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Oommen

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(54) **METHOD FOR OVER THE AIR MOBILE STATION MANAGEMENT**

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H04M 3/00 (2006.01)

(52) **U.S. Cl.** **455/419**; 455/420; 455/414.1; 455/517

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See application file for complete search history.

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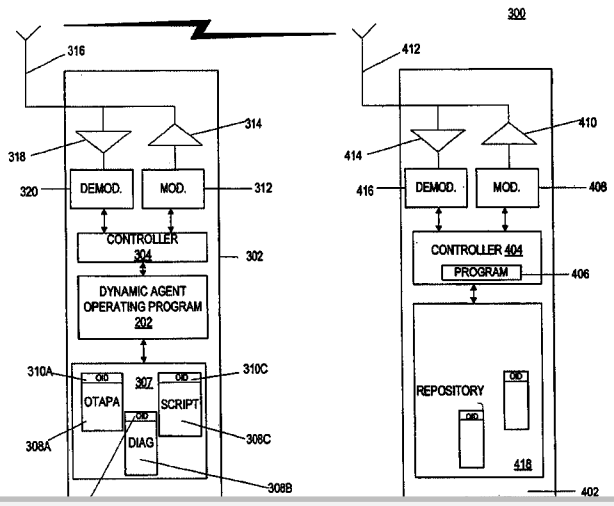
Primary Examiner—Nay Maung
Assistant Examiner—John J. Lee
(74) *Attorney, Agent, or Firm*—Banner & Witcoff, Ltd.

(57) **ABSTRACT**

The invention provides a system and method for managing a mobile station wirelessly. The control software includes a dynamic agent operating program and a group of objects linked to the dynamic agent operating program. Some of the objects allow the mobile station to utilize services, such as accessing the Internet or E-mail services. Additional objects for providing access to new services may be wirelessly transmitted from a management server to the mobile station over the air and stored in the mobile station. Users may selectively delete and download objects to customize the services available through their mobile stations while minimizing the memory requirements of the mobile station.

3 Claims, 3 Drawing Sheets



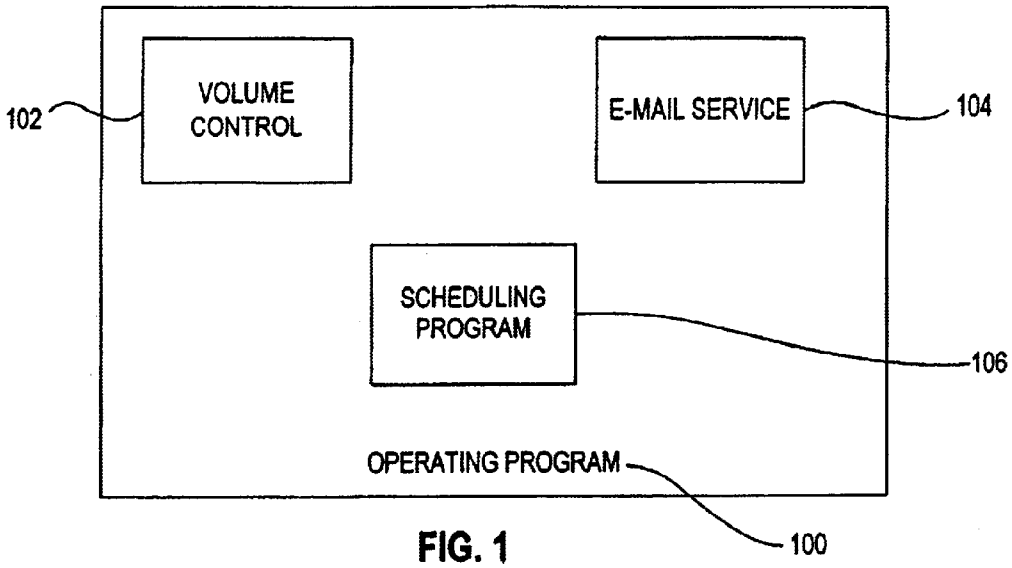


FIG. 1
(PRIOR ART)

