COS221: Practical 5

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TASK 1 RESEARCH: FIELD HOCKEY

Field hockey is a team sport played on a 91.4 x 55m wide pitch. Each team plays against each other with 10 outfield players and 1 goalkeeper. The objective is to score more goals than the opposing team. Goals are scored by striking the ball into the goal post from within the striking circle.

Players

There are 10 outfield players and 1 goalkeeper. Outfield players consist of defenders, midfielders, and attackers. 6 substitutes are allowed for each team. There is no limit to the number of times a player can be substituted.

Captains are responsible for the behaviour of all players on their team and for ensuring that substitutions of players on their team are carried out correctly. A personal penalty is awarded if a captain does not exercise these responsibilities.

Captains

The role of captain is assigned to one player in each team, a replacement must be appointed upon suspension of a captain. To distinguish players from captains, they must wear a distinctive armband.

Umpires

There are two umpires, one along each side-line for every match. The umpires start and re-start the match; they also signal to the Technical Officials on duty every time stoppage they order and the subsequent re-start. The Umpires (referees) enforce all laws and regulations during the match

Hockey Field Pitch

The pitch is 91.4 m long and 55m wide. A centre line splits the pitch in two halves. The two halves are further divided into two parts by two lines that are 22.9m from the centre line. This divides the pitch into 4 equal parts.

From each backline are semi circles drawn with solid lines and a radius of 14,63 m. These to circle halves are the striking circles. A second pair of semi circles is drawn with dashed lines outside the semi circles mentioned earlier and the radius of these circles 5m.

The penalty spot is 6.475m from the baseline on each end of the pitch. Defenders and attackers position themselves 4,97 and 9,975m away from the baseline. Each striking circle has 4 such points on the baseline known as the penalty corner and defender’s and attacker’s marks. Attackers may take a take up position at the long corner attackers mark which is 23m from the baseline.

Each goal post is positioned in the goal area which is in the striking circles. A goal post is white and 2.14m high and 0.3m wide.

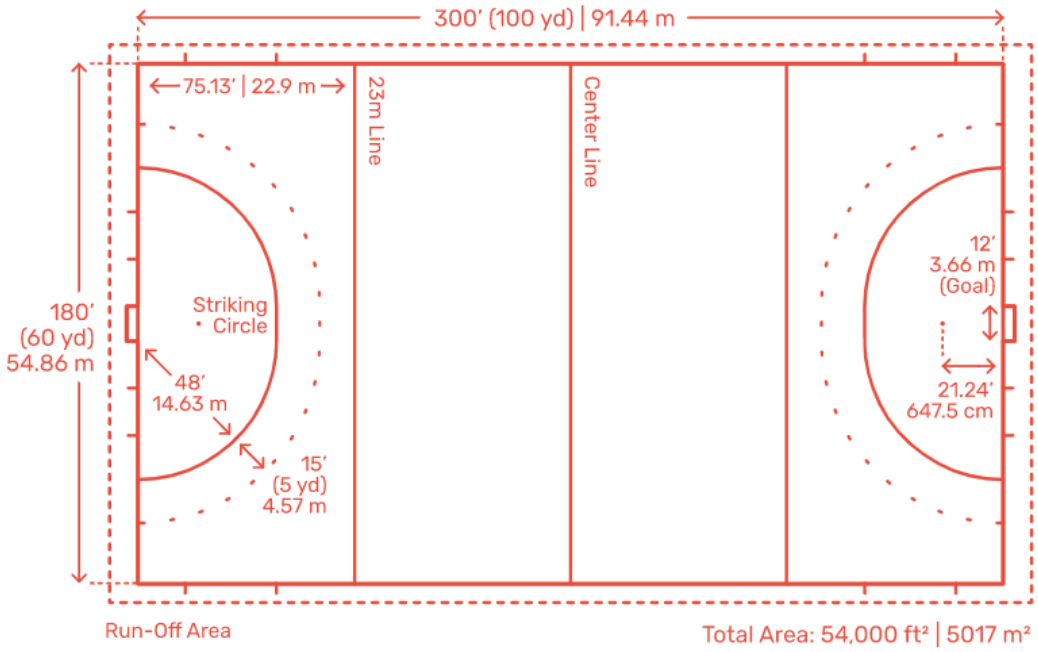


Image source: https://www.dimensions.com/element/field-hockey-pitch

Equipment

A hard ball and wooden stick are used to play hockey. Only the flat side of the wooden stick may be used to hit the ball. If the back side is used, then a foul may be called for the player. For protection, players wear shin pads and gum shields. Goal keepers have a lot more protection as they need to be protected from flying balls in their direction.

Outfield players require the following equipment:

- Shafts
- Electrical tape
- Grip
- Mouthguard
- Shin guards
- Long socks and rash guards
- Helmet
- Throat protector
- Neck protector
- Pelvic protector
- Turfs/Cleats

Equipment that is required by the Goalkeeper:

- Helmet

- Throat protector
- Chest pad
- Arm and elbow protection
- Right- and left-hand protection
- Goalie girdles
- Leg guards
- Kickers

Field equipment is as follows:

- Field Hockey Ball
- Field Hockey net

How a goal is scored

A goal is scored when the player hits the ball into the goal post **AND** over the line **FROM WITHIN** the striking circle. Goals must be made with a player's stick, and use of any body part will be against the rules and as such a foul will be called against the player. Only the goalkeeper may use their hands and feet or any body part to handle the ball.

Substitution

The area for substitution should be 3 meters from the centre line and should be marked with a cone. Substitution may take place at any point during the match except during penalty corners or if the goalkeeper is injured or suspended. (Hockey booklet)

When a game is stopped due to a player being injured, the player must be attended to by the relevant personnel. The injured player should leave the field and a substitute may take her place. If the injured player is the goalkeeper, then the goalkeeper may remain in the match. (Hockey booklet)

Winning a Hockey Game

The game is won by the team with the most goals scored at the end of the match once the timer has stopped. The duration of a hockey game is 70 minutes which is split into two 35-minute games with a 5-minute break after the first 35 minutes. If at the end of the game, there is a balance of scores between the two competing teams then the match ends in a draw.

In games that require a winner to advance to the next round, if the score is tied after regulation time, extra time of two, 7 1/2-minute periods is played. The games are ended when one team scores a goal. If the score remains tied after overtime, penalty strokes may be used to determine the winner. In penalty stroke competition, each team selects five players to take alternating penalty strokes against the opposing goalkeeper

Fouls

Should the foul or offence be bad enough, one of 3 cards would be issued, green, yellow, red.
The green card is used for warnings, the yellow card is used to remove a player from the game for a minimum of five minutes, and the red card disqualifies the player from the game.

