

EX-1014 (Comparison of '235 Patent and Crilly Reference)

235 patent	Crilly 2002/0158801
FIG. 12 illustrates an exemplary implementation 1200 of the multi-beam directed signal system 206 that weighs signals received via antenna array 302. Communication and/or data transfer signals are received from sources 1202 (e.g., sources A and B). The signals received from sources 1202 are considered desired signals because they are from nodes within the wireless routing network. Further, signals such as noise and WLAN interference associated with another external wireless system 1204 are not desired. EX-1001, 24:25-33.	[0090] Reference is now made to FIG. 4, which illustratively depicts signals received by a wireless routing device 102 from different sources. Here, for example, it is assumed that signals received from sources 160 are desired signals as they are from other nodes within wireless routing network 100 and that signals such as the noise and WLAN interference associated with another external wireless system 162, are not desired.
These signals, both desired and undesired, are received via antenna array 302 and are provided to the signal control and coordination logic 304 (shown in FIG. 3) from the receiver/transmitters (Rx/Tx) 824(0), 824(1), . . . , 824(N) (also shown in FIG. 8B). EX-1001, 24:34-38	[0091] These signals, both desired and undesired, are collected by receiving elements within antenna array 110 and are eventually provided to control logic 110. Note, while not important for the purposes illustrated in this example, receivers 114 actually provide the received signals to control logic 110.
In this example, the signal control and coordination logic 304 includes the scanning receiver 822 that is configured to update routing information 1206 with regard to the received signals. For example, scanning receiver 822 may identify information about different classes of interferers (e.g., known and unknown types) within the routing information 1206. In this example, routing information 1206 includes connection indexed routing table(s) based on identification information, such as address information, CID, and the like. The routing table includes identifiers of the desired sources and other identifiers for the interferers (“Int”). Further, the routing table includes stored weighting values (w) each associated with a particular signal source 1202 (e.g.,	[0092] Here, control logic 112 includes a search receiver 164 that is configured to update routing information 120 with regard to the received signals. For example, search receiver 164 may identify information about different classes of interferers (e.g., known and unknown types) within routing information 120. In this example, routing information 120 includes a connection indexed routing table(s) based on identification information, such as, e.g., address information, CID, etc. The routing table(s) includes identifiers of the desired sources and other identifiers for the interferers (Int). Further included in the routing table(s) are stored weighting values (w). Other information such as “keep out” identifiers,

sources A and B). Other information such as “keep out” identifiers may also be included in this exemplary routing table. EX-1001, 24:38-53	which are described in later sections, are also included in this exemplary routing table(s).
A description of the received signal(s) can be stored in the routing table in the form of the pattern or weighting of the signal(s). In this example, a polynomial expansion in z, $w(z)=w_0+w_1z+w_2z^2+w_3z^3+w_4z^4+\dots +w_iz^i$ can be utilized to establish the values of the weights (w_i) to be applied to a weight vector. The routing table(s) may store such weighing patterns as a function of θ, or the zeroes of the polynomial, for example. One advantage of zero storage is that the zeros represent directions for communication that should be nulled out to prevent self-interference or interfering with other nodes or possibly other known wireless communication systems, such as WLAN 1204 that is not part of the wireless routing network, but is operating within at least a portion of a potential coverage area 1208 and frequency bands. EX-1001, 24:54-67	[0087] Each of these illustrations represents a description of the form of the pattern or weighting that may be stored in the routing table(s). In the example shown here, the polynomial expansion in z, $w(z)=w_0+w_1z+w_2z^2+w_3z^3+w_4z^4+\dots +w_iz^i$ establishes the values of the weights (w_i) to be applied to the weight vector. The routing table(s) may store such weighing patterns as a function of θ, or the zeroes of the polynomial, for example. One advantage of zero storage is that the zeros represent directions that should be nulled out to prevent self-interference or possibly interfering with other nodes or possibly other known wireless communication systems, such as, e.g., a WLAN that is not part of wireless routing network 100 but is operating within at least a portion of potential coverage area 132 and frequency bands.
The polynomial expansion in z, $w(z)$, and the zeroes may be calculated from each other and each may be stored. Updates can be generated frequently (e.g., in certain implementations, about every millisecond), and a zero storage system may be more advantageous in most wireless network environments because only a few values will change at a given time. Storing the weighting values will in general require changes to all of the weighting values $w(i)$ when any change in the pattern occurs. Note that $w(i)$ and $A(\theta)$ may be expressed as Fourier transform pairs (discrete due to the finite antenna element space). The $w(i)$ is equivalent to a time domain impulse response (e.g., a time domain unit sample response) and the $A(\theta)$ is equivalent to the frequency	[0088] The polynomial expansion in z, $w(z)$ and the zeroes may be calculated from each other; therefore, each may be stored. Updates preferably occur fairly frequently (e.g., in certain implementations, about every millisecond), so a zero storage system may be more advantageous as it is expected that in most environments only a few values will change at a given time. Storing the weighting values will in general require changes to all of the weighting values $w(i)$ when any change in the pattern occurs. Note that $w(i)$ and $A(\theta)$ may be expressed as Fourier transform pairs (discrete due to the finite antenna element space). The $w(i)$ is equivalent to a time domain impulse response (e.g., a time domain unit sample response) and the $A(\theta)$ the

response (e.g., an evaluation of $w(z)$ sampled along a unit circle). EX-1001, 25:1-15	frequency response (e.g., an evaluation of $w(z)$ sampled along a unit circle).
The stored weighting values associated with each connection, data signal, and/or source are utilized in a weighting matrix 1210 which operates to apply the latest weighting values to the received signals and also to transmitted signals. In this illustrative example, subsequently received signals will be processed using the most recent weighting values in the weighting matrix 1210. EX-1001:25:16-22 Thus, as described herein, the multi-beam directed signal system 206 is configured to control the transmission amplitude frequency band and directionality of data packets to other nodes and assist in reducing the effects associated with received noise and interference (e.g., self interference and/or external interference). This is accomplished with the signal control and coordination logic 304 within the multi-beam directed signal system 206. EX-1001:25:22-30.	[0093] The stored weighting values associated with each connection/source are utilized in a weighting matrix 166. Weighting matrix 166 operates so as to apply the latest weighting values to the received signals and also to transmitted signals. In this illustrative example, subsequently received signals will be processed using the most recent weighting values in the weighting matrix. [0094] Thus, as described above and in subsequent sections, wireless routing device 102 is essentially configured to control the transmission amplitude frequency band and directionality of data packets to other nodes and assist in reducing the effects associated with received noise and interference (e.g., self interference and/or external interference). This is accomplished with control logic 112 within wireless routing device 102.
FIG. 13 illustrates an exemplary multi-beam directed signal system 206 that includes an antenna array 302 and a Butler matrix 1300 implemented as a beam-forming network (e.g., transmit beam-forming network 808 and/or receive beam-forming network 810 shown in FIGS. 8A and 8B). The multi-beam directed signal system 206 also includes multiple signal processors (SPs) 1302 and one or more baseband processors (e.g., baseband units 902 described with reference to FIGS. 9 and 10). Baseband processors 902 accept communication signals from and provide communication signals to the multiple receiver/transmitters 824 (FIG. 8B). A separate baseband processor 902 may be	[not present]

assigned to each signal processor 1302, or a single baseband processor 902 may be assigned to any number of the multiple signal processors 1302.	
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