

Control of a Criss-Cross Network

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Abstract

This thesis aims to develop an sequencing policy for the so-called criss-cross network to improve the system performance through intelligent scheduling. A criss-cross network consists of two single-server stations and two customer types. Customers of Type A require service only at server 1, while customers of Type B require service at server 1 and then at server 2. Each customer type arrives according to a different renewal process, and is processed according to different service time distribution. The dynamic sequencing policy focuses on server 1, since server 2 only serve one customer type. The aim is to minimise the expected number of customers in the system.

We first approximate the simplest criss-cross network by a stochastic control problem, using Brownian motion. The Brownian control problem is then solved and subtly translated back in terms of original queueing network into optimal sequencing policy. A generalised criss-cross network problem with holding cost as a newly included parameter is then solved based on those prior results. More comprehensive optimal sequencing policies are developed and conjectures are made to tackle different scenarios (Case I, Case IIA, IIB, IIC, and IID).