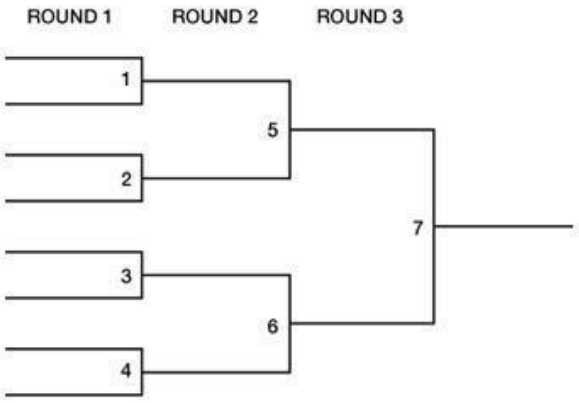
Fouls that can occur in field hockey

- Using the back side of the hockey stick instead of the flat side to strike the ball.
- Handling the ball with anything other than a player's hockey stick.
- Hitting the stick of their opponent to interfere with they're play
- Hitting the ball off another player with the intent to cause harm to a fellow player.
- The ball cannot hit your feet.
- You cannot raise your stick above your waist during regular play. If you are taking a free hit, it is up to the discretion of the ref.
- You cannot tackle (go for the ball) from behind. You must face your opponent head on (shoulder to shoulder) if you are fighting for the ball.
- No third party. It is always one vs. one. Once another player tries to go for the ball, a foul is called.
- Obstruction – when your back is turned to another player, and you are between the ball and that player.

Tournament Structure

The tournament structure that we will be following is a Single-Elimination/Knockout tournament starting with 8 teams.

In the first round of a knockout tournament each team is paired with another team to play a match against, and the loser of each match is immediately eliminated from the tournament, whereas the winner of each match will move on to the next stage/round, until the final round. The winner of the final match is the overall winner of the tournament.



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TASK 2: (E)ER-DIAGRAM

BRAINSTORMING OF EER DIAGRAM

MINUTES OF MEETINGS WHERE EER WAS DISCUSSED

First Draft – 2022/05/10

Field Hockey Teams		**Reasons/explanation**
PK	Team id	Uniquely identify each team
	Team names	
	Coach id	Coaches may have the same name so and ID is required for each coach
	Captains	
	Team origin	Which city or country does the team come from
	Total Substitutions	statistics

Field Hockey Players		**Reasons/explanation**
PK	Registration number	Uniquely identify each player as some may have the same name
	Team names	
	Position	Need to know as some player positions are limited to a certain area of the field. If crossed, then necessary action is to be taken which affects the game.
	Age	statistics

Field Hockey Coaches		**Reasons/explanation**
PK	Registration number	Uniquely identify each coach
FK	Team id	
FK	Coach id	Coaches may have the same name so and ID is required for each coach
	Gender	Statistics
	Position id	Is he/she the head coach, assistant coach etc.
	Experience in years	Statistics

	Start date	When coach started with current team
	End Date	When Coach ended with current team

Field Hockey Games		**Reasons/explanation**
PK	Game id	Uniquely identify each game
FK	Team id	Which teams are playing in this match
FK	Umpire id	Know who is umpiring this game
	Game match	Which game is this, 1st, 2nd, 3rd etc
	Location id	
	Date of match	
	Game host	Which team is hosting
	Game visitors	Which team is visting
	Game type	Is this a tournament or friendly match etc.

Field Hockey Umpire		**Reasons/explanation**
PK	Umpire id	Uniquely identify each umpire
FK	Umpire name	
	Umpire experience	Statistics
	Gender	Statistics
	Umpire age	Statistics
FK	Umpire games	A multivalued variable that lists all the games the umpire has umpired

Field Hockey Action Plays		**Reasons/explanation**
PK		
FK	Team id	
	Host score	Know who is leading
	Visitors score	Statistics
	Player who scored goal	Statistics

Second draft – 2022/05/13

Field Hockey Players	**Reasons/explanation**

PK	Registration number	Uniquely identify each player as some may have the same name
FK	Team id	To which team each player belongs. Links to field hockey teams table
	Player names	Idk it wasn't added before
	Position	Need to know as some player positions are limited to a certain area of the field. If crossed, then necessary action is to be taken which affects the game.
	Age	statistics

Added team id as a foreign to link each player to the team they belong to

Player names was somehow missed before, so it was added.

Field Hockey Games		**Reasons/explanation**
PK	Game id	Uniquely identify each game Games will be id by a number Eg. First game is 1 etc.
FK	Umpire Licence	Umpires need to be licenced to umpire a game. Links to Umpire table
FK	Team id	Which teams are playing in this match
	Game match	Which game is this, 1^{st}, $2^{nd,}$ 3^{rd} etc
	Location id	
	Date of match	
	Time duration	Matches are set to 70min but can go overtime if need be Require a Boolean to check if there was overtime…(incomplete)
	Game host	Which team is hosting
	Game visitors	Which team is visiting
	weather	Games can be postponed due to bad weather

Game type was dropped because in our database we will only be keeping records of tournament type matches. No friendly matches or any other type.

Added weather as a game can be postponed due to weather. Thus, a game can have multiple dates and the dates need to be tracked. All that matters is that a game is played, before the next round, so alternate days need to be planned ahead of the next round.

Umpire id was replaced with umpire licence as it was decided to identify each umpire rather uniquely by their licence number which each of them should have. Thus, there is no need add an additional form of identification. Use what they already have.

It was decided as necessary to add the time duration of a match. Initially it wasn't thought of that matches can run over time.

Field Hockey Coaches		**Reasons/explanation**
FK	Coach id	Coaches may have the same name so and ID is required for each coach
FK	Team id	
	Gender	Statistics
	Position id	Is he/she the head coach, assistant coach etc.
	Experience in years	Statistics
	Start date	When coach started with current team
	End Date	When Coach ended with current team

Registration number was dropped. It is enough to identify the coach by their coach id. Coach id was updated to the primary key

Field Hockey Umpire		**Reasons/explanation**
PK	Umpire licence	Uniquely identify each umpire
FK	Umpire name	
	Umpire experience	Statistics
	Gender	Statistics
	Umpire age	Statistics
FK	Umpire games	An integer variable that totals how many games an umpire has umpired

Umpire id was dropped and rather use the licence each umpire is given to uniquely identify them

Umpire games was changed to rather be running total. If wish to know which games, they have umpired then can filter games table with umpire licence.

Hockey action plays: these are the different actions that can take place in a hockey match.

Action plays will be divided into offensive stats, shots, defensive stats, and fouls.

