete. After completion, the indicator light will show a green light indicating that the car is under user-controlled mode. The car will stay stationary on the wall.