Kleene Modules for Routing Procedures

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In the past, algebraic techniques based on semirings have been used describe shortest path algorithms and routing procedures, e.g. [2, 1, 8, 3, 5]. These approaches often use matrices over semirings/Kleene algebra, which form again a semiring/Kleene algebra.

While these approaches work well for shortest paths algorithms, they fail when modelling timing aspects of routing algorithms. A major shortcoming is that at least one distributivity law has to be dropped on the level of semiring. This implies the loss of associativity on the matrix-level.

In this talk I will present the shortcoming with the help of the Ad hoc On-Demand Distance Vector (AODV) routing protocol [7]. AODV is a widely used and standardised routing protocol designed for wireless mesh networks (WMNs); AODV also forms the basis of new WMN routing protocols, such as the upcoming IEEE 802.11s wireless mesh network standard [4].

I will argue that Kleene module, as defined in [6], can help in this regard. I will show how crucial aspects of routing protocols in general, and AODV in particular, can be modelled using modules. The talk will be concluded with some discussion on on-going developments and future work.

(Joint work with Annabelle McIver)

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