2022/05/17

Field Hockey Games		**Reasons/explanation**
PK	Game id	Uniquely identify each game Games will be id by a number Eg. First game is 1 etc.
FK	Umpire Licence	Umpires need to be licenced to umpire a game. Links to Umpire table
FK	Team id	Which teams are playing in this match

	Game match	Which game is this, 1st, 2nd, 3rd etc
	Date of match	
	Time duration	Matches are set to 70min but can go overtime if need be Require a Boolean to check if there was overtime…(incomplete)
	weather	Games can be postponed due to bad weather
FK	Tournament id	Indicates which tournament the game is happening in
FK	Team 1	Need to know which teams are participating in the game. Use the team ID of each team
FK	Team 2	
	Alternate date	

Location ID was removed from games table as it was decided that all games will take place in one location. Location will be recorded in the tournament table.

Game host and game visitors was changed to team 1 and team 2.

Added alternate day to the table so that if a game were not to happen on the allocated day for any reason, then the game can be played on the allocated alternate day.

Field Hockey Teams		**Reasons/explanation**
PK	Team names	
	Coach id	Coaches may have the same name so and ID is required for each coach
	Captains	
	Team origin	Which city or country does the team come from
	Total Substitutions	statistics

Team id was removed, and it was decided that we rather use the team's name as the primary key. It's assumed that all teams must have a unique team name. Teams cannot share the same name.

Teams may strictly only have 11 field players, a maximum of 6 substitutes and 3 reserves.

Field Hockey Tournament		**Reasons/explanation**
PK	Tournament id	
	Season	This indicates when a tournament is taking place in the year for example 2022/2023 season
	Location	Which country and city a tournament is taking place in. described by country and city.
	Tournament name	
	winner	

The number of games that can take place in a tournament is assumed to be constant. All tournaments will have the same structure. If the tournament entry for winner is null this indicates that the game is still happening, and a winner has not been determined.

2022/05/18

Field Hockey Players		Reasons/explanation
PK	Registration number	Uniquely identify each player as some may have the same name
	Team names	
	Position	Need to know as some player positions are limited to a certain area of the field. If crossed, then necessary action is to be taken which affects the game.
	Age	statistics
	Start date	Start and end date of when player started in a team and when they will leave
	End date	

Added a player start and end date as it was assumed that players may switch between teams and for that reason, they should have a contract period. It is assumed that players will only be moved to teams that exist in our database.

Coaches Table

Coach id will be a concatenation of a random 3-digit number and the team id.

We assume that coaches will be allowed to switch to different teams as this would complicate the coach id.

How are winners recorded

Winners are recorded in the tournament table. An attribute winners will be created that will record who won the entire tournament.

2022/05/21

Decided to add a statistical table that will record the team stats, player, and game stats.

Team Stats		Reasons/explanation
PK/FK	Team id	To know which team stats we are currently looking at
	Cards issued	Running total of all cards team has received
	Total number of goals	Running total of all goals by the team
	Shots on goal	All successful goal attempts
	Shots on target	All successful and unsuccessful goal attempts
	Goal accuracy	Percentage of successful goals
	Team rating	Out of 5
	Team wins	
	Team losses	

	Team draws	
	Total number of games played	Running total for all time
	Goals conceded	Number of goals scored against them

Game stats		Reasons/explanation
PK/FK	Game id	To know which game stats we are currently looking at
	Own goals	
	Free hits	
	Total fouls	
	Short corners	
	Long corners	
	Cards issued	Yellow, green or red cards issued. Running total of all cards issued during the game
	Extra time	This will be a Boolean
	penalties	This will be a Boolean
	Game winner	
	Game loser	

We dropped the action plays table and all tables associated with action plays and decided to rather have an events table which records all types of events that can happen in a game. This events table will then have "child" tables which give more detail to the event. Each game will have an events table associated with it.

Type of events:

Foul (who did it: player ID, foul, card issued: green, yellow, red card, none)

These actions are split into single and dual person

Single: back of stick, undercutting, above shoulder, advancing

Dual: stick interference, blocking, obstruction (always one on one for the ball to two or more against one)

Def: undercutting is high ball

Def: stick interference: hit, hold, hook, or slash opponent's stick

Substitutions (who came off, who came on, position)

Shots table (penalty stroke, field goal, who took the shot: player ID, was it saved: Boolean, penalty shootout, intercepted: Boolean, assisted (either null or player id)

Def: Penalty stroke, happens during normal game time, happens due to like some obstruction

Def: Penalty, during extra time

Corners (short corner, long corner, was it a goal: Boolean, who took it: player ID)

HITS (who took it: player ID, free hit, 16-yard hit, intercepted (Boolean))

