

aspects of the system. One of the flags determines whether a specific player has permission to engage in voice chat. Accordingly, in the event that a specific player violates the terms of service or code of conduct, the bit controlling the ability of the player to communicate by voice can be changed to preclude such voice communications.

Once a player has elected to preclude voice communications with a specific player, the identification of the specific player is preferably transmitted to an online game service and stored there in relation to the identity of the player making that election, so that in future sessions of any games, the player who has made such a decision will not receive any voice communication from the specific other player and will not transmit any voice communication to the specific other player. This decision will not be apparent to the specific other player, since the dialog box showing the status of players in a game will simply display an indication on the specific other player's view that the player making that decision lacks voice communication capability, and in the dialog displayed to the player making the decision, the muted status of the specific other player will be indicated. Thus, even though the specific player changes the alias used or signs on with a different game console, the prohibition against voice communication for the specific player made by a player will continue in force.

It is also contemplated that the PCM data will also include lip position information associated with each segment of speech. The lip-sync information will be generated and transmitted to the encoder with the PCM data, converted to compressed data, and transmitted to recipient player so that when a player is speaking, the character represented and controlled by that player in the game appears to be speaking in synchronization with the words spoken by the player. Depending upon the nature of the graphics character representing the player who is speaking, the nature of the "mouth" may differ from that of a normal oral portion of a human's anatomy. For example, a character in a game might be an alien that has mandibles that move when the character speaks. Nevertheless, the synchronization of the oral portion of the character with the word spoken adds to the realism in game play. Details for accomplishing lip-sync using graphic characters and spoken words are disclosed in a commonly assigned U.S. Pat. No. 6,067,095 the disclosure and drawings of which are hereby specifically incorporated herein by reference. Alternatively, lip synchronization information can be extracted from the compressed data during decoding.

One of the advantages of the present invention is that it combines voice streams for all of the players on a game console into a single compressed data stream to more efficiently transmit data over a network within a limited bandwidth. Thus, when players on the same game console are talking to all of the other players participating in a game, all of the voice data for the players on the same console are combined into one network stream. It is not necessary to send multiple voice data streams from the game console.

Another advantage of the present invention is its ability to allocate a maximum number of encoders that is half of the number of players that might be playing a game on a game console. Accordingly, the game designer can determine the amount of resources to be allocated to voice communications and can limit those resources by, for example, providing only two encoders and requiring that the encoders operate in round-robin as discussed above. Although there is a slight negative effect from using previously transmitted packets when carrying out the round-robin approach, the adverse effect on the quality of voice communication is greatly outweighed by the limitation on the use of comput-

ing resources for voice communications to minimize adverse effects on the quality of game play.

When participating in a game over the Internet or other network, a player may optionally, depending upon the game being played, choose to play only with players who agree to a specific language in which voice communications are to be conducted. Also, the player can optionally determine that the game will only be played with those players having voice communication capability. Similarly, players without voice communication capability may selectively engage in games only with those other players who also do not have voice communication capability.

Although the present invention has been described in connection with the preferred form of practicing it, those of ordinary skill in the art will understand that many modifications can be made thereto within the scope of the claims that follow. Accordingly, it is not intended that the scope of the invention in any way be limited by the above description, but instead be determined entirely by reference to the claims that follow.

The invention in which an exclusive right is claimed is defined by the following:

1. A method for encoding a plurality of audio channels during play of an electronic game, using at least one encoder, but fewer encoders than audio channels to be encoded, each encoder encoding audio signals in an active audio channel and producing corresponding data packets for transmission to at least one recipient participating in the play of the electronic game, comprising the steps of:

- (a) creating a round robin history of the audio channels that have been encoded by the encoders during successive processing intervals;
- (b) if more than one audio channel per encoder are simultaneously active, selecting an audio channel to encode with each encoder based upon the round robin history and on the audio channels that are then active, so that an audio channel that is active will be skipped and not encoded more frequently than every other processing interval; and
- (c) updating the round robin history for each processing interval to indicate each audio channel that was encoded during the processing interval.

2. The method of claim 1, wherein the step of creating the round robin history comprises the step of indicating each audio channel that has just been encoded during a current processing interval, at a lower priority position in the round robin history.

3. The method of claim 2, wherein the round robin history includes indications of the audio channels in successively lower priority positions, from a highest priority to the lowest priority position, and wherein the step of selecting the audio channel to encode comprises the step of checking the audio channels that are indicated in said positions, starting at the highest priority position in the round robin history to determine if the audio channel indicated is active and if so, encoding said audio channel with any available encoder, so that audio channels that are active and have a higher priority position in the round robin history list are selected first for encoding.

4. The method of claim 1, wherein if a data packet for a specific audio channel that is still active was not encoded in a processing interval, further comprising the step of duplicating audio data from a data packet that was encoded and transmitted for said specific audio channel during an immediately prior processing interval, to provide audio data to be played for said specific audio channel for the processing interval in which the audio data packet was not encoded.