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Patent Search

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Abstract:

The present disclosure relates to systems and methods, and provides a Low Cost Embedded Smart Antenna Beam Steering System (100) that selects the best antenna signal strength and continuously repeats the process for real-time beam steering. The Low Cost Embedded Smart Antenna Beam Steering System (100) includes a dir antenna array (102), an RF switching module (104), a NodeMCU microcontroller (106), and a sequential antenna scanning procedure (110). The NodeMCU microcontroller measures per-antenna received signal strength values, applies a machine learning antenna prediction model (112) trained on an RSSI training dataset (114), and actuates the switching module (104) to connect the selected antenna during operation. This configuration improves signal quality, reduces interference, and provides efficient communication in dynamic environments without reliance upon phased array hardware.

Complete Specification

Description: TECHNICAL FIELD

[001] The present invention relates to wireless communication systems, and more particularly to a Low Cost Embedded Smart Antenna Beam Steering System employing RSSI-based antenna selection, RF switching, embedded microcontroller firmware, and machine learning techniques, applicable to IoT networks, wireless sensor systems, smart cities, railway communication, and adaptive communication systems.

BACKGROUND

[002] The field of wireless communication has witnessed considerable advancement in antenna technologies aimed at improving signal quality, reducing interference, supporting reliable data transmission across diverse deployment environments. Wireless systems are increasingly required to operate in dynamic scenarios, including mobile user environments, dense urban deployments, smart city infrastructure, and railway communication corridors, wherein signal propagation conditions change continuously and unpredictably. Conventional approaches to antenna deployment typically rely upon omnidirectional antenna configurations that radiate and receive electromagnetic energy uniformly across all directions. While such configurations may be adequate for static or low-density environments, they may present significant limitations when deployed in interference-rich or mobile scenarios.

[003] Omnidirectional antenna systems typically waste transmission power by radiating energy in directions that do not correspond to the intended communication. This non-directional energy distribution may result in reduced effective signal strength at the receiver, increased susceptibility to co-channel and adjacent-channel interference, and diminished link reliability in environments where multiple wireless devices compete for spectral resources. Furthermore, omnidirectional systems lack the capacity to adapt their radiation characteristics in response to changing propagation conditions, rendering them unsuitable for applications requiring consi

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