Quantitative Verification Session 5

November 21, 2017

TCTL Model Checking

Continued from Session 4...

Exercise 1. Consider the timed automaton shown in Fig. 1. Draw the region transition system (if necessary, augmented with a new clock $z$) so as to aid you in model checking TCTL specifications. Model check the property $\exists \diamond \leq 1$.

For more reading, see Section 9.3.3 of [1].

Markov Chains

Exercise 2. A simplified IPv4 Zeroconf protocol is outlined below. Download and install Prism Model Checker. Model the protocol in Prism and compute the transient probabilities for the first few steps. For a more realistic version of Zeroconf, visit http://www.prismmodelchecker.org/casestudies/zeroconf.php.

1. Randomly pick an address among the K (65024) addresses.
2. With m hosts in the network, collision probability is $q = \frac{m}{K}$
3. Send 4 ARP requests.
4. In case of collision, the probability of no answer to the ARP request is p (due to the lossy channel)
**Exercise 3.** Compute the probability of reaching $s_1$ from $s_0$ in the following simple Markov chain.

![Graph](image)

**Exercise 4.** Write the following Markov chain in the matrix representation. Suppose the initial distribution $\pi_0 = [1, 0, 0]$ – i.e. the process starts in the first state. What is the transient distribution after three time steps? What do you think happens in the long run? Does this change if the process starts uniformly at random from any of the states?

![Graph](image)

**References**