

[UNIVERSITY, TEAM, PLAYER]

*Universe**universities*: \mathbb{P} UNIVERSITY*teams*: \mathbb{P} TEAM*players*: \mathbb{P} PLAYER*uniteams*: UNIVERSITY \leftrightarrow TEAM*uniplayers*: UNIVERSITY \leftrightarrow PLAYER*teamplayers*: TEAM \leftrightarrow PLAYER*games*: TEAM \leftrightarrow TEAM $\text{dom } uniteams \subseteq universities$ $\text{ran } uniteams = teams$ $\forall team: \text{ran } uniteams \bullet \#(uniteams \triangleright \{team\}) = 1$ $\text{dom } uniplayers \subseteq universities$ $\text{ran } uniplayers = players$ $\forall player: \text{ran } uniplayers \bullet \#(uniplayers \triangleright \{player\}) = 1$ $teamplayers \subseteq uniteams \sim \S uniplayers$ $\text{dom } games \subseteq teams$ $\text{ran } games \subseteq teams$ $games \cap (uniteams \sim \S uniteams) = \emptyset$ $games \sim \cap games = \emptyset$ *addPlayerToUni* Δ Universe*player?*: PLAYER*uni?*: UNIVERSITY $player? \notin players$ $uni? \in universities$ $players' = players \cup \{player?\}$ $uniplayers' = uniplayers \cup \{(uni? \mapsto player?)\}$

AddPlayerToTeam

$\Delta\text{Universe}$

$player?: \text{PLAYER}$

$team?: \text{TEAM}$

$team? \mapsto player? \in \text{uniteams} \sim \S \text{uniplayers}$

$team? \mapsto player? \notin \text{teamplayers}$

$\text{teamplayers}' = \text{teamplayers} \cup \{(team? \mapsto player?)\}$

AddTeamToUni

$\Delta\text{Universe}$

$team?: \text{TEAM}$

$uni?: \text{UNIVERSITY}$

$team? \notin \text{teams}$

$uni? \in \text{universities}$

$\text{teams}' = \text{teams} \cup \{team?\}$

$\text{uniteams}' = \text{uniteams} \cup \{(uni? \mapsto team?)\}$

AddGame

$\Delta\text{Universe}$

$team1?: \text{TEAM}$

$team2?: \text{TEAM}$

$team1? \in \text{teams}$

$team2? \in \text{teams}$

$team1? \mapsto team2? \notin \text{uniteams} \sim \S \text{uniteams}$

$team1? \mapsto team2? \notin \text{games} \sim \cup \text{games}$

$\text{games}' = \text{games} \cup \{(team1? \mapsto team2?)\}$

DeletePlayerFromTeam

$\Delta\text{Universe}$

$player?: \text{PLAYER}$

$team?: \text{TEAM}$

$team? \mapsto player? \in \text{teamplayers}$

$\text{teamplayers}' = \text{teamplayers} \setminus \{(team? \mapsto player?)\}$

DeletePlayerFromUni

$\Delta\text{Universe}$

$player?: \text{PLAYER}$

$uni?: \text{UNIVERSITY}$

$uni? \mapsto player? \in \text{uniplayers}$

$\text{players}' = \text{players} \setminus \{player?\}$

$\text{uniplayers}' = \text{uniplayers} \triangleright \{player?\}$

$\text{teamplayers}' = \text{teamplayers} \triangleright \{player?\}$

DeleteTeamFromUniversity

$\Delta\text{Universe}$

$team?: \text{TEAM}$

$uni?: \text{UNIVERSITY}$

$uni? \mapsto team? \in \text{uniteams}$

$\text{teams}' = \text{teams} \setminus \{team?\}$

$\text{uniteams}' = \text{uniteams} \triangleright \{team?\}$

$\text{teamplayers}' = \{team?\} \triangleleft \text{teamplayers}$

$\text{games}' = \{team?\} \triangleleft \text{games} \cap \text{games} \triangleright \{team?\}$

DeleteGame

$\Delta\text{Universe}$

$team1?: \text{TEAM}$

$team2?: \text{TEAM}$

$team1? \mapsto team2? \in \text{games} \sim \cup \text{games}$

$\text{games}' = \text{games} \setminus \{(team1? \mapsto team2?), (team2? \mapsto team1?)\}$

ReplacePlayerInTeam

$\Delta\text{Universe}$

$oldplayer?: \text{PLAYER}$

$newplayer?: \text{PLAYER}$

$team?: \text{TEAM}$

$team? \mapsto oldplayer? \in \text{teamplayers}$

$team? \mapsto newplayer? \notin \text{teamplayers}$

$team? \mapsto newplayer? \in \text{uniteams} \sim \S \text{uniplayers}$

$\text{teamplayers}' = \text{teamplayers} \cup \{(team? \mapsto newplayer?)\} \setminus \{(team? \mapsto oldplayer?)\}$

TeamCountForPlayer

$\Delta\text{Universe}$

$player?: \text{PLAYER}$

$count!: \mathbb{N}$

$count! = \# (\text{teamplayers} \triangleright \{player?\})$