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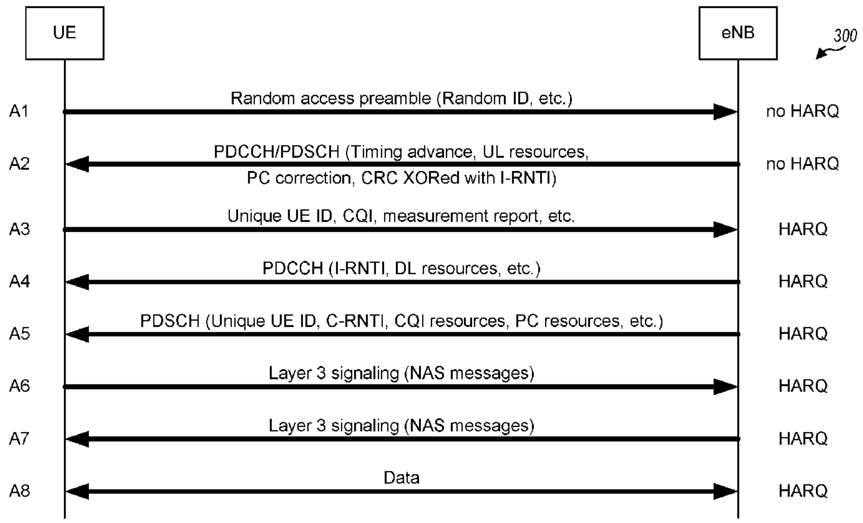
(54) Title: RANDOM ACCESS SIGNALING TRANSMISSION FOR SYSTEM ACCESS IN WIRELESS COMMUNICATION



(57) Abstract: Techniques for transmitting random access signaling for system access are described. In an aspect, random access signaling may be sent based on at least one transmission parameter having different values for different user equipment (UE) classes. At least one parameter value may be determined based on a particular UE class, and the random access signaling may be sent based on the determined parameter value(s). The random access signaling may be a random access preamble, and the at least one transmission parameter may include a target SNR, a backoff time, and/or a power ramp. The random access preamble may then be sent based on a target SNR value, a power ramp value, and/or a backoff time value for the particular UE class. In another aspect, a message for system access may be sent based on a power control correction received in a random access response for the random access preamble.

WO 2008/042967 A2

RANDOM ACCESS SIGNALING TRANSMISSION FOR SYSTEM ACCESS IN WIRELESS COMMUNICATION

[0001] The present application claims priority to provisional U.S. Application Serial No. 60/828,058, filed October 3, 2006, and assigned to the assignee hereof and incorporated herein by reference.

BACKGROUND

I. Field

[0002] The present disclosure relates generally to communication, and more specifically to techniques for accessing a wireless communication system.

II. Background

[0003] Wireless communication systems are widely deployed to provide various communication content such as voice, video, packet data, messaging, broadcast, etc. These wireless systems may be multiple-access systems capable of supporting multiple users by sharing the available system resources. Examples of such multiple-access systems include Code Division Multiple Access (CDMA) systems, Time Division Multiple Access (TDMA) systems, Frequency Division Multiple Access (FDMA) systems, Orthogonal FDMA (OFDMA) systems, and Single-Carrier FDMA (SC-FDMA) systems.

[0004] A wireless communication system may include any number of base stations that can support communication for any number of user equipments (UEs). Each UE may communicate with one or more base stations via transmissions on the downlink and uplink. The downlink (or forward link) refers to the communication link from the base stations to the UEs, and the uplink (or reverse link) refers to the communication link from the UEs to the base stations.

[0005] A UE may transmit a random access preamble (or an access probe) on the uplink when the UE desires to gain access to the system. A base station may receive the random access preamble and respond with a random access response (or an access grant) that may contain pertinent information for the UE. Uplink resources are consumed to transmit the random access preamble, and downlink resources are consumed to transmit the random access response. Furthermore, the random access preamble and other signaling sent for system access may cause interference on the uplink. There is therefore a need in the art for techniques to efficiently transmit the random access preamble and signaling for system access.

SUMMARY

[0006] Techniques for efficiently transmitting random access signaling for system access are described herein. In an aspect, a UE may send random access signaling based on at least one transmission parameter having different values for different UE classes, which may provide certain advantages described below. At least one parameter value for the at least one transmission parameter may be determined based on a particular UE class. The random access signaling may then be sent based on the at least one parameter value for system access.

[0007] In one design, the random access signaling may be a random access preamble, which is signaling sent first for system access. The at least one transmission parameter may comprise a target signal-to-noise ratio (SNR) for the random access preamble. The transmit power of the random access preamble may be determined based on a target SNR value for the particular UE class and other parameters. The random access preamble may then be sent with the determined transmit power. In another design, the at least one transmission parameter may comprise a backoff time, and the amount of time to wait between successive transmissions of the random access preamble may be determined based on a backoff time value for the particular UE class. In yet another design, the at least one transmission parameter may comprise a power ramp, and the transmit power for successive transmissions of the random access preamble may be determined based on a power ramp value for the particular UE class.

