

GROUPING AND USE OF SHORT SEQUENCE SIGNALS

TECHNICAL FIELD

This disclosure is directed generally to digital wireless communications.

BACKGROUND

Mobile telecommunication technologies are moving the world toward an increasingly connected and networked society. In comparison with the existing wireless networks, next generation systems and wireless communication techniques will need to support a much wider range of use-case characteristics and provide a more complex and sophisticated range of access requirements and flexibilities.

Long-Term Evolution (LTE) is a standard for wireless communication for mobile devices and data terminals developed by 3rd Generation Partnership Project (3GPP). LTE Advanced (LTE-A) is a wireless communication standard that enhances the LTE standard. The 5th generation of wireless system, known as 5G, advances the LTE and LTE-A wireless standards and is committed to supporting higher data-rates, large number of connections, ultra-low latency, high reliability and other emerging business needs.

SUMMARY

This disclosure relates to methods, systems, and devices for grouping and using short sequences in wireless communications, such as Physical Uplink Control Channel (PUCCH) and/or short PUCCH transmissions.

In a first aspect, the present disclosure provides a method for wireless communication, comprising: transmitting information to a wireless communication node based on a target sequence, wherein the target sequence is a member of a target sequence set, wherein each target sequence of the target sequence set corresponds to a sequence of an individual sequence group, and wherein the target sequence and the sequence of the individual sequence group have a degree of correlation with each other, wherein each target sequence of the target sequence set is a length-12 sequence, wherein a group index of the individual sequence group is denoted as u , and wherein the sequence which the length-12 target sequence corresponds to comprises at least one of:

$$\varphi(n) = [3 \ -1 \ -3 \ 3 \ -3 \ -1 \ 3 \ 3 \ 3 \ -3 \ -1 \ -3] \text{ with } u = 23,$$

$$\begin{aligned}\varphi(n) &= [1 \ -1 \ 3 \ -1 \ -1 \ -1 \ -3 \ -1 \ 1 \ 1 \ 1 \ -3] \text{ with } u = 6, \\ \varphi(n) &= [-1 \ -1 \ -1 \ -1 \ 1 \ -3 \ -1 \ 3 \ 3 \ -1 \ -3 \ 1] \text{ with } u = 16, \\ \varphi(n) &= [-3 \ -3 \ 3 \ 3 \ 3 \ -3 \ -1 \ 1 \ -3 \ 3 \ 1 \ -3] \text{ with } u = 27, \\ \varphi(n) &= [-3 \ 3 \ 1 \ -3 \ 1 \ 3 \ -1 \ -1 \ 1 \ 3 \ 3 \ 3] \text{ with } u = 1, \\ \varphi(n) &= [-3 \ 3 \ 3 \ 1 \ -3 \ 3 \ -1 \ 1 \ 3 \ -3 \ 3 \ -3] \text{ with } u = 2, \\ \varphi(n) &= [-3 \ 1 \ 3 \ -1 \ -1 \ -3 \ -3 \ -1 \ -1 \ 3 \ 1 \ -3] \text{ with } u = 15, \text{ or} \\ \varphi(n) &= [1 \ 3 \ -3 \ 1 \ 3 \ 3 \ 3 \ 1 \ -1 \ 1 \ -1 \ 3] \text{ with } u = 14.\end{aligned}$$

In a second aspect, the present disclosure provides an apparatus for wireless communication, comprising a memory and a processor, wherein the processor is configured to read code from the memory and transmit information to a wireless communication node based on a target sequence, wherein the target sequence is a member of a target sequence set, wherein each target sequence of the target sequence set corresponds to a sequence of an individual sequence group, and wherein the target sequence and the sequence of the individual sequence group have a degree of correlation with each other, wherein each target sequence of the target sequence set is a length-12 sequence, and wherein a group index of the individual sequence group is denoted as u , and wherein the sequence which the length-12 target sequence corresponds to comprises at least one of:

$$\begin{aligned}\varphi(n) &= [3 \ -1 \ -3 \ 3 \ -3 \ -1 \ 3 \ 3 \ 3 \ -3 \ -1 \ -3] \text{ with } u = 23, \\ \varphi(n) &= [1 \ -1 \ 3 \ -1 \ -1 \ -1 \ -3 \ -1 \ 1 \ 1 \ 1 \ -3] \text{ with } u = 6, \\ \varphi(n) &= [-1 \ -1 \ -1 \ -1 \ 1 \ -3 \ -1 \ 3 \ 3 \ -1 \ -3 \ 1] \text{ with } u = 16, \\ \varphi(n) &= [-3 \ -3 \ 3 \ 3 \ 3 \ -3 \ -1 \ 1 \ -3 \ 3 \ 1 \ -3] \text{ with } u = 27, \\ \varphi(n) &= [-3 \ 3 \ 1 \ -3 \ 1 \ 3 \ -1 \ -1 \ 1 \ 3 \ 3 \ 3] \text{ with } u = 1, \\ \varphi(n) &= [-3 \ 3 \ 3 \ 1 \ -3 \ 3 \ -1 \ 1 \ 3 \ -3 \ 3 \ -3] \text{ with } u = 2, \\ \varphi(n) &= [-3 \ 1 \ 3 \ -1 \ -1 \ -3 \ -3 \ -1 \ -1 \ 3 \ 1 \ -3] \text{ with } u = 15, \text{ or} \\ \varphi(n) &= [1 \ 3 \ -3 \ 1 \ 3 \ 3 \ 3 \ 1 \ -1 \ 1 \ -1 \ 3] \text{ with } u = 14.\end{aligned}$$

In a third aspect, the present disclosure provides a computer readable program storage medium having code stored thereon, the code, when executed by a processor, causing the processor to implement a method recited in the first aspect.