Def: Free hits, anywhere not in the circle

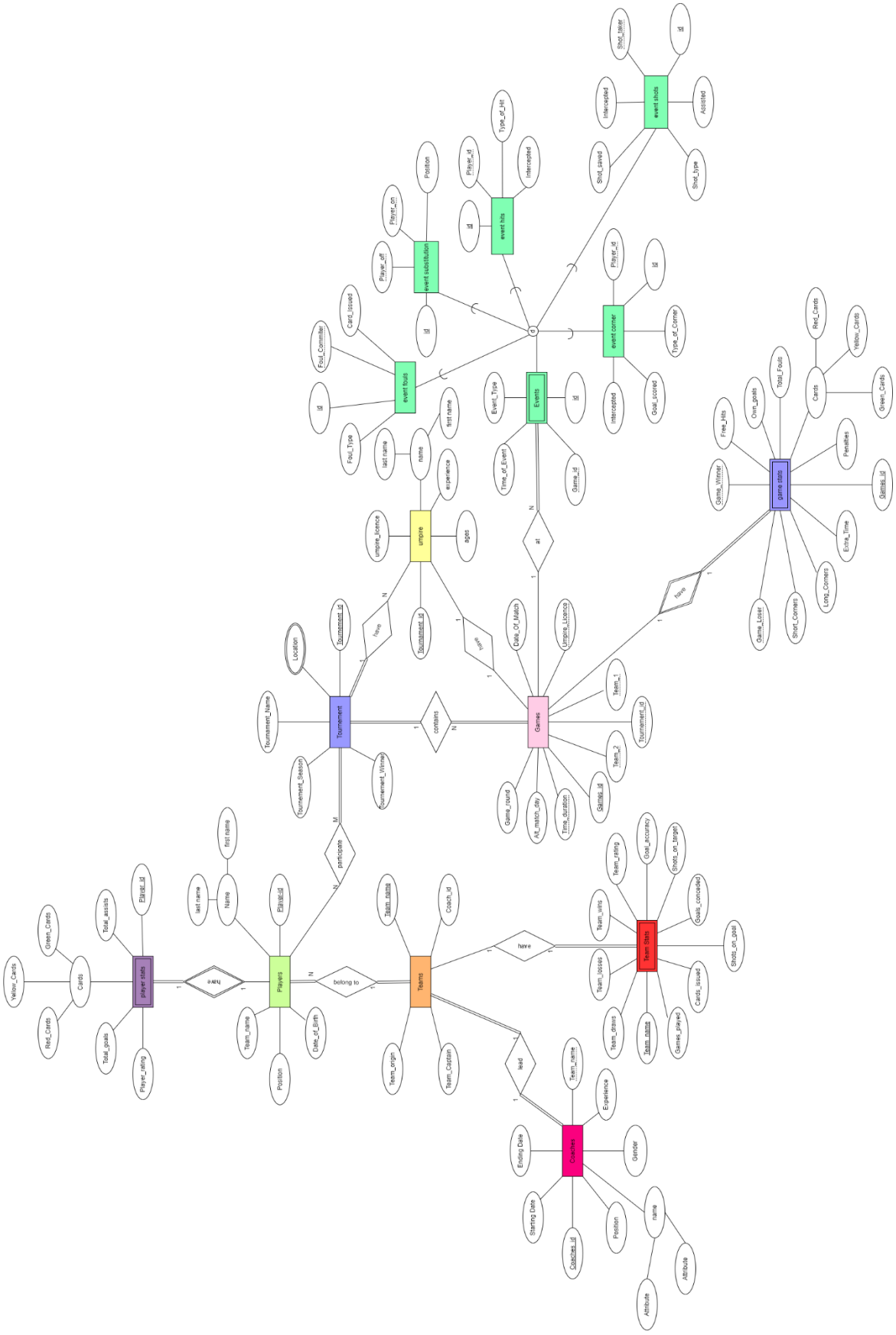
Def: 16-yard hit, hit from circle

Added assisted (player id)

2022/05/26

- Decided that the player ID will be generated as a 3-digit random number
- Age was removed from players and replaced by date of birth, that way it does not have to be continually updated. Age can be calculated from the date of birth.
- Name was made composite: Name -> first name and last name
- Games Table
    - Remove game weather, as it's the only attribute that has to be updated later whilst all other info will be added at the beginning.
- Coach ID was updated to be an auto incremented number instead of a concatenation of the team's name and a random number.

FINAL EER DIAGRAM



EXPLANATION OF EER DIAGRAM

The EER diagram models a database that will be used for capturing data on the sport Field Hockey.

The model consists of 14 entities in total. Of the 14 the strong entities are: Players, Teams, Tournament, Coaches, Games, Events, and Umpire. The weak entities are Player Statistics (player stats), Team Statistics (team stats), Events, and Game Statistics (game stats). Events is specialised into 5 categories namely: event fouls, event substitution, event hits, event shots and event corner.

PLAYERS

Each player must have a Player ID as a way of identifying them (describe how ID will be generated). The player ID is the primary key of the player entity. The first and last name and date of birth of a player will be captured. Each player should belong to a team,and have a position that they play on the field. Players has a total participation relationship with the team's entity. The relationship is a 1: N, where 1 team can have N number of players. In terms of field hockey, this is restricted to 10 outfield players, 1 goalkeeper and a maximum of 6 substitute players. Every player has their player statistics recorded. This information is detailed in the player stats entity

PLAYER STATS

Each player has their statistics recorded. Included in the statistics is the player rating, total number of goals a player has scored throughout their career, cards the player has received throughout their career and the total number of assists the player has made in all previously played games.

Player stats is a weak entity that relies in the existence of a player entity to record statistics for. The two entities are linked by the identifying relationship "have". This is a 1: 1 relationship. Each player has one set of statistical data recorded for them. The foreign key of the player stats is the player ID of the player for whom the statistics are recorded.

TEAMS

The team's entity has the attributes: team origin, team name, coach ID and team Captain.

Each team will a have unique name to uniquely identify them. The team's name is the primary key of the teams. Team origin describes which country the team is from. Coach ID is a foreign key linking to the coach table. Every team has at minimum one coach. A team has a team captain who is also a player in the team. The team captain is identified by the player ID. Player ID acts a foreign key to the player table.

TEAM STATS

The team stats, a weak entity, are a collection of statistical data about the team. Team statistics include team losses, team wins, team rating, goal accuracy, shots on target, goals conceded, shots on goal, cards issued, games played, team name, team draws.

Team name is a foreign key to the Team table. Team rating is a 5-star rating of the team. Team losses, team wins, team draws, and games played are running totals of the teams wins, losses, draws and number matches played. Shots on target is a total of all goal attempts taken by the team,

whether successful or not, for all time. Shots on goal is a total of all successful goal attempts, for all time. Goal accuracy is a percentage that is calculated as follows: (Shots on goal / shots on target) * 100. Cards issued records a running total of the different cards received by the team for all games that have been played. Goals conceded keeps a running total of all goals scored against the team by their opponent.

COACHES

Each team has at minimum one coach leading them. The attributes of the coach table are starting date, ending date, team name, gender, position, coach ID, and experience.

The starting and ending date indicate when the coach started coaching the team and when they will end. Team name is a foreign key to the team's entity indicating which team the coach belongs to. Experience is the number of years for which the coach has been coaching. Gender identifies the sex of the coach. Position describes whether the coach is a head coach or assistant coach; it describes their rank as a coach. Coach ID is the primary key.

UMPIRE

Every tournament has an unspecified number of umpires who will umpire at different games. A 1: N relationship exists between the two entities. The umpire entity has attributes: umpire licence, name (first name and last name), experience, age, and tournament ID.

Each umpire is issued a unique licence number which will be used as the umpire entity's primary key. It is assumed that this licence number is issued to the umpires when they are registered after completing the necessary qualification to become an umpire. Name is composite attribute which records the umpires first and last name. Experience is the experience of the umpire in years from when they first started umpiring in games. The age attribute records the umpire's age. Tournament ID is a foreign key to the tournament entity indicating which tournament the umpire is currently umpiring games for.

TOURNAMENT

The tournament entity has attributes: tournament name, location, tournament ID, tournament winner, and tournament season.

The tournament name records the name of the tournament. The location attribute is a multivalued attribute which records country and city where the tournament will be played. It is assumed that all games in a tournament will happen at one location. The tournament ID is the primary key of the tournament entity. The tournament winner is the overall winner of the tournament. The tournament season attribute records which season the tournament is happening. The season is recorded as a year, for example 2022/ 2023.

GAMES

Multiple games can take place in a tournament. The structure of our database allows for tournaments with up to 16 games. Games has a N: 1 relationship with the tournament entity. The attributes of the game's entity are as follows: game round, alternate match day, time duration, games ID, team 1, team 2, tournament ID, umpire licence, and date of match.

