# \<Smart Software Project Report #1\>

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## 1. Project Name

⇨ Cartender

⇨ Car + Bartender.

## 2. Project statement

The main goal of our project is tracking the lines automatically by certain requirement. SmartCAR goes along with line. The line has various brightness; 100% dark, 75% dark, 50% dark and 25% dark. If a SmartCAR stands at a crossroads, then it judges where to go by line brightness. Satisfying all requirements, The SmartCAR comes back in origin place.

We applied these movements to an exciting show, cocktail order. Suppose that you want to order some drink in bar. In classic bar, a waiter may take an order and give you ordered drink. However, can you imagine that a a mini car bring out your drink? What you do is just ordering the drink with the mobile menu, and then the SmartCAR will solve everything.

## 3. Project description

### ① Taking an order by mobile device

There is a smart device near the table, it can order into touch screen. In smart device, you can choose any cocktail. Below is UI of application.
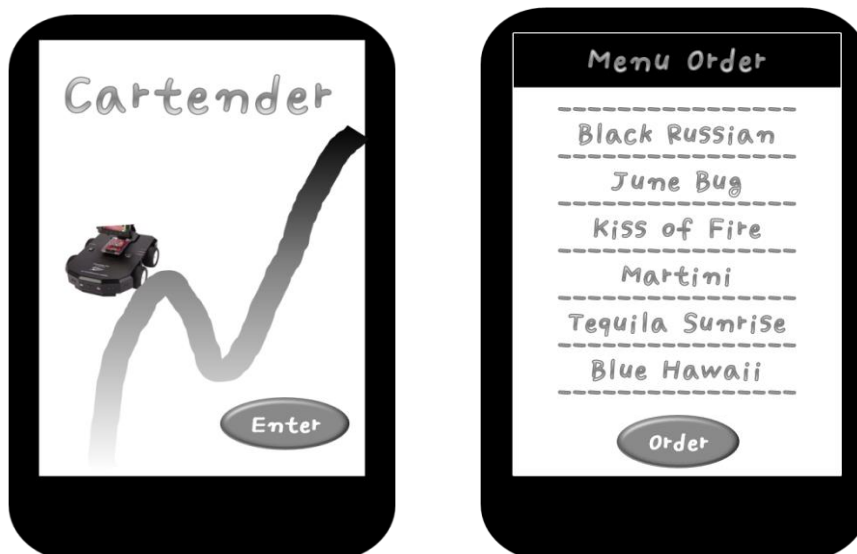
## ② Send the order to SmartCAR

After selecting the order in smart device menu, this passes value to SmartCAR. In this time, smart device can Bluetooth communicate with SmartCAR.

## ③ Processing the order

The SmartCAR checks where to go by value of No.2 If SmartCAR can access 4 places, A,B,C or D, It can choose A-D, A-B-C, or A-C-D as the path. Selecting cocktail, places is chosen as type of drinks. If there have 3 dispenser, all of probability are 7. (A,B,C,A-B,A-C,B-C,A-B-C) Because the order of dispenser is fixed, SmartCAR cannot move B-A, but A-B.

| The number of drink | Kind of drink | Probability | Order of Drink |
|---|---|---|---|
| 1 | A | A | A |
| 1 | B | B | B |
| 1 | C | C | C |
| 2 | A,B | A-B / B-A | A-B |
| 2 | B,C | B-C / C-B | B-C |
| 2 | A,C | A-C / C-A | A-C |
| 3 | A,B,C | A-B-C / A-C-B / B-A-C / B-C-A / C-A-B / C-B-A | A-B-C |

## ④ Moving along lines & Coming back along lines

SmartCAR moves lines by result of No.3.

## ⑤ Choosing where to go in a crossroads depending on brightness.

Brightness of line consists of 100%,75%,50%,25%. 100% brightness line means this line is linear. The other brightness of 75%,50%,25% is a path for dispenser. In 3, we already know whether go or not in crossroads. Therefore, if brightness of line is changed, checks the drink list and decides whether ignore or not. After going for crossroads, SmartCAR should come back.

## ⑥ Deciding the stay time. (It depends on quantity of drinks).

The Dispenser is similar to water purifier cork. When pushing the cork, drink comes out. A Cup attached SmartCAR push the cork, so It can get the drinks. The more time goes on pushing, the more cup gets the drinks.

