

TRANSMISSION METHOD IN A “CLUSTERED” NETWORK

The invention relates to a method of data transmission within a 'clustered' ad hoc wireless communication network, i.e. in which the transmitting/receiving nodes are distributed within multiple groups or clusters, each having a group or 'cluster' head.

One of the technical problems in ad hoc wireless communication networks is to enable a cluster head to communicate with other neighbouring cluster heads with the same number of radio resources regardless of the topology of the network. The known prior art techniques are based on establishing different paths of communication, according to the topology of the network, for enabling a cluster head to reach neighbouring cluster heads.

In a transmission network organized in clusters, each cluster operates on a different radio channel (frequency, code, etc.) and a common radio channel is used for the entire network for inter-cluster signalling. Each cluster has periodic guaranteed access to the common channel for broadcasting signalling or data to the other clusters. Intra-cluster communications are coordinated by the cluster head. Inter-cluster communications are, on the other hand, difficult to set up since they require coordination between the various cluster heads for sharing and access to the radio resources. As the inter-cluster heads are not always in direct sight of each other, i.e. with the possibility of reliably exchanging information directly without going through relay nodes, the signalling resource dedicated to these exchanges must be used effectively for enabling each cluster head to send its signalling messages to all the neighbouring cluster heads irrespective of the topology of the network.

One of the objectives of the present invention is to enable each cluster head to broadcast its inter-cluster signalling to all its neighbouring clusters, with a quantity of radio resources that does not depend on the topology of the network. Such access will reduce the need for inter-cluster

CLAIMS

- 1 – Method for broadcasting one or more signalling messages in a communication network comprising at least two clusters (10_1 , 10_2), a cluster comprising at least one cluster head (24_1 , 24_2) adapted to handle communications, and multiple nodes (11_{1k} , 11_{2k}) provided with transmitting/receiving means (12, 13), a cluster operating on a dedicated resource radio and all the clusters accessing to a common channel CS, characterized in that it comprises at least the following steps:
- 10 • at least one cluster head (24_1) of a first cluster (10_1) transmits a signalling message M to a set of nodes (11_{1k}) located in its cluster (10_1), using a dedicated radio resource CH_1 ,
 - the nodes (11_{1k}) of the first cluster (10_1) having received and decoded the signalling message M relay this signalling message M to one or more
15 relay nodes (11_{jk}) belonging to other clusters of the network that are in radio range using a distributed cooperative coherent transmission mechanism on a radio resource of a dedicated common channel CS,
 - the relay node or nodes (11_{jk}) of the other clusters (10_j) having received and decoded the signalling message M transmit it to their cluster head
20 (24_j) using a distributed cooperative transmission method on a dedicated radio resource CH_j .
- 2 – Method according to Claim 1, characterized in that a cluster head selects one or more relay nodes for reaching a set of neighbouring clusters, and
- 25 • if two selected relay nodes do not share an external neighbourhood then they transmit on the same radio resource without interfering with each other,
 - if two selected nodes have a portion of their external neighbourhoods in common, then they use the same radio resource cooperatively for
30 improving the quality of their transmission.

3 – Method according to one of Claims 1 or 2, characterized in that it uses the dedicated common channel CS including signalling corresponding to a time-slot used by a set of nodes belonging to a cluster for cooperatively relaying the signalling from their cluster head to the neighbouring clusters.

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4 – Method according to one of Claims 1 to 3, characterized in that a channel CH_j dedicated to the cluster (10_j) comprises a receiving RX_j slot (31_j) , multiple slots $RSCH_j$, (32_j) , used by a set of nodes belonging to a cluster for cooperatively relaying the inter-cluster signalling received from the neighbouring clusters to their cluster head, and a signalling slot $CHSCH_j$ dedicated to the cluster heads.

5 – System for broadcasting one or more signalling messages within a communication network comprising at least two clusters $(10_1, 10_2)$, a cluster comprising at least one cluster head $(24_1, 24_2)$ adapted to handle communications, and multiple nodes $(11_{1k}, 11_{2k})$ provided with transmitting/receiving means (12, 13), a cluster operating on a dedicated resource radio and all the clusters accessing to a common channel CS, characterized in that:

- 20 • at least one cluster head (24_1) of a first cluster (10_1) comprises a module adapted to transmit a signalling message M to a set of nodes (11_{1k}) located in its cluster (10_1) , using a dedicated radio resource CH_1 ,
- the nodes (11_{1k}) of the first cluster (10_1) are provided with means of receiving and decoding the signalling message M and with means of relaying the signalling message M to one or more nodes (11_{jk}) of the other clusters (10_j) of the network that are in radio range using a distributed cooperative coherent transmission mechanism, on a radio resource of a dedicated common channel CS,
- 25 • the node or nodes (11_{jk}) having received and decoded the signalling message M transmit it to their cluster head (24_j) using a distributed cooperative transmission method on a dedicated radio resource CH_j .

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6 – System according to Claim 5, characterized in that the common channel is the dedicated common channel CS including signalling corresponding to a time-slot used by a set of nodes belonging to a cluster for relaying the signalling from their cluster head to the neighbouring clusters.

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7 – System according to one of Claims 5 or 6, characterized in that a channel CH_j dedicated to a cluster (10_j) comprises a receiving RX_j slot (31_j) , multiple slots $RSCH_j$, (32_j) , used by a set of nodes belonging to a certain cluster for relaying the inter-cluster signalling received from the neighbouring clusters to their cluster head, and a signalling slot $CHSCH_j$ dedicated to the cluster heads.

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