The game round attribute records which round this game is. There are 16 games/ rounds in total in a single tournament. Date of match is an attribute that records the day when the match will be played. The alternate match day records an alternate day which the game can be played in case the match can't be played on the allocated day. Time duration records for how long a game was played. Games ID is the primary key of the game's entity. Attributes team 1 and team 2 record which teams are playing in the game. These attributes are foreign keys and use the team ID to link to the team entity. Tournament ID is a foreign key to the tournament table indicating which tournament the game is taking place in. umpire licence is also a foreign key linking to the umpire entity, which indicates which umpire is umpiring the game.

GAME STATS

All games have their statistics recorded under game statistics. Game stats is a weak entity that depends on the game entity. The attributes of game stats are: game winner, game loser, free hits, own goals, total fouls, cards, penalties, games id, extra time, long corners, short corners, and game loser.

The winner and loser of the game is recorded under game winner and game loser. The number of free hits, fouls, own goals, total fouls, penalties, long corners, and short corners that took place are recorded as a total. The game ID is a foreign key to the games table so that it is known for which game the statistics are being recorded. Cards is a composite attribute in the games stats table which indicates how many red, yellow, and/or green cards were issued during a game.

EVENTS

Events is a weak entity of games and describes the events that can take place in a hockey game. Multiple events can take place in a game, and so Events and Games have a N: 1 relationship. The attributes of events are event type, ID, game ID and time of event.

Event type specifies what type of event occurred. Events is specialised into the different events that may take place in a game. These events are disjoint; they happen independent of one another. These include event fouls, event substitution, event hits, event corner, event shots. Each event has an ID associated with it which acts as the primary key of the event. The game ID is a foreign key which links to the game entity, indicating which in which game the event took place. Time of event records the time when the event took place during the game.

EVENT FOULS

The attributes of event fouls are cards issued, foul committer, ID, and foul type. When a foul takes place either a red, yellow, or green card is issued. The type of card issued depends on what type of foul took place which is recorded in foul type. The ID is a foreign key which matches the ID of the event entity. The foul types are divided into two types: single, where the foul involves one player, and dual where the foul involves two people.

Single fouls include:

Back of stick: Players are fouled if they use the back of their stick to hit the ball

Undercutting: Undercutting happens when a player hits the ball in such a way that the ball lifts into the air. This leads to a foul. The ball should remain on the ground.

Above shoulder: Players may not raise their sticks above their shoulders.

Advancing: If a player uses any part of their body to advance the ball, a foul is awarded. Only hockey sticks may be used to advance the ball.

Dual fouls include:

Any rough or dangerous play which can/ does impose harm to another player.

Stick interference: Stick interference happens when a player uses their stick to hit an opponent's stick

Obstruction: obstruction occurs when a third player interferes with two players who are trying to get the ball. Only two players may go for the ball at a time.

EVENT SUBSTITUTION

The attributes of event substitution are player on, player off, position, and ID. The player on and player off attributes are foreign keys to the player entity indicating which player was taken off the field and which player took their place. The ID is a foreign key which matches the ID of the events entity. The position attribute indicates which position the player going onto the field is taking up.

EVENT HITS

The attributes of event hits are ID, player ID, type of hit, intercepted, and shot saved. The ID matches the ID of the events attribute. The player ID is a foreign key which informs us which player took the shot. Intercepted indicates whether the hit taken was intercepted by another player from another team. The types of hits that can happen are:

Free hits: This hit can be taken from anywhere on the field, except inside the circle.

16-yard hits: This hit is taken from inside the circle.

EVENT SHOTS

The attributes of event shots are id, shot type, shot saved, assisted, shot taker, and intercepted. ID is foreign key that matches the ID of events. Shot taker records the player id which is a foreign key identifying who took the shot. Assisted indicates if the shot was assisted by another player who is on the same team as the shot taker. Shot saved indicates whether the free hit was saved by the goalkeeper or not. Intercepted indicates if the shot was intercepted by a player from the opposing team. The types of shots that can take place are:

Penalty stroke: Penalty strokes happen during normal game time and are awarded to an obstruction that happened during a game.

Field goal: A player tries to get the ball behind the net.

Penalty: Penalties are taken during extra time. Each team is awarded a chance to score a goal in turns. Whichever team scores the most goals wins the game.

EVENT CORNERS

The attributes of event corners are type of corner, ID, player ID, goal scored and intercepted. ID is a foreign key that matches the ID of the events entity. Player ID is a foreign key which indicates which player took the corner shot. Intercepted records whether the corner was intercepted or not by the opposing team. Goal scored indicates whether the corner shot led to a goal or not. Two types of corners can take place:

> Long corner: Is a type of free hit. The difference is that a player must travel with the ball as they advance to the net to attempt a goal.
>
> Short corner (Penalty corner): Given against a team for committing a foul in the circle. During a short corner, a player from the team awarded a short corner stands at the backline. Some players from his/her team will stand outside the circle. The player at the backline will pass the ball to his/ her team members and they will advance the ball into the net in an attempt to score a goal. The net will be defended by the goalkeeper and some players from the other team.

TASK 3: RELATIONAL MAPPING

EXPLANATIONS OF RELATIONAL MAPPING:

STEP 1: MAPPING OF REGULAR ENTITY TYPES

Our strong entities include Player, tournament, games, teams, coaches, and umpire. For each of our strong entities we created a relation that includes all the simple attributes of the entity and chose one of the key attributes of the entity as a primary key for the relation. Our primary keys in our relations are:

- Player – PK: PlayerID
- Tournament – PK: TournamentID
- Games – PK: Game_ID
- Teams – PK: Team_Name
- Coaches – PK: Coach_ID
- Umpire – PK: Umpire_License
-

STEP 2: MAPPING OF WEAK ENTITY TYPES

Our weak entities include Player_stats, Game_stats, Team_stats, and Events. For each weak entity we created a relation and included all the simple attributes of the weak entity. In addition, we included, as foreign key attributes of the relation, the primary key of the relations that correspond to the owner entity types. The foreign keys of the weak entity types are:

- Player_stats – FK: Player_ID (no partial key, thus the primary key of this weak entity type is made up of the foreign key)
- Game_stats – Game_ID (no partial key, thus the primary key of this weak entity type is made up of the foreign key)
- Team_stats – FK: Team_Name (no partial key, thus the primary key of this weak entity type is made up of the foreign key)
- Events – FK: Event_ID and Games_ID (The primary key of events is made up of Events_ID and Games_ID)

STEP 3: MAPPING OF BINARY 1:1 RELATIONSHIP TYPE

For each of our binary relationship types R in our ER schema, we identified the relations S and T that correspond to the entity types participating in R.

