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CSCI 210: Database Management Systems

M06 Database Design Project

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# Introduction and Overview

You have recently become the King of a small castle in your home country. It is currently in a state of ruin and you are determined to bring your home country back from the brink, if the last castle fell apart, the country would cease to exist. As you look over your resources you find that the ledgers are outdated claiming an inflated level of wealth. You studied abroad in Greece and the Middle East gaining much knowledge, so you decide to take it upon yourself to get your castle back into order.

You begin by assigning duties to those who aren’t working but who can and making sure that everyone has one job. You record those people who have jobs and what they do, you also make a list of the jobs that everyone can have; Farmer, Artisan, Soldier, Lord, and Citizen. You also mark that Farmers and Artisans produce Goods and Food which can be traded for money. Lords, Soldiers, and Citizens produce nothing but serve different purposes. Lords can only exist as one per castle and keep things in order and producing at efficiency, without one the castle inevitably falls into disarray. Soldiers protect and fight battles to protect or expand their country for much needed resources. Hunters are fast producing and heavy resource consumers but produce large amounts of food and gold. The Farmers and Artisans produce about 15 units of food or gold per day, Hunters produce food and gold at a faster rate than Farmers and Artisans, but consume a lot of resources and can only be used when a herd is around. Regardless your subjects may only live in a single region. You have also noticed vagabonds and nomads traveling through your castle from time to time, independent of any nation you leave them be.

You decide you want to keep track of each person by assigning them an identifier number and tracking where they are and where they are from in your ledger.

Every country can have multiple castles which work to house your subjects. You can purchase new castles for 10,000 gold. There is no limit to how many castles can be purchased.

When it comes to recording your production, you decide to include total productions of your own country, as well as the productions of each castle on a day to day basis.

You also notice that you have a few neighboring countries which haven’t been heard from in the past 10 years. You decide to try and reach out, by sending food as a gift. You can continue to do this but alternatively you could try to take over the region and its castles by sending soldiers to it. When you defend from a castle, your troops are consumed 1 to 2, since your castle gives you an advantage. Although by sending soldiers you make the enemy country hostile, by trading you make friends with the country. Once you send troops to a castle, that castle will always be an enemy. Trades are kept track of in order for you to keep track of what has come in and out of your country, but you also keep track of your friendship level with other countries. You can also send your own subjects to other friendly countries to aid in production.

Other important things to note are the Regions and Herds. Regions can be in one of three biomes and have one of three terrains. Biomes are Cold, Temperate, and Hot. Terrains are Mountainous, Forest, Seaside.

Biomes influence the food yield of farmers extremes make it hard to produce food reducing their production by 5 but offer defensive boosts so that castles defending in these biomes trade for one soldier for three. Terrains affect production mostly,

Mountainous reduces farmer production by 5 but increases gold production of artisans on the account of rare minerals by 3, Forest offers stable production for artisans and farmers but increases the chance of a herd appearing, Seaside reduces farmer production by 10 due to the high salinity water, but enables hunters to fish and increases artisan yield by 5 due to the pretty shells.

Herds are groups of animals that migrate through each Region, there are Cashcows, Goats, Tuna, and Boar. Cashcows appear in random regions and when hunted produce gold, exceedingly rare. Goats, Boar, and Tuna appear most frequently in Mountainous, Forest, and Seaside terrains respectively. They will stay in one location for 5 days or until they have been hunted completely.

