Project phase-1

Team ID: 5

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1. Introduction to the mini world:

The mini world is centred around one of the most popular games in the world - **MINECRAFT**. In this game players interact with each other along with the other entities such as mobs,items,blocks,biomes and structures they do this by creating another entity 'world' in the game.

2. Purpose of the database:

The database offers an integrated solution for organising information, ensuring that gamers can quickly access and manipulate data that would be cumbersome to manage through traditional methods. It serves to:

i) **Act as a Wiki:** To help anyone who is looking for any information about the different entities that exist in Minecraft World.
ii) **Leaderboard and Achievements**: Provide in-game leaderboards by tracking various stats for each player.Also it can be used to store the different achievements which players get while surviving in the world.
iii) **Game Balance Analysis and Development Support:** It allows the developers of the game to analyse the gameplay experience as well as player and retention and help them make meaningful updates to the game.
iv) **Manage multiplayer interaction:** Track server/world popularity metrics and manage multiplayer interaction data

3. Users of the database:

Game Developers: Developers can seek information about item usage, mob encountered etc. This can be used to rectify bugs for the upcoming updates in the game.
Texture Designers: Can see and update texture for the game in the database (A subclass under Game Developers).
Players: Players can see their and friends' stats as well as access the wiki.
World Owners/Moderators: Can see the attributes of their world as well as monitor/moderate the players playing on it.

4. Database Requirements:

Assumptions -

A. Base spawn is always set to (0,0,0) while creation of World. You cannot insert it at the start.
B. Same seed always generates the same world by some algorithm.

a) Strong Entities

Entity type	Attributes	Attribute type	Data Type
Player	PlayerID	Simple (Primary Key)	INT
	Gamertag(Unique)	Simple(Key)	VARCHAR
	Minecoins	Simple	INT
	Skin	Simple	IMG(BLOB)
	Total Distance Travelled	Simple(derived)	INT
	Total Mobs Killed	Simple(derived)	INT
	Total Items Crafted	Simple(derived)	INT
	Total Blocks Placed	Simple(derived)	INT
	Total Time Played	Simple(derived)	INT
Items	Item ID	Simple (Primary Key)	INT
	Name	Simple (Primary Key)	VARCHAR
	Type	Simple	VARCHAR
	Recipe (Ordered Tuple of 9)	Multivalued	[INT[9]]
	Texture	Simple	IMG(BLOB)
	Stackable(1,16,64)	Simple	INT
Mobs	Name	Simple (Primary Key)	VARCHAR
	Type (Passive, Hostile, Neutral, Boss)	Simple	VARCHAR (ENUM)
	Name_tag	Simple	VARCHAR
	Effects a. Effect name b. Duration	Composite Multivalued a. Simple b. Simple	[a. VARCHAR b. INT]
	Naturally Spawnable	Simple	Boolean
	Max. HP	Simple	INT
	Base Damage	Simple	INT
	Dimension a. Length b. Width c. Height	Composite a. Simple b. Simple c. Simple	a. FLOAT b. FLOAT c. FLOAT

Biomes	Biome Name	Simple(Primary Key)	VARCHAR
	Type	Simple	VARCHAR

b) Weak Entities

Entity type	Attributes	Attribute type	Data Type
World	World Name	Simple (Partial Key)	VARCHAR
	Seed	Simple	VARCHAR
	Spawnpoint a. X-coordinate b. Y-coordinate c. Z-coordinate	Composite a. Simple b. Simple c. Simple	a.INT b.INT c.INT
	Settings a. Default Gamemode b. Difficulty c. Cheats d. Tick Speed	Composite a. Simple b. Simple c. Simple d. Simple	a. VARCHAR b. VARCHAR c. BOOLEAN d. INT
	Gamerules (Ordered Tuple)	Multivalued	[BOOLEAN]
Structures	Structure Name	Simple(Partial Key)	VARCHAR
	Generate Chance	Simple	FLOAT
	Loot a. Item ID b. Percent chance of find	Composite Multivalued a. Simple b. Simple	[a. VARCHAR b. FLOAT]

c) SubClass Of Items

Entity type	Attributes	Attribute type	Data Type
Armaments	Damage	Simple	INT
	Durability	Simple	INT
	Armour Points	Simple	INT
	Possible Enchantments	Multivalued	[VARCHAR]
Blocks	Height	Simple	FLOAT
	Flammable	Simple	BOOLEAN
	Blast Resistance	Simple	FLOAT
Consumable	Saturation	Simple	INT