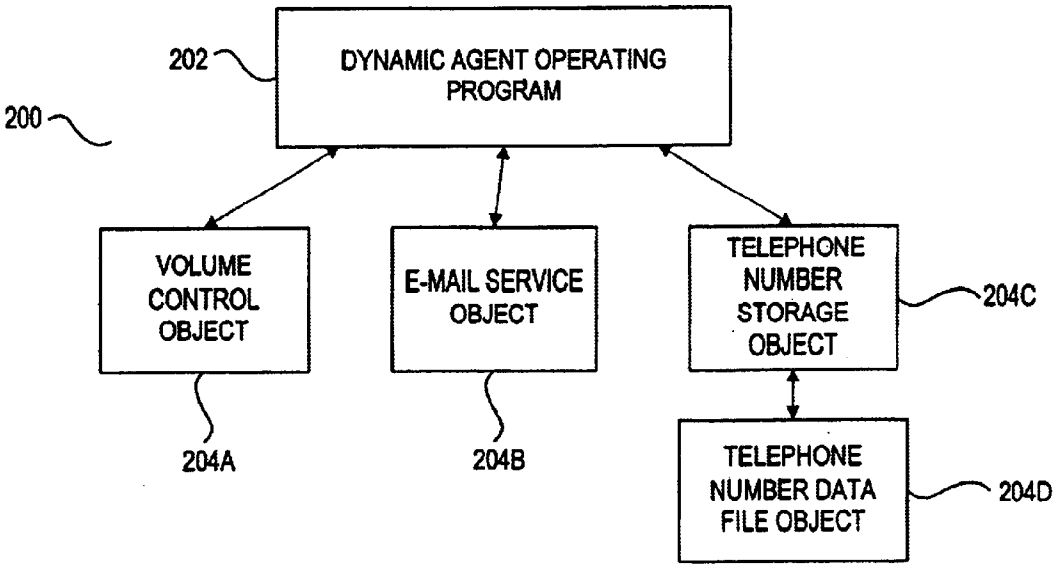


FIG. 2

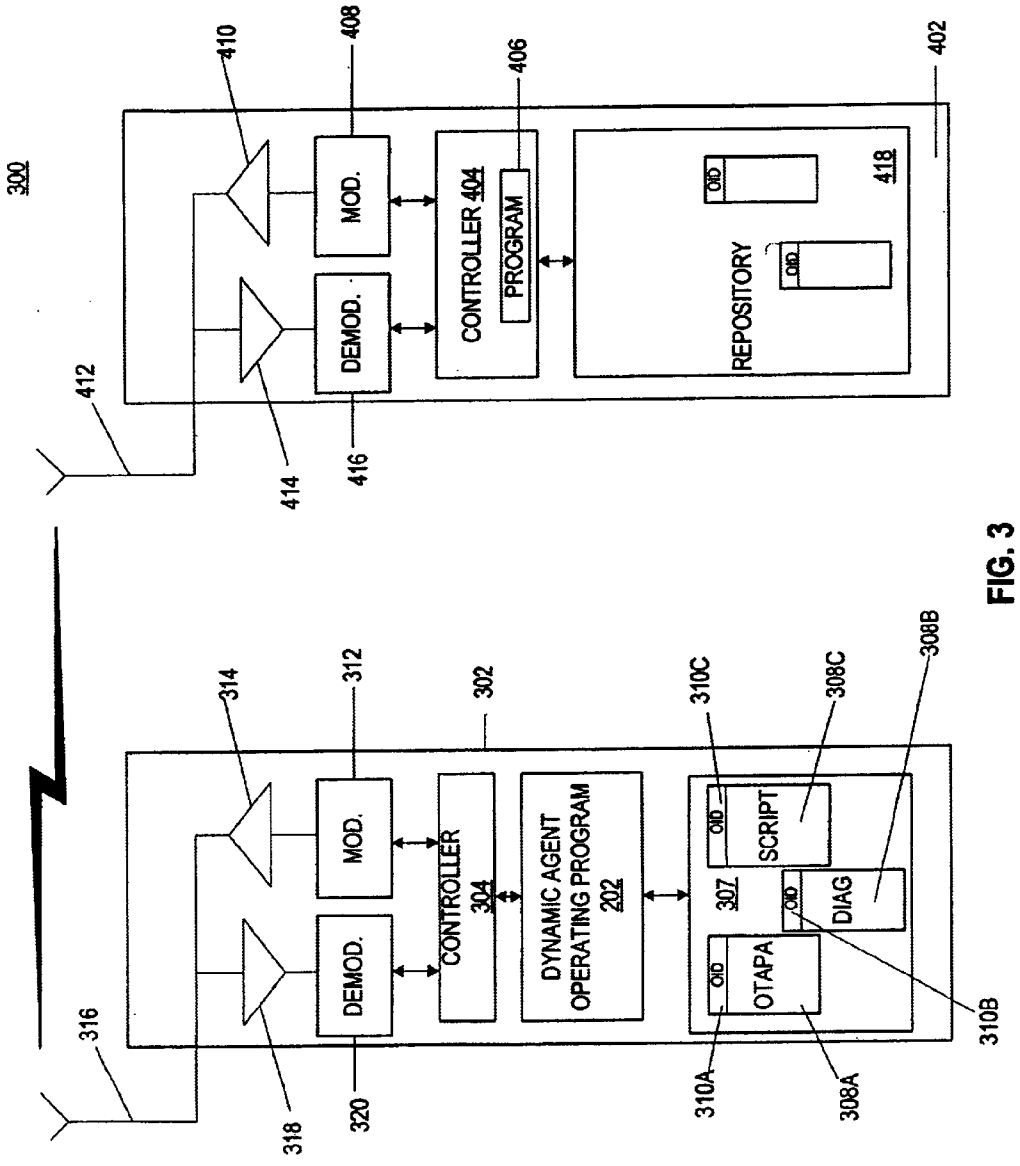


FIG. 3

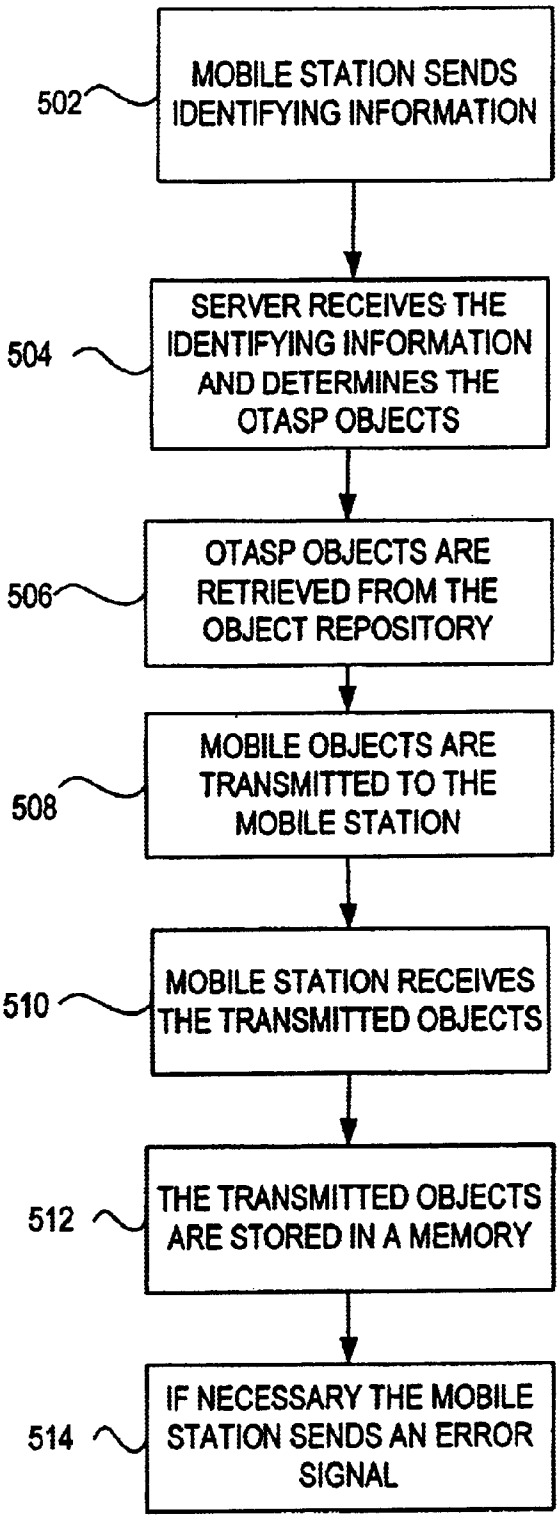


FIG. 4

METHOD FOR OVER THE AIR MOBILE STATION MANAGEMENT

BACKGROUND OF THE INVENTION

1. Technical Field

This invention relates generally to the management of mobile stations. More particularly, the invention provides a method and system for remotely managing and programming a mobile station over the air.