Our binary relations are between **Teams and Coaches**, **Player and Player_Stats**, and **Games and Game_Stats**. We followed the foreign key approach to mapping these relationships, and thus chose one of the relations (either S or R) and included the simple attributes of the 1:1 relationship type (S or R) as attributes of S.

STEP 4: MAPPING OF BINARY 1: N RELATIONSHIP TYPES

Our 1: N relationship types include: **Teams: Players**, **Tournament: Games**, **Tournament: Umpire**, and **Games: Events**. We used the foreign key approach to map these relationships. We identified the relation S that represents the participating entity type in the N-side of the relationship and included, as a foreign key in S, the primary key of the relation T that represents the other entity. So, the primary key of Teams is included in Players, and so on.

STEP 5: MAPPING OF BINARY M: N RELATIONSHIPS

Tournament and players have a M: N relationship as many players can participate in multiple tournaments. The relation **Participates** was created to map tournaments and players. The primary keys tournament ID and player ID were used as foreign keys in the participates relation. Together these two foreign keys make a primary key for the **Participates relation**.

STEP 6: MAPPING OF MULTIVALUED ATTRIBUTES

Our only multivalued attribute is the Location attribute of Tournaments. We thus created a new relation – Tour_Location. Tour_location references the tournament entity tournaments through tournamentID, and tournament_location is added to the participation relation.

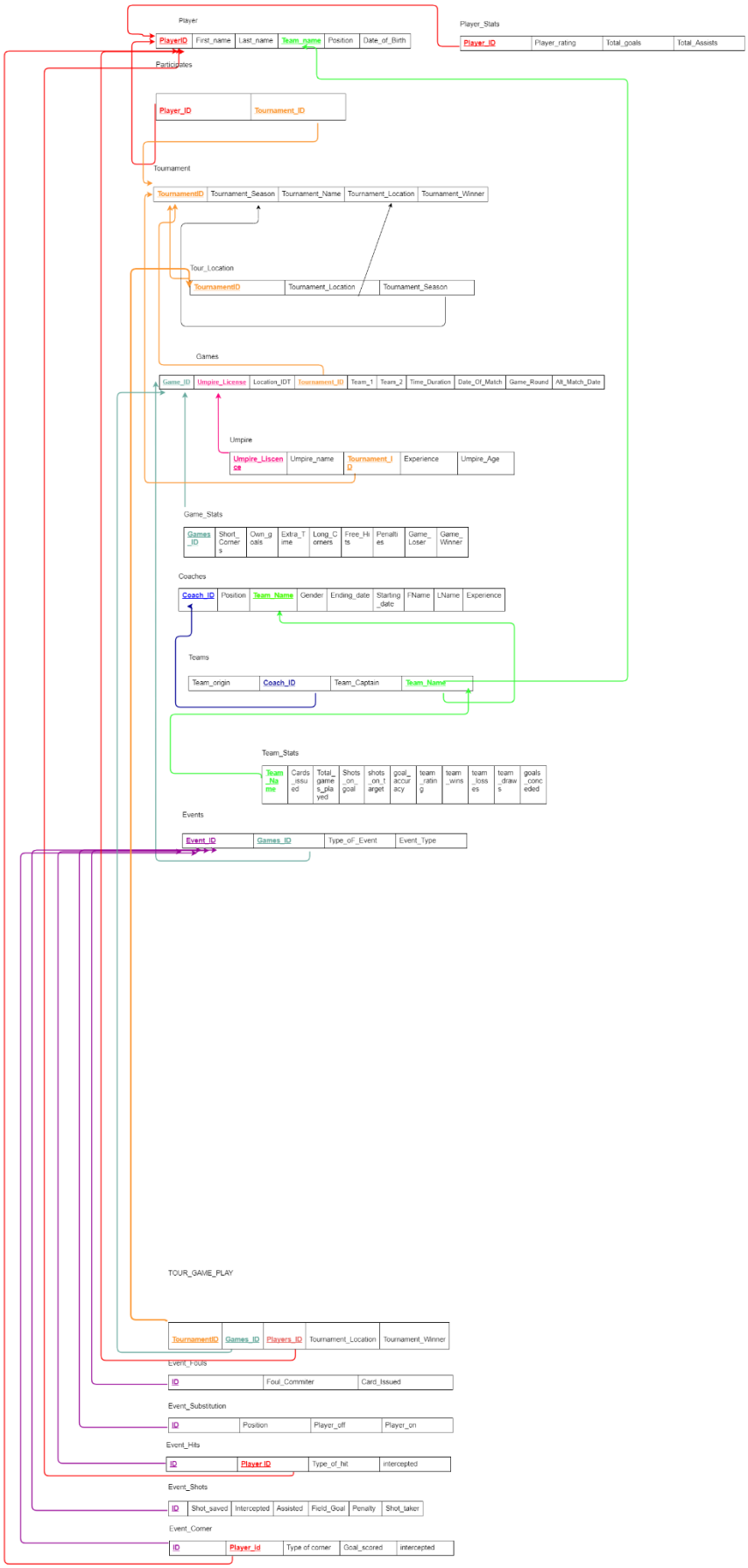
STEP 7: MAPPING OF N-ARY RELATIONSHIP TYPES

Our N-ary relations include Tournament, Games, Teams, Player, Coaches, Umpire, Events and Game_Stats. We use the relationship method to map these relations. For each relationship type R, where n > 2, we created a new relationship S to represent the relation R. We included (as foreign key attributes) in S the primary keys of the entity types participating in the relationship.

