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Secondary user pricing strategies in a cognitive radio environment

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Abstract

There has been a growing demand for spectrum availability due to inefficient management of the radio frequency spectrum and underutilization of all spectrum bands. Spectrum has been managed with the same approach for over the last decade and only recently due to the phenomenal growth in mobile and broadband communications has attention been given to it. Intelligent communication systems such as cognitive radio have been identified in assisting the need for the limited resource, wireless spectrum. If spectrum trading becomes commercially successful, it can provide great economic and social benefits for the service provider, primary and secondary users. In order to maintain viability of spectrum trading, a pricing strategy is necessary for secondary users, it is also imperative to find a game theory model that minimally impacts the primary users in terms of their service, however it should aid in decreasing the cost to the primary users. Game theory along with economic theory is used to analyse the relationships/cooperation between the users and service provider. This work contributes to the field of dynamic spectrum access and aims to compare pricing strategies of secondary users in terms of the revenue earned by the primary service providers as well as investigate the impact of regulations on said pricing strategies.

The pricing strategies modelled and simulated in MATLAB include the market-equilibrium pricing strategy and the competitive pricing strategy. These two strategies are chosen as they are the most relevant in South Africa. The two pricing strategies are compared in terms of advantages and disadvantages as well the revenue earned by each of the primary services. The framework for testing is provided along with the test cases. The influence of telecommunication regulations and policy on the frameworks and results are discussed in detail as well as the impact of the telecommunication regulation and policy in South Africa.