# Business Rules

Every country has at least one castle

If a country has no castles, it does not exist

countries have only one king

Only a lord can become king

countries can be either friendly, neutral, or enemies

Alignment is determined by sending of items

Sending Soldiers makes enemies

Sending food makes friends

Doing nothing remains neutral

Every castle needs a lord

Every castle belongs to a country

Every castle can house around 100 people

Every person can have one occupation but it can be changed

There are six professions; Farmers, Artisans, Hunters, Soldiers, Lords, or nomads

Nomads are independent of any country, castle, or region and are self-sufficient

Every person consumes 5 food

Hunters consume 10 food

Farmers produce 15 food, Artisans produce 15 gold

Hunters produce 15 food and 15 gold while hunting most species of herd

Hunters produce 0 food and 30 gold while hunting cashcows

Hunters can only fish at Seaside terrains and fish at reduced production

Hunters produce 15 food while fishing without a herd

Hunters can only hunt with herds around

Each Hunter will hunt one animal from a herd a day

As long as a herd is present the hunters will hunt animals

Soldiers and Lords produce nothing but are integral to the production and safety of the castle

Every person can live in a single region or be nomadic

Every person may live in another region, but will return to their home region

Production occurs at the end of one day

Regions are the home of countries, they affect production and battle

Extreme (Cold, Hot) biome regions will reduce food production but reduce battle costs for defending regions

Mountainous terrains improve artisan production

Forest Terrain improve chances of herd appearances

Seaside terrain allows hunters to fish without a herd, although at a reduced rate

Herds appear randomly and can only be harvested by hunters

Herds disappear after being hunted completely or after around 5 days

Herds produce mostly food and produce small amounts of money

Herds exist mostly independent of region, existing in between them needing no region to exist.

Regions are independent of all entities, but countries are dependent on them.

Subjects can be nomadic and not have a castle or country or region, but simply switch between them.

# Entity Relationship Diagram

A close up of text on a white background

Description automatically generated

# Relational Diagram

A screenshot of a cell phone

Description automatically generated

# Primary Keys

|  |  |
| --- | --- |
| Entity | Primary Key |
| Country | CNTRY\_NUM |
| Region | REG\_NUM |
| Subject | SUB\_NUM |
| Castle | CSTL\_NUM |
| Profession | PROF\_NUM |
| Productions | PROD\_CODE |
| Trades | TRAD\_NUM |
| Reputations | REP\_NUM |
| The Herd | HERD\_NUM |

# Integrity Rules as they apply to the entities

Each Region exists independently of any other entity, but acts as a home to castles and countries

Herds exist independently of regions and move between them, they have no foreign key since they don’t need a Region to exist, it simply helps to know where they are at a given time

Countries need at least one person and one castle without both they are destroyed

Castles can be abandoned, and thus don’t need people but they do need a region to exist in.

Subjects are independent of regions, being capable of living in any region, but most give up their freedom to live as part of a safe kingdom. They have one foreign keys since they don’t need to exist as a subject to a specific country in a specific region, but they do need to be marked as nomad

Trades need to be performed by countries, thus they are not independent.

Reputations represent the level of friendship between different countries and are dependent on countries

Professions represent the job that subjects inhabit, they need to be classified as one of the professions

Castles have productions based on their subjects and their duties but since they can be abandoned and the country, they belonged to can be destroyed they have no foreign key for their lord or country

# Relationships between Entities

|  |  |  |
| --- | --- | --- |
| Entity 1 (M) | Entity 2 (N) | 1\*1, M\*N, M\*1/1\*N, |
| Region | Country | 1\*N |
| Region | Herd | M\*N |
| Subject | Profession | M\*1 |
| Subject | Country | M\*1 |
| Subject | Castle | M\*1 |
| Castle | Productions | 1\*N |
| Castle | Subject | 1\*N |
| Castle | Country | M\*1 |
| Castle | Region | M\*1 |
| Herd | Region | M\*N |
| Country | Reputation | M\*N |
| Country | Trades | M\*N |

