Examples of DBs & when to use

8/29

1. Define a structure
   - name (string)
   - student_number (int)
   - class (int)
   - major (string)

2. Construct data
   - a program for writing

3. Manipulate data
   - changing class of "smith"] update
   - give all "~~classes~~ courses" that smith completed] query

How do I get to the design?

- requirements gathering
- conceptual design (ER model)
- logical design (maintainable by ~~RDMS~~ DBMS)

STUDENT

Name	Student_number	Class	Major
Smith	17	1	CS
Brown	8	2	CS

GRADE_REPORT

Student_number	Section_identifier	Grade
17	112	B
17	119	C
8	85	A
8	92	A
8	102	B
8	135	A

COURSE

Course_name	Course_number	Credit_hours	Department
Intro to Computer Science	CS1310	4	CS
Data Structures	CS3320	4	CS
Discrete Mathematics	MATH2410	3	MATH
Database	CS3380	3	CS

SECTION

Section_identifier	Course_number	Semester	Year	Instructor
85	MATH2410	Fall	07	King
92	CS1310	Fall	07	Anderson
102	CS3320	Spring	08	Knuth
112	MATH2410	Fall	08	Chang
119	CS1310	Fall	08	Anderson
135	CS3380	Fall	08	Stone

Advantage of DB

1. controlling redundancy
   a. remove duplicate effort
   b. wasted storage space
   c. data inconsistency
      ↖ fixed w/ data normalization

* Note: denormalization: not normalized data sometimes used to speed up performance

2. efficient queries
   - efficent for disk acces
   - special techniques
   - indexes (trees or hashing d.s.)
   - query opt
     - $A = \{(a,1), (c,3), (b,2)\}$
     - $B = \{\overbrace{(1,\alpha), (1,\beta), (1,\ldots)}^{1}, \overbrace{(2,\alpha), (2,\beta), \ldots}^{2}, \overbrace{(3,\ldots), \ldots}^{3}, \overbrace{(10,\ldots), \ldots}^{10\ldots}, (100,\ldots)\}$