⑦ **SmartCAR comes back, and notify the smart device.**

After line tracking and coming back the SmartCAR, it sends the message that cup is filled with drinks. Then smart device receives the message, prints out that. Between SmartCAR and mobile device, they communicate Bluetooth communication.
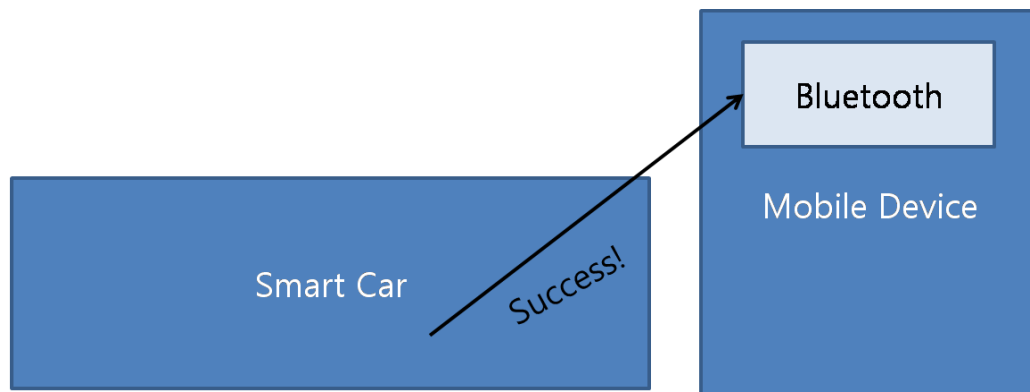


⑧ **Mixing the drink after putting a lid on cup.**

After putting a lid on cup, Smart device sends message to SmartCAR. Then, SmartCAR moves back and forth short.ly. It helps mix the drinks of cup.
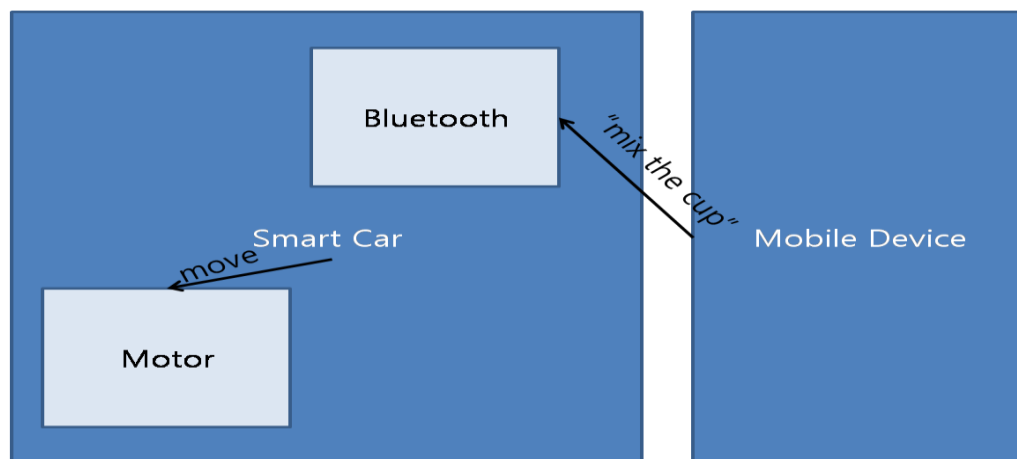