# SQLite Table Creation

**SUBJECT Table**

CREATE TABLE SUBJECT (

SUB\_NUM INTEGER NOT NULL UNIQUE,

SUB\_FNAME CHAR(20) NOT NULL,

SUB\_LNAME CHAR(20) NOT NULL,

SUB\_AGE INTEGER NOT NULL,

SUB\_PROF CHAR(20) NOT NULL,

SUB\_CSTL INTEGER NOT NULL,

SUB\_REGION INTEGER NOT NULL,

SUB\_HOME INTEGER NOT NULL,

PRIMARY KEY(SUB\_NUM),

FOREIGN KEY(SUB\_PROF) REFERENCES PROFESSION(PROF\_NUM)

);

**Profession Table**

CREATE TABLE "PROFESSION"(

PROF\_NUM INTEGER NOT NULL UNIQUE,

PROF\_NAME CHAR(20) NOT NULL,

PROF\_PROD INTEGER NOT NULL,

PROF\_ITEM CHAR(20) NOT NULL,

PRIMARY KEY (PROF\_NUM)

);

**Herd Table**

CREATE TABLE "HERD"(

HERD\_NUM INTEGER NOT NULL UNIQUE,

HERD\_SIZE INTEGER NOT NULL,

HERD\_REG INTEGER NOT NULL,

HERD\_SPEC CHAR(20) NOT NULL,

PRIMARY KEY (HERD\_NUM)

);

**Region Table**

CREATE TABLE "REGION"(

REG\_NUM INTEGER NOT NULL UNIQUE,

REG\_NAM CHAR(20) NOT NULL,

REG\_BIOME CHAR(20) NOT NULL,

REG\_TERRAIN CHAR(20) NOT NULL,

PRIMARY KEY (REG\_NUM)

);

**Castle Table**

CREATE TABLE "CASTLE"(

CSTL\_NUM INTEGER NOT NULL UNIQUE,

CSTL\_LRD INTEGER,

CSTL\_NAM CHAR(20) NOT NULL,

CSTL\_REG INTEGER NOT NULL,

CSTL\_CNTRY INTEGER,

CSTL\_SUB INTEGER NOT NULL,

PRIMARY KEY (CSTL\_NUM),

FOREIGN KEY (CSTL\_REG) REFERENCES REGION(REG\_NUM)

);

**Production**

CREATE TABLE "PRODUCTIONS"(

PROD\_CODE INTEGER NOT NULL UNIQUE,

PROD\_FOOD INTEGER NOT NULL,

PROD\_GOLD INTEGER NOT NULL,

PROD\_SUB INTEGER NOT NULL,

CSTL\_NUM INTEGER NOT NULL,

PROD\_DATE date NOT NULL,

PRIMARY KEY (PROD\_CODE),

FOREIGN KEY (CSTL\_NUM) REFERENCES CASTLE(CSTL\_NUM)

);

**Country**

CREATE TABLE "COUNTRY"(

CNTRY\_NUM INTEGER NOT NULL UNIQUE,

CNTRY\_NAM CHAR(20) NOT NULL,

CNTRY\_RULE INTEGER NOT NULL,

CNTRY\_CSTL INTEGER NOT NULL,

CNTRY\_GOLD INTEGER NOT NULL,

CNTRY\_FOOD INTEGER NOT NULL,

CNTRY\_REG INTEGER NOT NULL,

PRIMARY KEY (CNTRY\_NUM),

FOREIGN KEY (CNTRY\_RULE) REFERENCES SUBJECT(SUB\_NUM),

FOREIGN KEY (CNTRY\_REG) REFERENCES REGION(REG\_NUM)

);

**TRADES**

CREATE TABLE "TRADES"(

TRAD\_NUM INTEGER NOT NULL UNIQUE,

TRAD\_SEND INTEGER NOT NULL,

TRAD\_REC INTEGER NOT NULL,

TRAD\_ITEM CHAR(20) NOT NULL,

TRAD\_QUANT INTEGER NOT NULL,

TRAD\_DATE date NOT NULL,

PRIMARY KEY (TRAD\_NUM),

FOREIGN KEY (TRAD\_SEND) REFERENCES COUNTRY(CNTRY\_NUM),

FOREIGN KEY (TRAD\_REC) REFERENCES COUNTRY(CNTRY\_NUM)