[0008] In another design, the random access signaling may be a message sent after receiving a random access response for the random access preamble. The at least one transmission parameter may comprise a power offset between a first channel used to send the random access preamble and a second channel used to send the message. The transmit power of the message may be determined based on a power offset value for the particular UE class, and the message may be sent with the determined transmit power.

[0009] In another aspect, a message for system access may be sent based on a power control (PC) correction. A random access preamble may be sent for system access, and a random access response with a PC correction may be received. The transmit power of the message may be determined based on the PC correction and other parameters such as the power offset between the channels used to send the random access preamble and the message. The message may then be sent with the determined transmit power.

[0010] Various aspects and features of the disclosure are described in further detail below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1 shows a wireless multiple-access communication system.

[0012] FIG. 2 shows a transmission structure for the uplink.

[0013] FIG. 3 shows a message flow for initial system access.

[0014] FIG. 4 shows a message flow for system access to transition to an active state.

[0015] FIG. 5 shows a message flow for system access for handover.

[0016] FIG. 6 shows successive random access preamble transmissions with backoff.

[0017] FIG. 7 shows a block diagram of an eNB and a UE.

[0018] FIG. 8 shows a process for transmitting random access signaling.

[0019] FIG. 9 shows an apparatus for transmitting random access signaling.

[0020] FIG. 10 shows a process for transmitting a message for system access.

[0021] FIG. 11 shows an apparatus for transmitting a message for system access.

DETAILED DESCRIPTION

[0022] The techniques described herein may be used for various wireless communication systems such as CDMA, TDMA, FDMA, OFDMA, SC-FDMA and other systems. The terms “system” and “network” are often used interchangeably. A CDMA system may implement a radio technology such as Universal Terrestrial Radio Access (UTRA), cdma2000, etc. UTRA includes Wideband-CDMA (W-CDMA) and Low Chip Rate (LCR). cdma2000 covers IS-2000, IS-95 and IS-856 standards. A TDMA system may implement a radio technology such as Global System for Mobile Communications (GSM). An OFDMA system may implement a radio technology such as Evolved UTRA (E-UTRA), Ultra Mobile Broadband (UMB), IEEE 802.11 (Wi-Fi), IEEE 802.16 (WiMAX), IEEE 802.20, Flash-OFDM®, etc. UTRA, E-UTRA and GSM are part of Universal Mobile Telecommunication System (UMTS). 3GPP Long Term Evolution (LTE) is an upcoming release of UMTS that uses E-UTRA, which employs OFDMA on the downlink and SC-FDMA on the uplink. UTRA, E-UTRA, GSM, UMTS and LTE are described in documents from an organization named "3rd Generation Partnership Project" (3GPP). cdma2000 and UMB are described in documents from an organization named "3rd Generation Partnership Project 2" (3GPP2). These various radio technologies and standards are known in the art. For clarity, certain aspects of the techniques are described below for system access in LTE, and LTE terminology is used in much of the description below.

[0023] **FIG. 1** shows a wireless multiple-access communication system 100 with multiple evolved Node Bs (eNBs) 110. An eNB may be a fixed station used for communicating with the UEs and may also be referred to as a Node B, a base station, an access point, etc. Each eNB 110 provides communication coverage for a particular geographic area. The overall coverage area of each eNB 110 may be partitioned into multiple (e.g., three) smaller areas. In 3GPP, the term "cell" can refer to the smallest coverage area of an eNB and/or an eNB subsystem serving this coverage area. In other systems, the term "sector" can refer to the smallest coverage area and/or the subsystem serving this coverage area. For clarity, 3GPP concept of cell is used in the description below.

[0024] UEs 120 may be dispersed throughout the system. A UE may be stationary or mobile and may also be referred to as a mobile station, a terminal, an access terminal, a subscriber unit, a station, etc. A UE may be a cellular phone, a personal digital assistant (PDA), a wireless modem, a wireless communication device, a handheld device, a laptop computer, a cordless phone, etc. A UE may communicate with one or more eNBs via transmissions on the downlink and uplink. In FIG. 1, a solid line with double arrows indicates communication between an eNB and a UE. A broken line with a single arrow indicates a UE attempting to access the system.

[0025] **FIG. 2** shows an example transmission structure for the uplink. The transmission timeline may be partitioned into units of radio frames. Each radio frame may be partitioned into multiple (S) subframes, and each subframe may include multiple symbol periods. In one design, each radio frame has a duration of 10

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