COGNITIVE RADIO FOR GREEN RADIO COMMUNICATIONS: GREEN COGNITIVE RADIO

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Abstract: Green Cognitive Radio (GCR) is a Cognitive Radio (CR) with intelligence-enhanced functionalities, which is aware of sustainable development (SD) for energy efficiency and takes it as an additional crucial constraint in the decision making process of the holistic cognitive cycle. The Brundtland Commission of the United Nations (UN) defined SD as the development that "meets the needs of the present without compromising the ability of future generations to meet their own needs". From then, several United Nations' Conferences (from Rio de Janeiro '92 to Durban '11) have confirmed this important issue. One of the most obvious aspects and challenges of SD is the earth climate change and the ever-growing CO2 emission. Currently, 3% of the world-wide energy is consumed by the ICT (Information and Communications Technology) infrastructure, which causes about 2 % of the world-wide CO2 emissions and surprisingly is comparable to the world-wide CO2 emissions by all commercial airplanes. These values of carbon footprint are extreme impressive. They have been confirmed by a lot of scientific studies and reported in many relevant international conferences and workshops. Generally, Green Radio is closely related to reducing energy consumption, but Green Radio could also be envisaged in a more widespread sense, such as to optimize spectrum usage (Green spectrum), to decrease spectrum pollution (which may have great consequences for astronomic observations), to reduce electromagnetic radiation/interference levels in order to enable harmonized coexistence of multiple wireless communications systems (i.e., less interference) as well as a reduced human exposure to harmful radiations, to recycle and reuse ICT equipment, and in many other related contexts. The radio spectrum is also considered as a natural and public resource, which should be carefully used, shared world-widely and economized efficiently. Therefore, in our point of view, what is classically meant for Green Communications should be fundamentally extended and even reformed. Recently, we have claimed in that Cognitive Radio is a paradigm–shift enabling technology for realizing Green Radio. Basically, we proposed an intelligent solution based on CR approach, keeping in mind the following key objective: "Decreasing the electromagnetic level by sending the right signal in the right direction with the right power, only when it is necessary, for achieving the same QoS by taking advantage of advanced intelligence". This is the essential concept of Useful Radio Waves.

BRIEF BIOGRAPHY

Jacques Palicot received, in 1983, his PhD degree in Signal Processing from the University of Rennes. Since 1988, he has been involved in studies about equalization techniques applied to digital transmissions and new analog TV systems. Since 1991 he has been involved mainly in studies concerning the digital communications area and automatic measurements techniques. Prof. Palicot has taken an active part in various international bodies EBU, CCIR, URSI, and within RACE, ACTS and IST European projects. He has published various scientific articles notably on equalization techniques, echo cancellation, hierarchical modulations and Software Radio techniques. He is currently involved in adaptive Signal Processing and in new techniques as Software Radio and Cognitive radio. From November 2001 to September 2003 he had a temporary position with INRIA/IRISA in Rennes. He serves as Associate Editor for EURASIP JASP since 2008. He also served as lead guest editor several Special Issues on Software Radio, Cognitive Radio and Green Radio. He was Technical Program Chairman of CROWNCOM 2099 and Co General Chairman of ISCIT 2011. Since October 2003 he is with Supélec in Rennes where he leads the Signal Communications and Embedded Electronics (SCEE) research team.

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