);

**REPUTATION**

CREATE TABLE "REPUTATION"(

REP\_NUM INTEGER NOT NULL UNIQUE,

REP\_CNTRY1 INTEGER NOT NULL,

REP\_CNTRY2 INTEGER NOT NULL,

REP\_STATUS CHAR(20) NOT NULL,

PRIMARY KEY (REP\_NUM),

FOREIGN KEY (REP\_CNTRY1) REFERENCES COUNTRY(CNTRY\_NUM),

FOREIGN KEY (REP\_CNTRY2) REFERENCES COUNTRY(CNTRY\_NUM)

);

# SQLite Table Population

**Profession Insertion**

INSERT INTO PROFESSION VALUES(0, "Lord", 0, "None");

INSERT INTO PROFESSION VALUES(1, "Hunter", 30, "Both");

INSERT INTO PROFESSION VALUES(2, "Farmer", 15, "Food");

INSERT INTO PROFESSION VALUES(3, "Artisan", 15, "Gold");

INSERT INTO PROFESSION VALUES(4, "Soldier", 0, "None");

**Subject Insertion**

INSERT INTO SUBJECT VALUES(0,"Levi", "George", 21, 0, 0,0,0);

INSERT INTO SUBJECT VALUES(1,"Octavia", "Middleton", 25, 0, 1,1,1);

INSERT INTO SUBJECT VALUES(2,"James", "Anunda", 20, 0, 2,2,2);

INSERT INTO SUBJECT VALUES(3,"Charles", "Muombo", 22, 0, 3,3,3);

INSERT INTO SUBJECT VALUES(4,"Billy", "Corgan", 53, 0, 4,4,4);

**Herd Insertion**

INSERT INTO HERD VALUES(0, 75, 2, "Tuna");

INSERT INTO HERD VALUES(1, 98, 4, "Goats");

INSERT INTO HERD VALUES(2, 98, 4, "Cashcow");

INSERT INTO HERD VALUES(3, 43, 0, "Boar");

INSERT INTO HERD VALUES(4, 5, 1, "Cashcow");

**Region Insertion**

INSERT INTO REGION VALUES(0, "Black Forest", "Temperate", "Forest");

INSERT INTO REGION VALUES(1, "White Ridge", "Cold", "Mountainous");

INSERT INTO REGION VALUES(2, "Ivory Coast", "Hot", "Seaside");

INSERT INTO REGION VALUES(3, "Ebony Valley", "Cold", "Mountainous");

INSERT INTO REGION VALUES(4, "Wood of Holly", "Temperate", "Mountainous");

**Castle Insertion**

INSERT INTO CASTLE VALUES(0, 0, "Ivy Tower", 0, 0,

(SELECT COUNT(\*) FROM SUBJECT WHERE SUBJECT.SUB\_CSTL = 0)

);

INSERT INTO CASTLE VALUES(1, 1, "Kitten Cliff", 1, 1,

(SELECT COUNT(\*) FROM SUBJECT WHERE SUBJECT.SUB\_CSTL = 1)

);

INSERT INTO CASTLE VALUES(2, 2, "Coral Fortress", 2, 2,

(SELECT COUNT(\*) FROM SUBJECT WHERE SUBJECT.SUB\_CSTL = 2)

);

INSERT INTO CASTLE VALUES(3, 3, "Tower of Apollo", 3, 3,

(SELECT COUNT(\*) FROM SUBJECT WHERE SUBJECT.SUB\_CSTL = 3)

);

INSERT INTO CASTLE VALUES(4, 4, "Jade Outpost", 4, 4,

(SELECT COUNT(\*) FROM SUBJECT WHERE SUBJECT.SUB\_CSTL = 4)

);

**Productions**

INSERT INTO PRODUCTIONS VALUES(0, 200, 200, 1, 0, datetime('now'));

