Integrated Real-Time Mobility Information System Providing Shortest-Path Applied To NUGU AI Speaker

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Abstract— *This service is a recommending system that applied to NUGU speaker. It provides integrated mobility information and recommends first-move vehicle to get to destination. Our team wants to provide some convenient functions to busy modern people.*

1) *Integrated all of vehicles(Bus, Subway, Seoul-bike, Kickboard) information.*
2) *Real-time information of above.*
3) *The shortest-time spent vehicle in ambiguous distance.*
4) *The best-first vehicle when the user picks a destination.*
5) *Voice information through NUGU speaker.*

By using our system, many people can have real-time criteria to choose among various vehicles.

Keywords—AI speaker, Bus, Subway, Seoul-bike, real-time, shortest path

Role Assignments

Roles	***Name***	***Task description and etc.***
User	*NUGU speaker users*	*The user's needs are the final goal of the project. They want to make their lives easier and more efficient through the output of the project. They can raise concerns and necessities to the project if their needs don't meet up to satisfaction. It is the most important their rules in a project.*
Customers	*SKT*	*Customers demand to the project to make satisfied with users. Customers are located between Develop teams and users. The user's needs through the whole project are really close to the main purpose of their rules because they are closely related to their interests. They want project teams to use NUGU speaker to satisfy users.*
Software developers	*Hyunho Kim, Kyumin Kim*	*Software developers are main resources of the the project. Their technical stacks and engineering skills create actual product. They demand core function requirements to Development managers which give them up to their developing process. Their final goal is to satisfy users and customers by realizing close to the requirements.*
Development managers	*Sangwon Kim, Injun Hwang*	*Development mangers intercommunicate with Customer and Software developer to satisfy with whole stakeholders. They schedule timelines to stick to the project before deadline. They build overall developing design process. So they should figure out what they are confronted by, such as threats and variables, plan projects and direct business matters that Software developers can't handle with. They support Software developers to focus on developing processes.*

I. INTRODUCTION

Nowadays, lots of modern people are too busy because of tight office-going hour or appointments. So they usually use various visualized applications which provide minimum path to minimize moving route and time. But routes recommended as the shortest route through applications don't include sharing vehicles such as Seoul-Bike or sharing kickboard. If that route includes sharing vehicles, The shortest path to destination will become extremely shorter. Thus, our team suggest a solution to this problem through our service and AI speaker.

First, Various sharing vehicles coming out in market, but some users feels sharing vehicles are too complex to use because their cumbersome applications(They need to check each applications, locations and remainders). So they feel tired or scared to use these things. The market of sharing mobility is getting bigger and its convenience and usefulness are expanding but many people can't enjoy them. Furthermore, even if they decide to use them, they have a lot work to do. For example, when the user wants to go SageunDong to Wangsimni, he has to open real-time bus timetable, Seoul-bike and various sharing kickboard applications. As a solution, our service serves all of information of sharing vehicles at once.

Second, even if they check all of the vehicle information, they have to judge when the bus will come or if Seoul-bikes and kickboards are around them. For example, as a mentioned above, the user gets information of three vehicles but they have to judge when the bus is coming, are there any kickboard and Seoul-bus around the user. As a solution, our service serve information(prediction time of upcoming bus, the count of Seoul-bike and kickboard near their house) of all of vehicles in real-time.

Third, current commercialized finding direction applications don't reflect about various sharing vehicles. If users want to travel an ambiguous distance, it is effective to use sharing vehicles. For example, if the time to wait for the upcoming bus is 15 minutes and takes 5 minutes, and taking kickboard takes just 10 minutes, it is better to use sharing kickboard. Our service can make solution for this situation, comparing the spending time to go somewhere. By comparing "walking time to bus station + waiting time for bus + taking time on bus | walking time to Seoul-bike + taking time on Seoul-bike | walking time to sharing kickboard + taking time on sharing kickboard", we can decide what vehicle to take is wise.

Fourth, the biggest anxiety of searching shortest time is the arrival time of the first location before destination. For example, if user want to go Hongik University from SageunDong, taking time to go to WangSimni station is the biggest anxiety factor. This factor is very variable depending on taking bus, Seoul-bike and kickboard around me. Our service suggests the fastest way to go to first stop to destination, it won't be a problem anymore.

Fifth, when users are in a hurry for going out and not knowing about what vehicle to take, they don't have enough time to calculate and compare what to take. Modern people usually very busy to prepare to go out. They even don't have time to open mobile application. For example, when they are wake up late and have to go school tightly, they have to open all of applications, calculate how much time to go to school by that vehicle, and compare each vehicle. Even the sharing kickboard applications don't supply about how much time to take to go somewhere. We decide to make better service which is appended sharing vehicle taking time that is discriminated than any other minimum path provider applications. During preparing, they can just ask NUGU speaker "How to get somewhere", and NUGU speaker answer "If you use sharing vehicle nearby, you can get there few minutes faster". In this scenario, they could save time to check what vehicles to take.

