**Exercise 4: Database schema**

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**Schema:**

Notation: primary key, foreign key

* Elector: id, name, sex, birthday, wahlkreis2009, wahlkreis2013, vote2009, vote2013, vote2017
* Vote: id, year, erststimme, zweitstimme, wahlkreis
* Party: id, name, abkuerzung, color
* PartyInElection: party, year, erststimmen, zweitstimmen, wonDistricts, fivePercentTaken
* FederalLand: id, name, residents2009, residents2013
* Wahlkreis: id, name, federalLand
* WahlkreisInElection: wahlkreis, year, residents, winnerParty, winnerCandidate, wahlbeteiligung
* Candidate: id, name, jahrgang
* CandidateInElection: candidate, year, erststimmen, rank, party, wahlkreis, federalland
* RunsForElection: federalLand, party, year

**Normal forms:**

* This schema is in 1NF due to the use of a relational database system.
* It is also in 2NF, because all attributes, which are not in the primary key, depend on the primary key completely.
* The schema fulfills 3NF, because in no attribute, which is not in the primary key, depends on the primary key transitively.

**Create scripts:**

* create table Elector (

id serial primary key,

name varchar(60),

sex char(1) check (sex = ‘m’ or sex = ‘f’),

birthday date not null,

wahlkreis2009 smallint references Wahlkreis(id)),

wahlkreis2013 smallint references Wahlkreis(id)),

vote2009 boolean default false,

vote2013 boolean default false,

vote2017 boolean default false);

* create table Vote (

id serial primary key,

year smallint not null,

erststimme smallint references Candidate(id),

/\* when "erststimme" is invalid, it has the value NULL\*/

zweitstimme smallint references Party(id),

/\* when "zweitstimme" is invalid, it has the value NULL\*/

wahlkreis smallint references Wahlkreis(id));

* create table Party (

id smallint primary key,

name varchar(100) not null,

abkuerzung varchar(30) not null,

color varchar(30));

* create table PartyInElection (

party smallint references Party(id),

year smallint not null,

erststimmen integer,  
 zweitstimmen integer,  
 wonDistricts smallint,  
 fiverPercentTaken boolean,  
 primary key (party, year));

* create table FederalLand (

id smallint primary key,

name varchar(25) not null,

residents2009 integer not null check (residents2009 >= 0),

residents2013 integer not null check (residents2013 >= 0));

* create table Wahlkreis (

id smallint primary key,

name varchar(90) not null,

federalLand smallint references FederalLand(id));

* create table WahlkreisInElection (

wahlkreis smallint references Wahlkreis(id),  
 year smallint not null,  
residents integer not null,  
winnerParty smallint references Party(id),  
winnerCandidate smallint references Candidate(id),

wahlbeteiligung numeric(5, 4),  
primary key (wahlkreis, year));

* create table Candidate (

id integer primary key,

name varchar(80) not null,

jahrgang smallint not null );

* create table CandidateInElection (

candidate integer references Candidate(id),  
 year smallint not null,  
 erststimmen integer,  
 rank smallint,  
 party smallint references Party(id),  
 wahlkreis smallint references Wahlkreis(id),

federalland smallint references Federalland(id),  
 primary key (candidate, year) );

* create table RunsForElection (

federalLand smallint references FederalLand(id),

party smallint references Party(id),

year smallint not null,

primary key (federalLand, party, year) );