An Incomplete Overview of some Applications of Game Theory to Patient Flow

Vincent Knight
Cardiff University
Cardiff, UK
knightva@cf.ac.uk

Paul Harper
Cardiff University
Cardiff, UK
harper@cf.ac.uk

Jeff Griffiths
Cardiff University
Cardiff, UK
griffiths@cf.ac.uk

Izabela Komenda
Cardiff University
Cardiff, UK
komendai@cf.ac.uk

Rob Shone
Cardiff University
Cardiff, UK
shoner@cf.ac.uk

ABSTRACT

Describe paper.

KEYWORDS. Patient Flow, Game Theory, Queueing Theory

Main Area: Healthcare

1. Introduction

- Review GT in HC in general (small);
- Review congestion type games;
- PoA;
- Structure.

2. Choosing queues

This section describes how patient choices between various congestion affected services may be modelled. In particular the situation shown diagrammatically in Figure **??** is considered: patients have a choice amongst $M/M/c$ queues.

Show diagram.

There are two approaches to solving this problem: assuming that patients observe or not the system states before choosing a facility. A rigorous comparison of these two approaches for individuals choosing to join an $M/M/1$ queue is given in [].

An unobservable study is given in [] where routing games [**?**] are used to study the system described. The routing game used is shown in **??** To be able to obtain the PoA for a given instance the following mathematical program must be solved:

OPTMP:	NASHMP:
minimise (**??**)	minimise (**??**)

such that:

$$\sum_{j=1}^{n} \lambda_{ij} \leq \Lambda_i \text{ for all } i \in [m] \tag{1}$$

$$\lambda_{ij} \in \mathbb{R}^{m \times n}_{\geq 0} \text{ for all } i \in [m],\ j \in [n] \tag{2}$$

$$\sum_{i=1}^{m} \lambda_{ij} < c_j \mu_j \text{ for all } j \in [n] \tag{3}$$

$$C(\lambda) = \sum_{i=1}^{m} \alpha_i \sum_{j}^{n} d_{ij} \lambda_{ij} + \sum_{j=1}^{n} \sum_{i=1}^{m} \lambda_{ij} w_j \left(\sum_{i=1}^{m} \lambda_{ij} \right) + \sum_{i=1}^{m} \beta_i \left(\Lambda_i - \sum_{j=1}^{n} \lambda_{ij} \right) \tag{4}$$

and:

$$\Phi(\lambda) = \sum_{i=1}^{m} \alpha_i \sum_{j}^{n} d_{ij} \lambda_{ij} + \sum_{j=1}^{n} \int_{0}^{\sum_{i=1}^{m} \lambda_{ij}} w_j(x) dx + \sum_{i=1}^{m} \beta_i \left(\Lambda_i - \sum_{j=1}^{n} \lambda_{ij} \right) \tag{5}$$

The constant $\alpha_i \in \mathbb{R}_{\geq 0}$ is simply a weighting statistic for the relative importance of travel distances to the other factors (once again allowing for this coefficient to be dependent on population partitioning).

3. CCU Work

- IK Paper

4. EU and EMV Interface

- Describe model;
- Show some results.

5. Conclusions

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