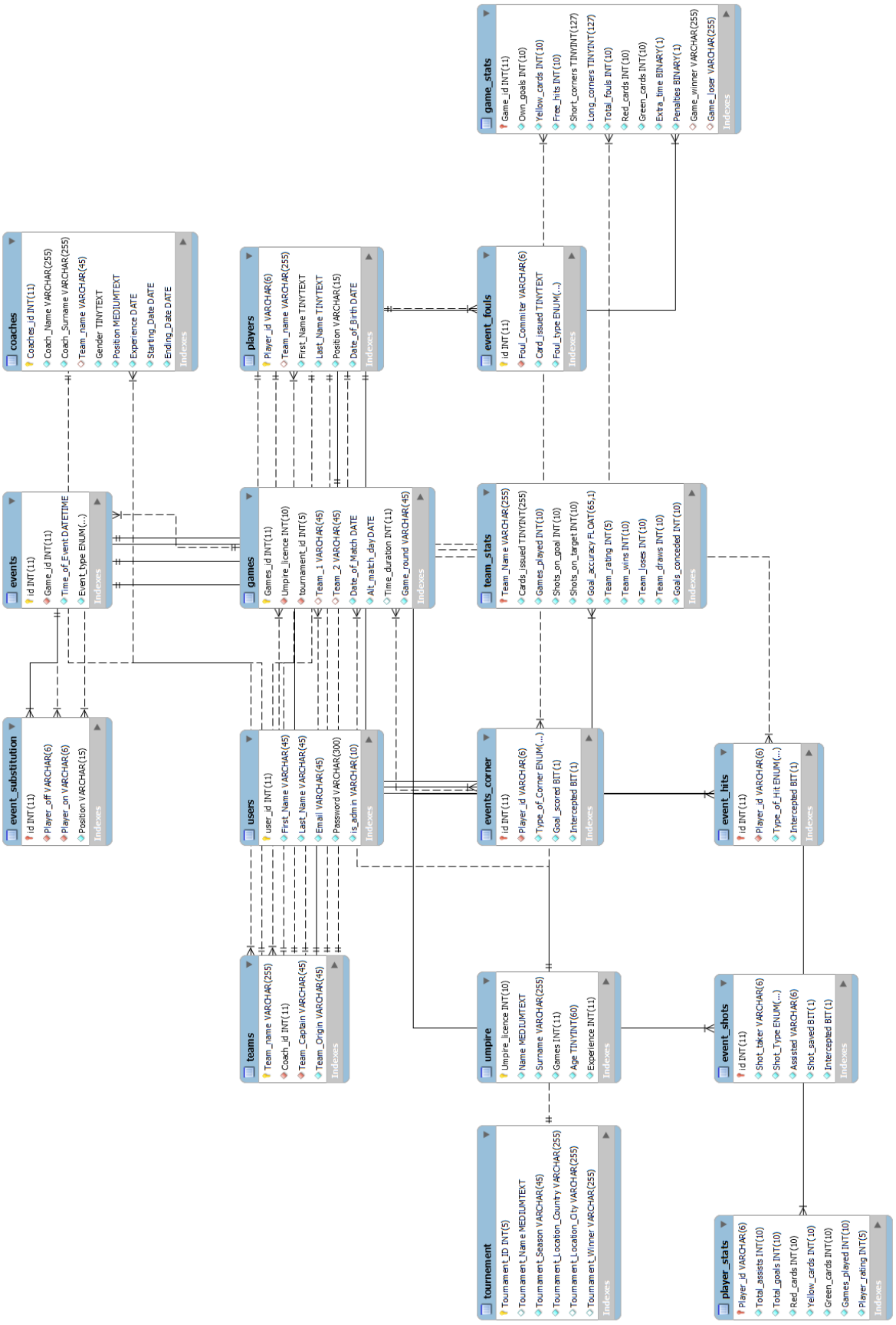
STEP 8: MAPPING OF SPECIALISATIONS OR GENERALISATION

We have an events superclass, with subclasses calling event fouls, event substitution, event hits and event corner. We mapped these relations using option 8A. All our subclasses are disjoint as an event can only be of one type, and not multiple types at a time. We created the relation events with the attributes: event_id, games_id, Type_of_event and event_type. Then we created the relations for the subclasses: event_fouls, event_substitutions, event_hits, event_shots, and event_corner with their extra attributes that only relate to their specific entity type, and for each subclass' relation we included the primary key of our events relation.

GUM - E(E)R to ER Mapping



TASK 4: RELATIONAL EXCLUSION



TASK 6: SAMPLE DATA

We decided to go with mock data that will be manually added to the database. When creating a tournament user with the privilege of adding tournaments will be able to use the players, coaches and umpires we have on our database, and they can add players, coaches, and umpires to the database. Users with this privilege must provide login details before they can go on to create tournaments.

Mock data was chosen because results such as the winner and loser aren't known beforehand. Our data is collected as a tournament is happening.

TASK 7: ANALYSE AND OPTIMISE

Explanation:

Due to how a JOIN function operates, by creating more tuples the JOIN function slows down the query execution time, lowering the efficiency of server that is running it, thus breaking it down and selecting the absolute required tables and/or columns the query needs to execute, thus a basic SELECT FROM and GROUP BY was best

Query:

```
SELECT fieldhockey_gum.teams.Team_Name,
fieldhockey_gum.team_stats.Total_games,fieldhockey_gum.team_stats.Te
am_wins,fieldhockey_gum.team_stats.Team_rating

FROM fieldhockey_gum.teams

JOIN fieldhockey_gum.team_stats ON
fieldhockey_gum.team_stats.Team_Name=fieldhockey_gum.teams.Team_Name
;
```

Optimised Query:

```
SELECT fieldhockey_gum.team_stats.Team_Name,
fieldhockey_gum.team_stats.Total_games,fieldhockey_gum.team_stats.Te
am_wins,fieldhockey_gum.team_stats.Team_rating

FROM fieldhockey_gum.team_stats

GROUP BY fieldhockey_gum.team_stats.Team_rating;
```

Interpretation:

The overall query above is mainly to create a table that would display a team's rating including their total goals scored, all these would be grouped by their Team_rating.

Using a JOIN in this instance we lost our efficiency time, a longer query leads to more compile time and execution time in a server, by optimising the query we gain a faster compilation and execution time for the overall server, thus we gain a faster query.

Explanation:

By creating more tuples depending on how the JOIN function works, the JOIN function slows down the execution time of queries, reduces the efficiency of running servers, and tables and tables that absolutely need queries. Explode and select column. Simple SELECT FROM and GROUP BY were best because they had to be done

Query:

```
SELECT fieldhockey_gum.player_stats.Player_id,
fieldhockey_gum.player_stats.Total_goals,fieldhockey_gum.player_stat
s.Player_rating, fieldhockey_gum.players.Team_name

FROM fieldhockey_gum.player_stats

JOIN fieldhockey_gum.players ON
fieldhockey_gum.player_stats.Player_id=fieldhockey_gum.players.Playe
r_id;
```

Optimised Query:

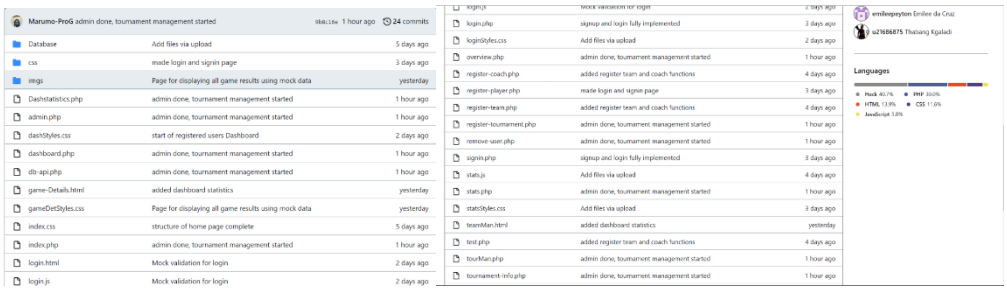
```
SELECT fieldhockey_gum.player_stats.Player_id,
fieldhockey_gum.player_stats.Total_goals,fieldhockey_gum.player_stat
s.Player_rating, fieldhockey_gum.players.Team_name

FROM fieldhockey_gum.player_stats,fieldhockey_gum.players

GROUP BY fieldhockey_gum.player_stats.Player_rating;
```

