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Scheduling Automatic Pickup by Self-driving Cars

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ABSTRACT

This disclosure includes techniques to automatically schedule pickups by self-driving cars. The techniques utilize data about a user such as the user's location, payments, calendar, to-do list etc. An example technique uses data from commercial establishments (e.g., payments systems), and self-driving cars to determine a location and a time at which the user needs to be picked up. A self-driving car system schedules a self-driving car to pick up the user at the specific location and time. The techniques described may be implemented in self-driving cars, a central server system, user mobile devices, client devices, or different combinations of these systems and devices.

KEYWORDS

- autonomous vehicle
- self-driving car
- automatic pickup
- schedule pickup

BACKGROUND

Visitors to commercial establishments such as restaurants sometimes have drivers/ chauffeurs or valets at the establishments park their cars. When the visitor is ready to leave, the visitor can place a call to the chauffeur or valet and have the car be brought to the right location (e.g., an exit gate of the establishment) at the right time.

In an example scenario, the car is a self-driving or autonomous vehicle that originally dropped the visitor off at the entrance to the commercial establishment. In this scenario, it would offer a great convenience to the visitor if the self-driving car showed up at the right spot at the right time for pickup, like a called chauffeur or valet.

DESCRIPTION

This disclosure describes techniques to schedule automatic pickup at a suitable time at a particular location by self-driving cars. Users of self-driving cars may include people who own such cars. Users may also include people who rent self-driving cars e.g., when the cars operate as taxis or are otherwise available for rent. The techniques are described with reference to Fig. 1 which shows an example environment in which automatic pickup by self-driving driving cars is scheduled.

In Fig. 1, a user (110) is shown at a commercial establishment (140) such as a restaurant, a grocery store, a shopping mall etc. The commercial establishment may be coupled to a network (150). For example, the commercial establishment includes a payments system that exchanges data over the network. In some examples, the user carries a user mobile device (110a). The mobile device (110a) may be a smartphone, a wearable device, a tablet, and/or a head mounted display. The user mobile device (110a) is coupled to the network (150). The user mobile device (110a) is capable of performing various operations, such as making a payment via an electronic wallet, tracking the user's location e.g., by using the Global Positioning System (GPS) etc.

Self-driving cars (120a, 120b) are shown as part of the environment. Self-driving cars are any kind of automated vehicle. Self driving cars are coupled to the network. In the example shown in Fig. 1, self-driving car system (130) is shown separate from self-driving cars i.e., self-driving car system is implemented in a server computer coupled to the network. In some examples, self-driving car system can be implemented in self-driving cars. In some examples, self-driving car system can be implemented in any combination of a server, the user mobile device (110a), and self-driving cars.

Self-driving car system includes a scheduling module (132) configured to exchange data over the network with user devices and with self-driving cars. The scheduling module is coupled to user data store (134) and is configured to access data in the user data store. The user data store includes data for users for users who consent to collection and storing of such data. The user data store includes data regarding various user activities such as payments (134a), To-do list (134b), location (134c), calendar (134d), and historical behavior (134e). In an example scenario, the user data store may include only some of user data 134a-134e. In

some cases, where users approve of such collection, additional user data may be available in the user data store. The scheduling module retrieves and/or updates data in the user data store. The user data store indexes data for each user e.g., by linking data records to a user identifier such as an e-mail id.

The self-driving car system can be implemented in one or more server computers, or as a distributed system. In an example scenario, the self-driving car system is distributed over one or more servers and self-driving cars 120. Scheduling module (132) can be implemented as instructions in hardware, software, or a combination of hardware and software. User data store (134) is implemented in a memory of the self-driving car system.

Examples of use

Example 1

The user is at a commercial establishment such as a restaurant, grocery store, or a mall. The user makes a payment, which indicates that the user's work at the establishment is almost complete. The scheduling module determines that a payment is made. The scheduling module receives payments data from the commercial establishment over the network and determines that a payment is made by the user using an electronic payment method such a credit/debit card, electronic wallet etc. The scheduling module links the event of making the payment to the user identifier. The scheduling module notifies the self-driving car that the user's work at the establishment is almost complete and triggers the self-driving car. The self-driving car is then activated to drive itself to the pickup location for the user.

Example 2

The user maintains a to-do list. The scheduling module accesses the to-do list to determine the various tasks that the user intends to perform (e.g., shop for a list of groceries). The scheduling module accesses the user's location (e.g., using data from the user mobile device) and payments history (e.g., data from the commercial establishment or data from user's mobile device). The scheduling module determines the types of stores visited and in some examples, also determines items bought based on such data. When the scheduling module determines that all the tasks (e.g., tasks that are related to the present location) are complete, the scheduling module triggers the self-driving car to pick up the user from the present location.

Example 3

The user maintains a calendar. The scheduling module accesses the calendar to determine the metadata for an event e.g., that the event is a golf meeting that occurs monthly on Sunday from 10 am to 1 pm. The scheduling module accesses historical behavior data to determine that in the past, the user returned to the car after the golf meeting at 1:15 pm. The scheduling module utilizes this information to notify the self-driving car to pick up the user at the meeting location at 1:15 pm. The scheduling module can also specify a specific pickup location for the self-driving car. For example, if the historical behavior or location of the user indicates an exit location (e.g., an exit gate of the golf course) that is different from the drop location (e.g., an entry gate of the golf course), the scheduling module specifies the exit location as the pickup location.