2. Related Information

Consumers are increasingly using mobile stations, such as cellular telephones and handheld computing devices. In addition to the traditional function of transmitting telephone calls, mobile stations have been used for additional functions, such as accessing the Internet, storing scheduling information and storing telephone numbers. Service providers are constantly increasing the number of services available to consumers through mobile stations.

FIG. **1** shows a conventional monolithic operating program **100** for a conventional mobile station. Conventional operating programs include modules for controlling the operation of the mobile station and providing services to users. For example, operating program **100** includes a volume control module **102** for controlling the volume of the mobile station speaker (not shown) and an e-mail service module **104** for allowing the user to send and receive e-mail messages. Operating program **100** also includes scheduling program module **106** for storing scheduling information. Conventional operating programs may include a variety of additional modules.

When a service provider offers a new service to consumers, it is often necessary to update the software in the mobile station for the consumer to utilize the new service. In particular, it is often necessary to replace the existing operating program with a new operating program that includes a module allowing the user to utilizing the new service. As the number of available services increases, so does the size of the operating program.

In some cases, consumers have been required to bring their cellular telephones to services centers to have new software installed. Consumers are less likely to use new services when they are required to go through burdensome steps to use the new service. An alternative method that involves transmitting an entire new processing program over the air is described in U.S. Pat. No. 5,887,254 to Halon.

Conventional operating programs also do not include diagnostic modules for diagnosing malfunctions. In many instances consumers are required to bring their mobile stations to service centers when their mobile stations malfunction. Service centers perform diagnostic tests on the mobile station and correct the identified problem. The diagnostic process may involve executing one or more diagnostic software modules using the processor of the cellular telephone. Furthermore, the process of correcting the program may involve changes to the software installed on the telephone.

Therefore, there exists a need for a system and method that allows consumers to conveniently receive updates to the software installed on their mobile stations and to have malfunctions diagnosed while minimizing the memory requirements of the mobile stations and the drain on cellular telephone networks.

SUMMARY OF THE INVENTION

control software installed in a mobile station. In one embodiment of the invention, a method of modifying control software installed on a mobile station is provided. The control software includes a dynamic agent operating program linked to a group of objects. The method includes the steps of wirelessly transmitting a new object from a management server to a mobile station over the air; receiving the new object at the mobile station; and storing the new object in a memory of the mobile station.

In another embodiment of the invention, a mobile station that allows a user to communicate in a wireless manner is provided. The mobile station includes a controller that manages the operation of the mobile station. A control program that includes a group of current objects stored in an object memory and dynamic agent operating program stored in a program memory are also provided. The dynamic agent operating program uses the group of current objects to control the operation of the mobile station. Furthermore, the controller and the dynamic agent operating program are configured to allow the mobile station to receive additional objects broadcast in a wireless manner and to store the additional objects in the object memory.

In accordance with, another embodiment of the invention, a system for reconfiguring control software stored in a mobile station is provided. The control software includes a dynamic agent operating program linked to a group of objects. The system includes a mobile station configured to receive and store new objects and a management server configured to wirelessly transmit the new objects to the mobile station.

In accordance with yet another embodiment of the invention a management server that transmits data to reconfigure control software stored in a mobile station is provided. The control software includes a dynamic agent operating program linked to a group of objects. The management server includes a memory containing new objects and a transmitter that transmits the new objects to a mobile station.

The invention, described in detail below, allows users to selectively delete and download objects to customize the services available through their mobile stations while minimizing the memory requirements of the mobile station. Other features and advantages of the invention will become apparent with reference to the following detailed description and the figures.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows a conventional monolithic operating program used by conventional mobile stations.

FIG. **2** shows a control program that includes a dynamic agent operating program and objects in accordance with a preferred embodiment of the invention.

FIG. **3** shows system for over the air management of a mobile station in accordance with a preferred embodiment of the invention.

FIG. **4** shows a method for downloading objects to a mobile station in response to a request from the mobile station.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. **2** shows a control program **200** that includes a dynamic agent operating program **202** and objects **204**A–**204**D for controlling the operation of a mobile sta-

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