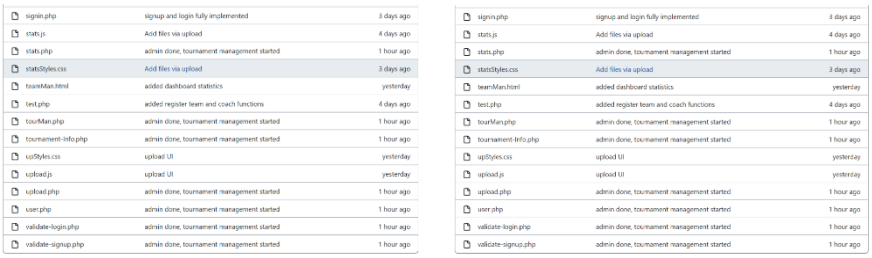
Interpretation:

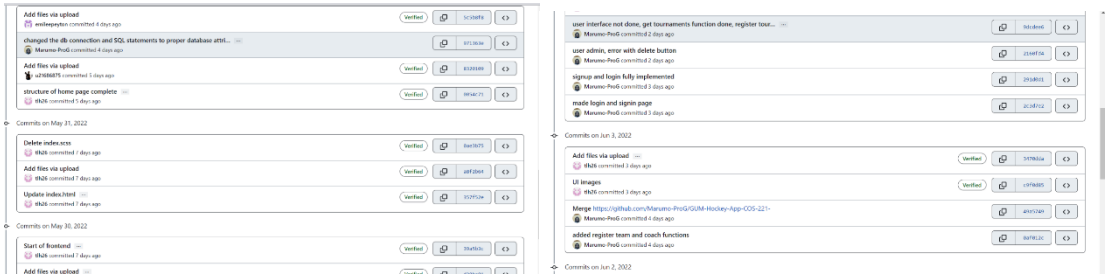
The overall query above is primarily to create a table showing the player's total goals and player_ids all grouped by player_rating. This is to determine which player has the higher rating. Using JOINs in this case will take more time, as longer queries will take longer to compile and run on the server. Optimizing queries reduces overall server compilation and execution time and speeds up queries.

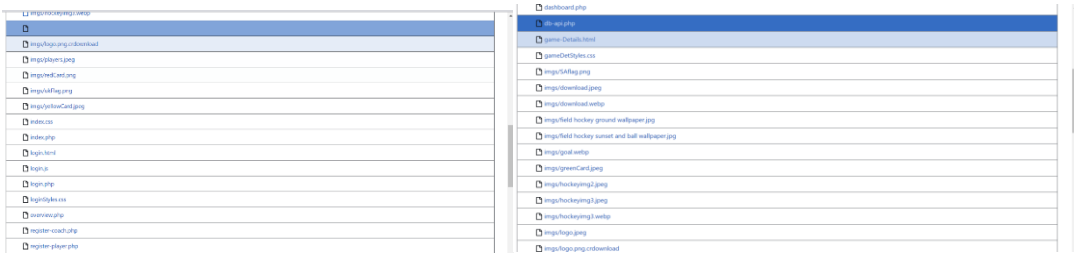
TASK 8: DEVELOPMENT

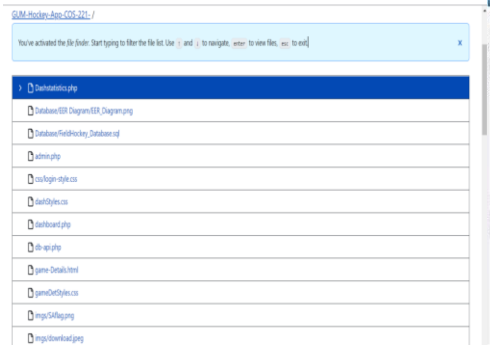
SCREENSHOTS OF EVENTS

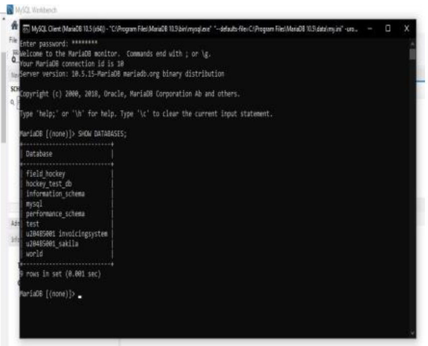









GUM-Hockey-App-COS-221- /
You've activated the file finder. Start typing to filter the file list. Use ↑ and ↓ to navigate, enter to view files, esc to exit
Dashstatistics.php
Database/EER Diagram/EER_Diagram.png
Database/FieldHockey_Database.sql
admin.php
css/login-style.css
dashStyles.css
dashboard.php
db-api.php
game-Details.html
gameDetStyles.css
imgs/SAflag.png
imgs/download.jpeg


MySQL Workbench
MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" "--defaults-file=C:\Program Files\MariaDB 10.5\data\my.ini" -uro...
Enter password: ********
Welcome to the MariaDB monitor. Commands end with ; or \g.
Your MariaDB connection id is 10
Server version: 10.5.15-MariaDB mariadb.org binary distribution
Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.
MariaDB [(none)]> SHOW DATABASES;
Database
field_hockey
hockey_test_db
information_schema
mysql
performance_schema
test
u20485001 invoicingsystem
u20485001_sakila
world
9 rows in set (0.001 sec)
MariaDB [(none)]>


Database
field_hockey
hockey_test_db
information_schema
mysql
performance_schema
test
u20485001 invoicingsystem
u20485001_sakila
world
9 rows in set (0.001 sec)
MariaDB [(none)]> use field_hockey;
Database changed
MariaDB [field_hockey]> SELECT * from users
-> SELECT * from users;
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that corresponds to your MariaDB server version for the right syntax to use near 'SELECT * from users' at line 2
MariaDB [field_hockey]> SELECT * FROM users;
user_id | First_Name | Last_Name | Email | Password | is_admin
16 | Eunice | Ntjana | e.ntjana@yahoo.com | No
17 | Lenny | Thobejane | Lennythobejane@gmail.com | Yes
2 rows in set (0.000 sec)
MariaDB [field_hockey]>