⑨ **Turning LED on/off when driving.**

Giving an interest and joyfulness, SmartCAR can control front and rear LED. Initially, front LED sets up HIGH, and rear LED sets up LOW. In driving, both LED blinks turn and turn.. Interval time is 1000ms. In special time, blink time can change diversely. For example, the time of mixing the drinks can blink rapidly.
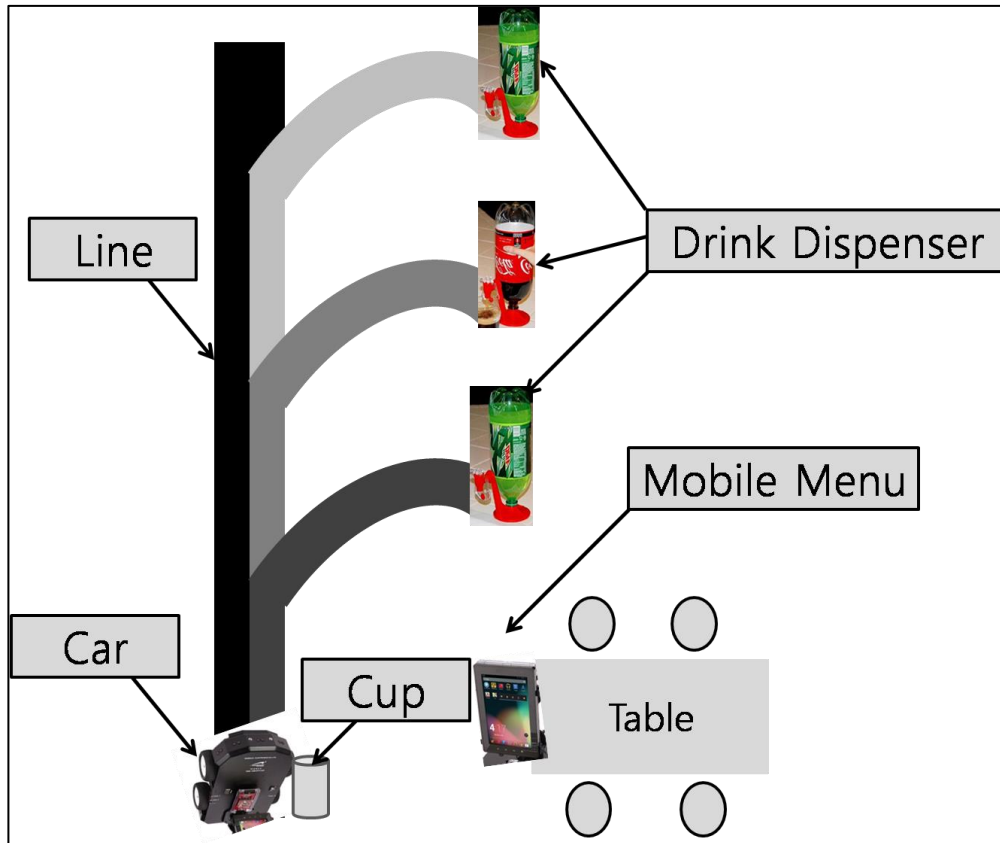
Above picture is overview of our project.. The SmartCAR can distinguish brightness of line. There are 3 dispenser, each dispenser has drinks bottle (In cocktail, it can be Vodka, peach juice and orange juice) . We'll print the line on paper.. The map is bigger than A4 paper, so we divide line by pieces, then glue pieces. SmartCAR is just car, so we combine car and cup. (This is very important part in view of secure of SmartCAR ☺ )

## 4. Contribution of our work to industry

### ① Attraction

The important part of cocktail industry is attraction for it. So, many cocktail bars use various ways to catch customer's eye. It can be another succession case for attraction. In fact, there is a similar case in sushi restaurant using mini cars and rails for serving. These pictures show the details of it.

(*Example

A) Customer can choose menu using touch menu device.

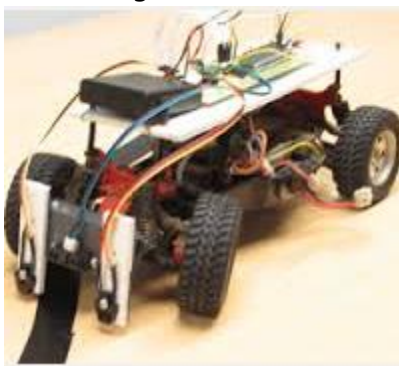B) Cook makes the right menu and then lay the dish on mini car for serving.



C) Mini car deliver the dish to the customer.



D) This unusual serving system makes the restaurant famous.)

## 5. Related work

① line tracking



Two infrared sensors were mounted to the front of the robot, enabling it to see a strip of black tape on the tabletop. It detects black line on white surface. Principle is simple. Left sensor will be controlling left motor, when the sensor is on white surface