An exemplary embodiment discloses a method for wireless communication. The method comprises communicating with a wireless communication node based, at least in part, on a distinguished target sequence included in a distinguished sequence group, the distinguished sequence group selected from a plurality of sequence groups. The distinguished target sequence is a member of a target sequence set, and each target sequence of the target sequence set is allocated to an individual sequence group of the plurality of sequence groups based, at least in part, on a value of correlation between the target sequence and at least one other sequence of the individual sequence

Claims

1. A method for wireless communication, comprising:

transmitting information to a wireless communication node based on a target sequence, wherein the target sequence is a member of a target sequence set, wherein each target sequence of the target sequence set corresponds to a sequence of an individual sequence group, and wherein the target sequence and the sequence of the individual sequence group have a degree of correlation with each other,

wherein each target sequence of the target sequence set is a length-12 sequence,

wherein a group index of the individual sequence group is denoted as u , and wherein the sequence which the length-12 target sequence corresponds to comprises at least one of:

$$\varphi(n) = [3 \ -1 \ -3 \ 3 \ -3 \ -1 \ 3 \ 3 \ 3 \ -3 \ -1 \ -3] \text{ with } u = 23,$$

$$\varphi(n) = [1 \ -1 \ 3 \ -1 \ -1 \ -1 \ -3 \ -1 \ 1 \ 1 \ 1 \ -3] \text{ with } u = 6,$$

$$\varphi(n) = [-1 \ -1 \ -1 \ -1 \ 1 \ -3 \ -1 \ 3 \ 3 \ -1 \ -3 \ 1] \text{ with } u = 16,$$

$$\varphi(n) = [-3 \ -3 \ 3 \ 3 \ 3 \ -3 \ -1 \ 1 \ -3 \ 3 \ 1 \ -3] \text{ with } u = 27,$$

$$\varphi(n) = [-3 \ 3 \ 1 \ -3 \ 1 \ 3 \ -1 \ -1 \ 1 \ 3 \ 3 \ 3] \text{ with } u = 1,$$

$$\varphi(n) = [-3 \ 3 \ 3 \ 1 \ -3 \ 3 \ -1 \ 1 \ 3 \ -3 \ 3 \ -3] \text{ with } u = 2,$$

$$\varphi(n) = [-3 \ 1 \ 3 \ -1 \ -1 \ -3 \ -3 \ -1 \ -1 \ 3 \ 1 \ -3] \text{ with } u = 15, \text{ or}$$

$$\varphi(n) = [1 \ 3 \ -3 \ 1 \ 3 \ 3 \ 3 \ 1 \ -1 \ 1 \ -1 \ 3] \text{ with } u = 14.$$

2. The method of claim 1, wherein each length-12 sequence corresponds to a mathematical form of: $e^{j\pi\phi(n)/4}, n = 0, 1, 2, \dots, 11$.

3. An apparatus for wireless communication, comprising a memory and a processor, wherein the processor is configured to read code from the memory and transmit information to a wireless communication node based on a target sequence, wherein the target sequence is a member of a target sequence set, wherein each target sequence of the target sequence set corresponds to a sequence of an individual sequence group, and wherein the target sequence and the sequence of the individual sequence group have a degree of correlation with each other, wherein each target sequence of the target sequence set is a length-12 sequence, and wherein a group index of the individual sequence group is denoted as u , and wherein the sequence which the length-12 target sequence corresponds to comprises at least one of:

$$\phi(n) = [3 \ -1 \ -3 \ 3 \ -3 \ -1 \ 3 \ 3 \ 3 \ -3 \ -1 \ -3] \text{ with } u = 23,$$

$$\phi(n) = [1 \ -1 \ 3 \ -1 \ -1 \ -1 \ -3 \ -1 \ 1 \ 1 \ 1 \ -3] \text{ with } u = 6,$$

$$\phi(n) = [-1 \ -1 \ -1 \ -1 \ 1 \ -3 \ -1 \ 3 \ 3 \ -1 \ -3 \ 1] \text{ with } u = 16,$$

$$\phi(n) = [-3 \ -3 \ 3 \ 3 \ 3 \ -3 \ -1 \ 1 \ -3 \ 3 \ 1 \ -3] \text{ with } u = 27,$$

$$\phi(n) = [-3 \ 3 \ 1 \ -3 \ 1 \ 3 \ -1 \ -1 \ 1 \ 3 \ 3 \ 3] \text{ with } u = 1,$$

$$\phi(n) = [-3 \ 3 \ 3 \ 1 \ -3 \ 3 \ -1 \ 1 \ 3 \ -3 \ 3 \ -3] \text{ with } u = 2,$$

$$\phi(n) = [-3 \ 1 \ 3 \ -1 \ -1 \ -3 \ -3 \ -1 \ -1 \ 3 \ 1 \ -3] \text{ with } u = 15, \text{ or}$$

$$\phi(n) = [1 \ 3 \ -3 \ 1 \ 3 \ 3 \ 3 \ 1 \ -1 \ 1 \ -1 \ 3] \text{ with } u = 14.$$

4. The apparatus of claim 3, wherein each length-12 sequence corresponds to a mathematical form of: $e^{j\pi\phi(n)/4}, n = 0, 1, 2, \dots, 11$.

5. A computer readable program storage medium having code stored thereon, the code, when executed by a processor, causing the processor to implement a method recited in any of claims 1 to 2.