In some implementations, the scheduling module also specifies a time at which the self-driving car should reach the pickup location. For example, the scheduling module determines that the time of pickup should be x minutes (e.g., 5 minutes, 10 minutes, or 15 minutes) from the occurrence of the payment event. The scheduling module makes such determination based on historical data (e.g., historical data about last 3 pickups at the location) In some examples, when the user consents to use of such information, the scheduling module makes such determination based on the user's current location e.g., from a GPS location determined by the user mobile device.

Scenarios of use

The self-driving car system described here can be used in different scenarios. A first scenario is when the user owns the self-driving car and the self-driving car is parked in the vicinity of an establishment where the user is dropped off. A second scenarios is when the user rents the self-driving car for a duration of time (e.g., an all-day, weekly, or monthly rental) and the car is parked in the vicinity of the drop-off location. In these scenarios, the scheduling module of the self-driving car system schedules pickup by the same self-driving car that dropped off the user.

In another scenario, the user rents a self-driving car (e.g., 120a) for a drop. In this scenario, the same self-driving car may not be available when the user is ready to be picked up. The scheduling module rents another self-driving car (e.g., 120b) that is available in the vicinity of the user. The scheduling module provides the pick up location to the self-driving

car (120b) and provides the users with details of the vehicle that is scheduled to pick up the user.

This disclosure allows a user to automatically schedule pickups by self-driving cars based on data about a user such as the user's location, payments, calendar, to-do list etc. The described techniques provide advantages, in that they do not require a user to manually enter information such as pick up time or location or otherwise instruct the self-driving car.

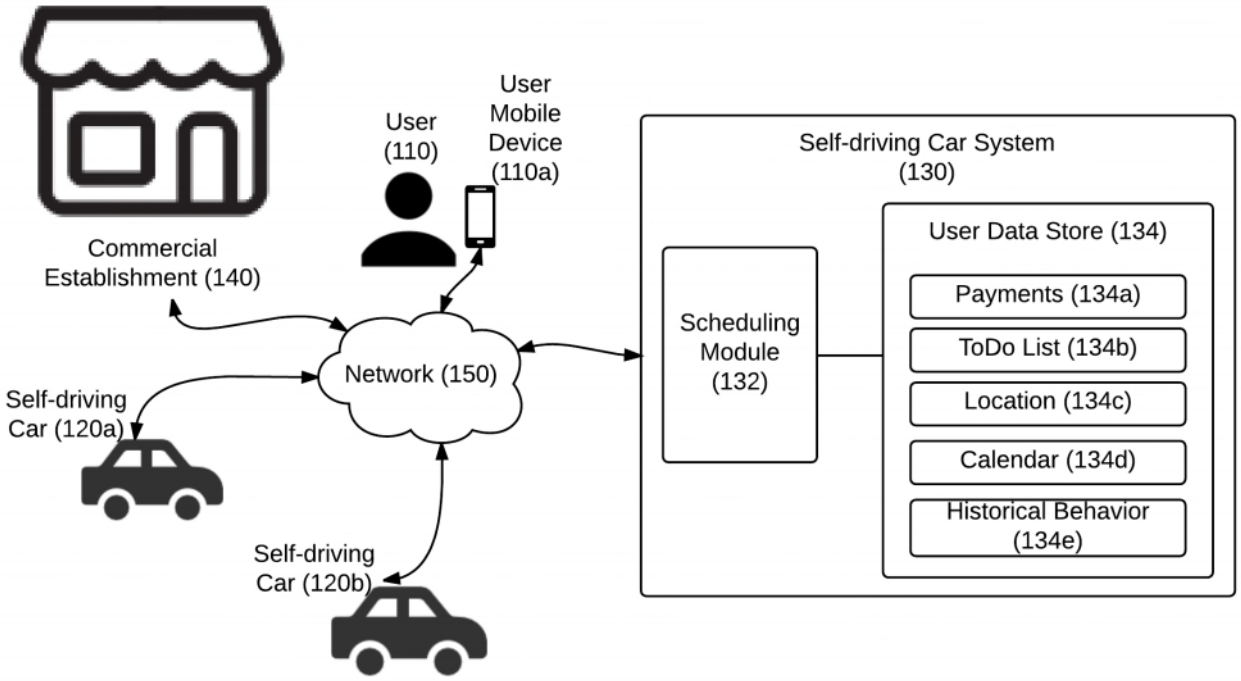
User
(110)
User
Mobile
Device
(110a)
Commercial
Establishment (140)
Network (150)
Self-driving
Car (120a)
Self-driving
Car (120b)
Self-driving Car System
(130)
Scheduling
Module
(132)
User Data Store (134)
Payments (134a)
ToDo List (134b)
Location (134c)
Calendar (134d)
Historical Behavior
(134e)

Fig. 1