motor will be switched on else switched off. Similarly right motor is controlled by right sensor. To sense the line properly sensor must be placed on he robot is such a way that they are every close the ground.　　Same thing is tracking the line, but different is that we distinguish diverse bright line.
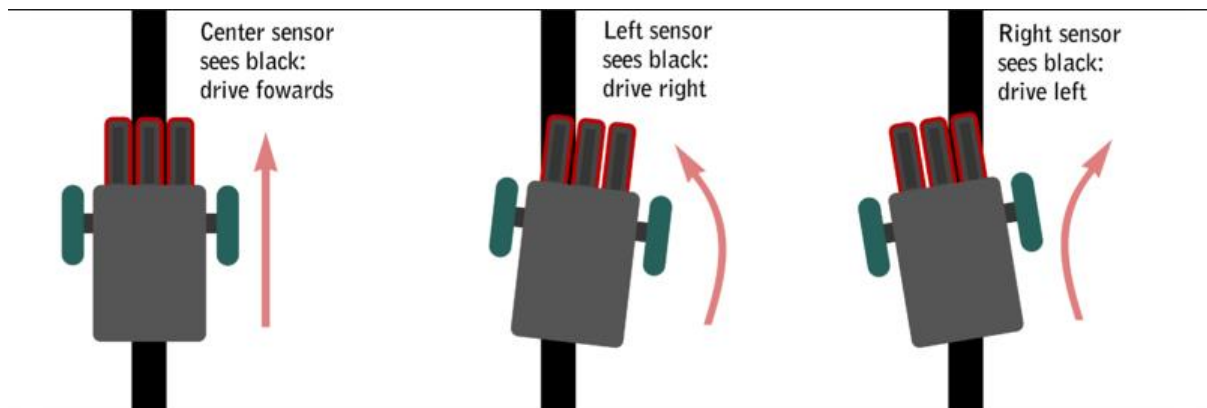


② arduino cocktail machine

That is based on arduino. Machine has some drink. Pushing the button, cup moves automatically and get the drinks. In machine, there are 9 bottles. In this bottles, it can make the cocktail more than 100.

Same thing is for making cocktail. However implementation is very different.



③ Minicar serving sushi.

In japan, there is special sushi shop., ordered menu come using minicar. Minicar is located above table. And, it has fixed rail. It is similar to conveyor belt.. Minicar moves just one direction, and it has go or stop.

Same thing is serving thought CAR. However difference is directional nation.



