T-79.5102 **Autumn 2006**
Special Course in Computational Logic
Tutorial 6

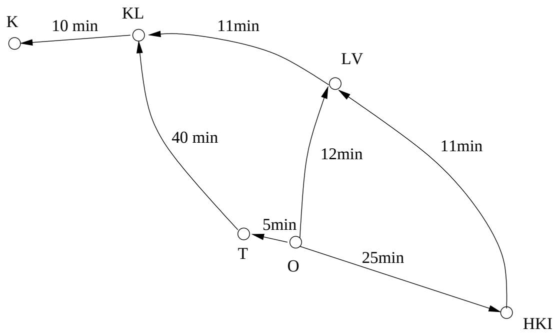
1. A rational engineer wants to travel from Otaniemi to Kirkkonummi using public transport. There are three possible routes:

I) First take a bus to downtown Helsinki (ticket 15 mk) and then travel from there to Kirkkonummi by train (24 mk).

II) Take a bus to Leppävaara (10 mk) and from there to Kirkkonummi by train (16 mk).

III) Take a bus to Tapiola, change to another bus and go to Kauklahti (10 mk) and board a train from there (10 mk).

The durations of the individual connections are shown in the figure:



(a) Suppose that the engineer has a cost function $U(t,m) = m + at$ where m is the sum of ticket fares, t is the duration of trip, and $a = 40$ mk/h is his hourly rate.

- Which one of the alternatives minimises $U(t,m)$?
- What should his hourly rate be so that route III would be better than the route II?
- Is one of the routes clearly better or worse than the others?

(b) Consider a cost function $U(t_1, t_2, m) = a_1 t_1 + a_2 t_2 + m$ where t_1 is the time spent in a bus, t_2 the time spent on a train, $a_1 = 1.5a$, and $a_2 = 0.5a$. What is the best route now?

(c) Let $U(t)$ be as in item (a) but let us assume that buses may be delayed according to the following probability distribution:

Line	0 min	1 min	5 min	10 min	15 min
O-Hki	75%	20%	5%	-	-
O-T	80%	15%	5%	-	-
T-KL	20%	20%	20%	20%	20%
O-LV	30%	20%	-	20%	30%

Which choice is now the best alternative?