Queensland University of Technology

CAB203

Discrete Structures

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Chapter 1

Tournament structure

The tournament structure is defined by two constraints:

- For every pair of distinct players, either they play against each other, or there are at least two other players that they both play against
- All players have the same number of games

By abstracting the tournament to a graph structure, the players to vertices and the games to edges, these constraints can be represented as follows:

$$\text{Constraint 1:} \forall u, v \in V (u, v) \in E \wedge |N(u) \cap N(v)| \geq 2 \tag{1.1}$$

$$\text{Constraint 2:} \forall v \in V \, |\deg(v)| = 1 \tag{1.2}$$

Where V is the set of vertices, E is the set of edges, $N(u)$ is the set of neighbours of u and $\deg(v)$ is the degree of v. Given the condition that a game between a and b is the same as a game between b and a, the given graph was symmetrised in order to simplify the implementation. The symmetrisation was implemented as follows:

$$\text{Symmetrisation:} \forall u, v \in V (u, v) \in E \rightarrow (v, u) \in E \tag{1.3}$$

Chapter 2

Assign referees

All games must have a referee, but referees cannot have any biases for the game they are refereeing, i.e., the referee cannot be a player in the game, have any relation to the players in the game, or any conflicts of interest in the game. Furthermore, to minimise the burden on referees, they are required to at most be assigned to one game.

$$r \in R : c(r) \cap G = \emptyset \tag{2.1}$$
$$R = \bigcup_{g \in G} f(g) \tag{2.2}$$

Assigning referees to games as a bipartite graph

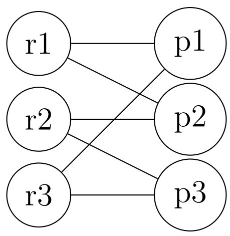

Figure 2.1: Bipartite graph of referees and players

Chapter 3

Game groups

Chapter 4

Game schedule

Chapter 5

Tournament winners