

Preface

The concept of *cognitive radio*, first introduced by Mitola in 2000, envisioned it as a cognitive agent capable of autonomous operation in pursuing its own goals, communication with other agents, flexible adaptation, reasoning and learning. However, nowadays the term “cognitive radio” is typically interpreted as a radio that is able to monitor the unused spectrum in its environment and selecting spectrum for own transmissions without interfering with the licensed users of the given spectrum band.

This book takes up on the challenges of realizing the original goals of cognitive radio. Although it focuses on the topic of flexible link adaptation, the various technical solutions presented in this book will be useful for realizing the rest of the goals of the original vision for cognitive radio.

While adaptation is incorporated in essentially all communications protocols, such adaptations are limited to the situations envisioned by the protocol and radio designers. Protocol-based solutions cannot deal with the unknown. In other words, such adaptations lack the flexibility in the types of feedback they can process, the types of responses to the feedback they can invoke and most importantly they cannot negotiate better solutions with other radios or network nodes.

A greater flexibility of adaptation could be achieved via two mechanisms—collaborative negotiation of solutions and learning. In this book we are focusing on the first of the approaches. In communications, like in dancing, it takes two to the tango. One radio cannot modify the communications protocol without agreeing on such a change with its peers. Neither can it dictate what the peer needs to do without considering the capabilities of the other radio. Radios need to negotiate changes in the protocol. The question is—what language can they use for such negotiations. This book describes such a language and mechanisms to achieve collaboration. The potential usability and power of such a language should not be underestimated.

Boston, MA

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Flexible Adaptation in Cognitive Radios

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2013, XX, 156 p.,

ISBN: 978-1-4614-0968-7