The AI speaker(Smart speaker) is a kind of wireless speaker, which is activate by more than one impressive words(hot words). Voice-Command-Device which embed The Virtual Assistant carries out co-interactive functions and hands-free commands.

The biggest difference between AI Speaker and typical Speaker is that the AI speaker recognizes "Speech Recognition" to perform specific commands like listening to music, setting alarm and timer, searching information like News, weather, etc. The main input and output unit of Speech-Recognition device is built-in Microphone and Speaker. The AI speaker is consisted of such like these simple units, so it is efficient to send and receive information than any other smartphone, smart TV.

Accordingly, the biggest advantage of using AI speaker is to order AI something by "Speak some words" when the user is doing some other things on their own hands or can't type some words through smart device. For example, when the user is driving or cooking, the user can't use smart device. And when the user is on the verge of falling asleep or busy for ready to go out, the user can't afford to use a smart device.

Specifically, The NUGU speaker is the first Korean-made AI speaker made by SKT in 2016. Over the last two years, The NUGU speaker so far developed a lot so typical functions such as mentioned above are already applied. So our team had to decide to make service that speaker doesn't provide and groundbreaking service. So our team decided to make service, "Shortest path guide including sharing vehicles".

This service is well suitable for NUGU speaker. The biggest advantage of NUGU speaker is when the user ask NUGU speaker what transportation to take, The NUGU speaker answer briefly in one sentence. The modern people are too busy to do other things, so it is better to deliver information of current transportations through "voice" than "visual". Also, It will be a solution for modern peoples of difficulty of choosing because the AI speaker just recommends the transportation, and the user doesn't have to choose what to take. Because of our precise recommend system of what transportation to take, the user don't need to choose other recommendation.

The integrated service we offer is different from other services. Other services just offer shortest time path, but we combine shortest path including sharing vehicles. The current shortest path recommending application's biggest problem is that it is not chasing the newest trends. In 2016, the use rate of Seoul-bike increased by 2615% compared to 2015. monthly downloads for Kick Going, the nation's largest electric kickboard rental company, increased approximately five times in April 2019 compared to November 2018. These statistics shows that the service will follow trends to success.

Furthermore, this service can be expanded to the service that all of the transportations are provided. The present plan is just for Subway, Bus, Seoul-bike, sharing kickboard, but later

it can provide another transportation, e.g. sharing car service. This service will be applied to NUGU service. This will become a Light to the busy daily life of modern people.

II. Requirements

1) User address informing to AI speaker

   This function will be used when the user wants to start this service. This is a module that teach AI speaker to know where is the user's NUGU speaker. When the user recognizes AI speaker through speaking where he or her is, the information of location is saved to backend server. By this function, the NUGU speaker can serve various functions below.

2) Serving distance of mobility station

   inform the user how long it takes to walk to mobility stations such as bus station, subway station, Seoul-bike rent station based on user's location.

   a. Location of bus station: inform the user how long it takes to walk to nearest bus station based on user's location

   b. Location of subway station: inform the user how long it takes to walk to nearest subway station based on user's location

   c. Location of Seoul-bike rent station: inform the how long it takes to walk to nearest Seoul-bike rent station based on user's location

3) Serving real-time information of mobility station :

   a. Real-time bus information : Inform the user how long it takes to walk to nearby bus station based on user's location. Also, it provides real-time upcoming bus information. By this function, user can checks information of the bus which can get user to the destination.

   b. Real-time subway information : Inform the user how long it takes to walk to nearby subway station. Also, it provides real-time subway route.

4) Destination informing to AI speaker

   The user notifies the destination that the user want to go to NUGU speaker. When the user notifies the destination to speaker, the speaker searches the first of the mobility to his destination.

5) Serving Real-time information of the first of the mobility to destination

   Serves real-time information(real-time subway, bus upcoming information, the count of remaining Seoul-bike, and location of Seoul-bike and sharing kickboard) of the first of the mobility to destination based on the user's location.

   a. Real-time bus information of the first of the bus to destination: Inform the user how long it takes to walk to nearby bus station that is the first of the mobility to destination is upcoming based on user's location. Also, it provides real-time upcoming bus information. By this function, user can checks information of the bus which can get user to the destination.

   b. Real-time subway information of the first of the bus to destination: Inform the user how long it takes to walk to nearby subway station that is the first of the mobility to destination is upcoming based on user's location. Also, it provides real-time subway route.

   c. Real-time Seoul-bike information of the first of the bus to destination: Inform the user how long it takes to walk to nearby Seoul-bike rent station that is the first of the mobility to destination based on user's location. Also, it provides real-time count of the remaining bikes.

   d. Real-time sharing kickboard information of the first of the bus to destination: Inform the user how long it takes to walk to nearby sharing kickboard that is the first of the mobility to destination based on user's location. Also, it provides what company of the kickboard is.

6) Reservation

   a. Seoul-bike reservation: This serves Seoul-bike rent page that user wants to use.

   b. Sharing kickboard reservation: This serves sharing kickboard preservation page that user wants to use.