## 6.      System overview & Architecture
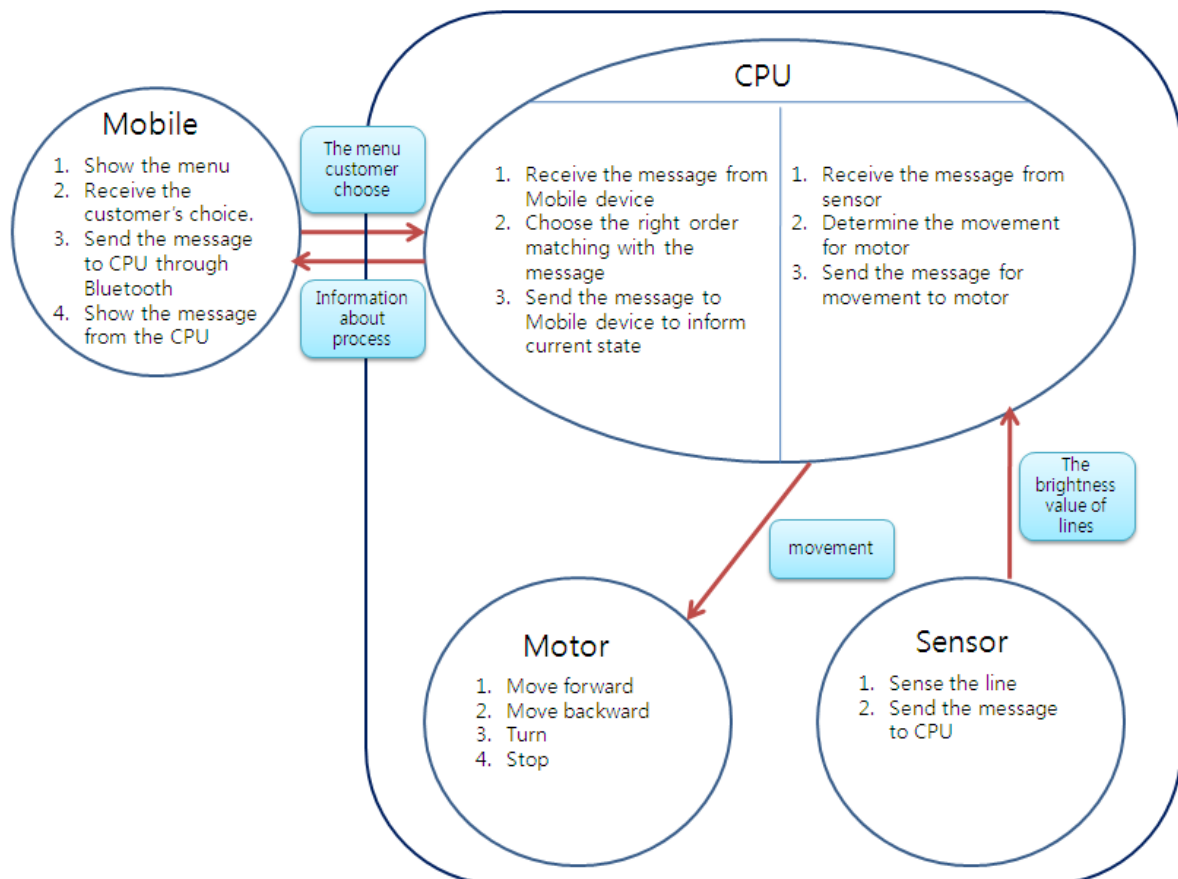


## 6. Development environment

–     Arduino Mega 2560-based SmartCAR

-    Android device

-    3 Drink Suspenser

-    Android Studio IDE

-    Sensor : infrared sensor

- Android app development – APP Invent


## 7. .Verification procedure

① Data Transmission Using Bluetooth

- Send the message from mobile to CPU (Can the SmartCAR select right way?)

- Send the message from CPU to mobile (Can the mobile shows right message?)

② Line Tracking

(Does the SmartCAR get out of the line with various type, brightness and direction?)

* Criteria = 1/2*(width of SmartCAR)

a) Forward

|        | Straight line | Curve |
|--------|---------------|-------|
| 100%   |               |       |
| 75%    |               |       |
| 50%    |               |       |
| 25%    |               |       |

b) Backward

|        | Straight line | Curve |
|--------|---------------|-------|
| 100%   |               |       |
| 75%    |               |       |
| 50%    |               |       |
| 25%    |               |       |

③ Distinguishing Brightness

(Can the SmartCARrecognize the different brightness between two lines?)

(SmartCAR has to send the check message to mobile)

* Comparison standard = 100% brightness

| 75% |  |
|-----|--|
| 50% |  |
| 25% |  |

④ Minimum distance between crossroads

(Can the SmartCAR track the right line without interrupt of other lines?)

| 30cm |  |
|------|--|
| 60cm |  |
| 90cm |  |

⑤ Minimum Shaking times

(How many times the SmartCAR shouldmove(=shake) to mix the drink?)

(Is there any layer in the drink?)

* 1 time = 1 back and forth

* Distance = 1m , Speed = standard speed*2

(Standard speed would be determined at the time to start the project)

| | |
|---------|---|
| 1 time  | |
| 2 times | |
| 3 times | |
| 4 times | |
| 5 times | |

## 9. What do you anticipate will be the easiest part of your project?

: The easiest part of our project is controlling of SmartCAR LED. As for function, it is not necessary. But, in this project, attraction is a considerable part. That's why we decided to using LED additionally. We will use LED when the car performs the last mission, shaking the drink and then delivering it to customer. It can make the car showy. We plan to conduct it using PWM. As we already learned for managing SmartCAR LED in the class, it can be relatively easy.

## 10. What do you anticipate will be the most difficult part of your project?:

The most difficult part of our project is making SmartCARdistinguish the line using difference of brightness. Also, it is the most important part of ours. That's because we use intensity difference to separateways to particular drinks. We have to make SmartCAR select the right road matching the order. Furthermore we have to use 4 different lines at least. Probably it would be better for starting from specifying the SmartCar's capacity for recognizing light and shade. Of course, it is not easy, but to our knowledge, it can be implemented.

## 11.Detatiled time plan

| 1주차 | 모바일환경 구축, 물품구매, 스마트카 specification측정 |
|-------|------------------------------------------------------|
| 2주차 | 모바일 통신관련 함수 구현 |
| 3주차 | : 모바일 통신관련 함수 구현 |
| 4주차 | line tracking using infrared sensor – 함수구현 |
| 5주차 | line tracking using infrared sensor – 함수구현 |
| 6주차 | line tracking using infrared sensor – 함수구현 |
| 7주차 | 자동차에 장비 세팅 및 베타테스트 및 디버깅 |
| 8주차 | 자동차에 장비 세팅 및 베타테스트 및 디버깅 |
| 9주차 | 베타테스트 및 디버깅 |
| 10주차 | 마무리 및 포스터 보고서(프리젠테이션) 작성 |

## 12. Refernce

Line tracking : http://www.machinescience.org/line-tracking-rc-car/

Cocktail machine : http://www.theinebriator.com/

sushi minicar : http://noas.tistory.com/1225