	Hunger Filled	Simple	INT
	Effects a. Effect name b. Duration	Composite Multivalued a. Simple b. Simple	[a. VARCHAR b. INT]

d) Relationships

Relationship	Attributes	Attribute type	Data Types	min-max constraint
Player FRIENDS_WITH Player	-			(0, N) -> (0, N)
Player OWNS World (Identifying Relationship)	Creation Time	Composite a. Time b. Date c. Month d. Year	a. INT b. INT c. INT d. INT	(0, N) -> (1, 1)
World CONTAINS Player	Current Location a. X-coordinate b. Y-coordinate c. Z-coordinate	Composite e. Simple f. Simple g. Simple	a. INT b. INT c. INT	(1, N) -> (0, N)
	ReSpawnpoint a. X-coordinate b. Y-coordinate c. Z-coordinate	Composite a. Simple b. Simple c. Simple	a. INT b. INT c. INT	
	Gamemode	Simple	VARCHAR	
	Health	Simple	INT	
	Hunger	Simple	INT	
	Experience	Simple	FLOAT	
	Inventory (36 for Inventory Slot + 4 Armour + 1 for Offhand) a. Item Id b. Number of Item	Composite Multivalued a. Simple b. Simple	[a. INT b. INT]	
	Count of Items crafted	Derived	INT	
	Blocks Placed	Derived	INT	
	Mobs killed	Derived	INT	
	Distance travelled	Simple	INT	

	Time Played	Simple	INT	
	Advancements	Multivalued(derived)	[VARCHAR]	
	Effects a. Effect name b. Duration	Composite Multivalued a. Simple b. Simple	[a. VARCHAR b. INT]	
Structure SPAWNS IN Biome (Identifying Relation)	Generate Rate	Simple	FLOAT	(0,N)->(1,N)
Item(reactant) CRAFTS Item(product)	-	-		(1,N)->(1,N)
Mobs SPAWN IN Biome	Spawning Rate	Simple	FLOAT	(0,N)->(1,N)
	Despawn Time	Simple	INT	
Mobs SPAWNS IN Structure	Spawning Rate	Simple	INT	(0,N)->(1,N)
Mobs DROP Items	Drop Percentage	Simple	FLOAT	(0,5)->(0,N)
Player IN World ACQUIRES Item	Number of times	Simple	INT	Player: (0,N) World: (0,N) Item: (0,N)
Player IN World BREAKS Block	Number of times	Simple	INT	Player: (0,N) World: (0,N) Block: (0,N)
Player IN World KILLS Mob	Number of times	Simple	INT	Player: (0,N) World: (0,N) Mob: (0,N)
	Experience gained	Simple	FLOAT	
Player IN World CAN_TRADE_WITH Mob USING Item(Cost) FOR Item(Product)	Experience gained	Simple	FLOAT	Player: (0,N) World: (0,N) Mob: (0,8) Item Used: (0, N) Item got: (0, N)
	Cost of Trade (Item)	Simple	INT	

5.Functional Requirements

(Modifications are not actually done by the player but the game logic on the player's system)

1)Retrieval

a)

i) Selection - Players can retrieve data about mobs,biomes,achievements.

Ex - Retrieve all tuples belonging to mobs.

Ex - Retrieve all tuples belonging to people.

ii) Projection - Players can search for different attributes related to mobs,Biomes..

Ex- Select all mobs with Max.Health < 10 Hitpoints.

Ex - Select all biomes from Biomes with type = 'Ocean'

iii) Aggregate - Players can search for this requirement in mobs.

Ex - Select mob with MAX(Base Damage).

Ex - Select player with MAX(Minecoins).

iv) Search - Players can search in the Player attribute to find others with the same subpart.

Ex- Select Player with Gametag starting with "Bond"

Ex - Select Biome with Biome name containing "Forest"

b)Analysis -

Ex - Select Players, Worlds and Players IN world with Above-Average Interaction Across Worlds(Total_Mobs_Killed, Total_Items_Crafted, and Total_Blocks_Placed All above average values in Player)

Ex - Select Biome, Mob Such that SpawnRate of Mob in that biome is above average spawn rate of that particular mob in all biomes

Ex - Select Mob such that it is the maximum killed Mob by all players across all mobs

Ex - Select Item such that it is acquired the least number of times summed across all players

2)Modification -

a)Insertion - Can be done by Game Developers.

Ex - INSERT <'Mangrove Forest',Forest> in Biomes.

INSERT <50032,'name_not_found',0,skin.jpeg> in Player.

INSERT <NULL,'name_found',1000,skin.jpeg> in Player ❌ (This violates as you can not insert NULL as a value for Primary Key.)

b)Update - Can be done by Player, World Owners, Game Developers, Designers.

Ex- UPDATE Player SET Minecoins = 0 where ID Tag=1.

Ex- UPDATE World SET SpawnPoint = (100, 100, 100) where ID=1 and WorldName = 'MYworld'

Ex- UPDATE Mob SET MaxHealth = 25 where MobName = 'Zombie'

Ex- UPDATE Item SET Texture = 'Some Texture' where ItemID = 1 and Name = 'Dirt'

c)Delete - Can be done by both Players, World Owners and Game developers.

Ex - Delete from Player where Player ID = 1

Ex - Delete from World where Player ID = 2 and World name = ‘MYworld’.

Ex - Delete from Item where Item ID = 1 and Item Name = ‘Dirt’