INSERT INTO PRODUCTIONS VALUES(1, 100, 300, 1, 1, datetime('now'));

INSERT INTO PRODUCTIONS VALUES(2, 300, 100, 1, 2, datetime('now'));

INSERT INTO PRODUCTIONS VALUES(3, 250, 150, 1, 3, datetime('now'));

INSERT INTO PRODUCTIONS VALUES(4, 50, 350, 1, 4, datetime('now'));

**Country**

INSERT INTO COUNTRY VALUES(0, "Drangleic", 0, 0,

(SELECT SUM(PRODUCTIONS.PROD\_GOLD) FROM PRODUCTIONS WHERE PRODUCTIONS.CSTL\_NUM = 0),

(SELECT SUM(PRODUCTIONS.PROD\_FOOD) FROM PRODUCTIONS WHERE PRODUCTIONS.CSTL\_NUM = 0),

0

);

INSERT INTO COUNTRY VALUES(1, "Felicitous Moor", 1, 1,

(SELECT SUM(PRODUCTIONS.PROD\_GOLD) FROM PRODUCTIONS WHERE PRODUCTIONS.CSTL\_NUM = 1),

(SELECT SUM(PRODUCTIONS.PROD\_FOOD) FROM PRODUCTIONS WHERE PRODUCTIONS.CSTL\_NUM = 1),

1

);

INSERT INTO COUNTRY VALUES(2, "Puma's Nest", 2, 2,

(SELECT SUM(PRODUCTIONS.PROD\_GOLD) FROM PRODUCTIONS WHERE PRODUCTIONS.CSTL\_NUM = 2),

(SELECT SUM(PRODUCTIONS.PROD\_FOOD) FROM PRODUCTIONS WHERE PRODUCTIONS.CSTL\_NUM = 2),

2

);

INSERT INTO COUNTRY VALUES(3, "Sunspear", 3, 3,

(SELECT SUM(PRODUCTIONS.PROD\_GOLD) FROM PRODUCTIONS WHERE PRODUCTIONS.CSTL\_NUM = 3),

(SELECT SUM(PRODUCTIONS.PROD\_FOOD) FROM PRODUCTIONS WHERE PRODUCTIONS.CSTL\_NUM = 3),

3

);

INSERT INTO COUNTRY VALUES(4, "PumpkinPatch", 4, 4,

(SELECT SUM(PRODUCTIONS.PROD\_GOLD) FROM PRODUCTIONS WHERE PRODUCTIONS.CSTL\_NUM = 4),

(SELECT SUM(PRODUCTIONS.PROD\_FOOD) FROM PRODUCTIONS WHERE PRODUCTIONS.CSTL\_NUM = 4),

4

);

**Trades**

INSERT INTO TRADES VALUES(0, 0, 1, "Gold", 100, datetime('now'));

INSERT INTO TRADES VALUES(1, 1, 0, "Food", 50, datetime('now'));

INSERT INTO TRADES VALUES(2, 3, 4, "Food", 50, datetime('now'));

INSERT INTO TRADES VALUES(3, 4, 3, "Gold", 100, datetime('now'));

INSERT INTO TRADES VALUES(4, 0, 2, "Food", 100, datetime('now'));

INSERT INTO TRADES VALUES(5, 2, 0, "Gold", 200, datetime('now'));

**Reputation**

INSERT INTO REPUTATION VALUES(0, 0, 1, "FRIEND");

INSERT INTO REPUTATION VALUES(1, 3, 4, "FOE");

INSERT INTO REPUTATION VALUES(2, 0, 2, "FRIEND");

INSERT INTO REPUTATION VALUES(3, 3, 1, "NEUTRAL");

INSERT INTO REPUTATION VALUES(4, 3, 2, "NEUTRAL");

INSERT INTO REPUTATION VALUES(5, 3, 0, "NEUTRAL");