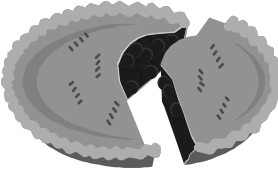


### Object Concepts

- Encapsulation
- Inheritance
- Polymorphism




PIE

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### Encapsulation

- Packaging
  - Data and operations together
- User data types
- Implementation hiding
  - Abstract data types (ADT's)

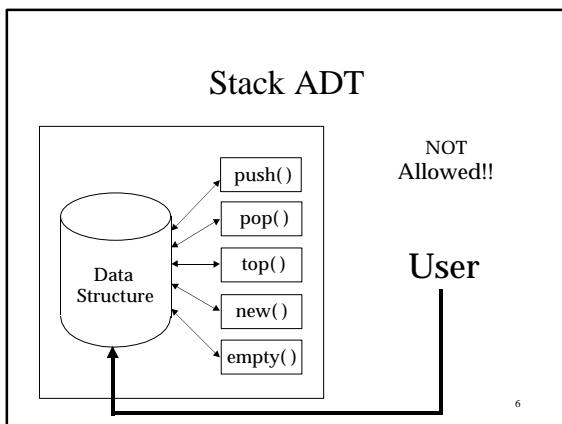
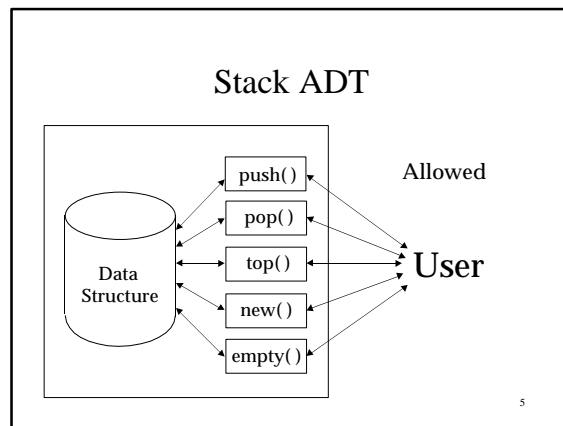


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### Data Encapsulation

- Also called:
  - Data Abstraction
  - Abstract Data Types (ADT's)
- C++ implements data abstraction via “classes”

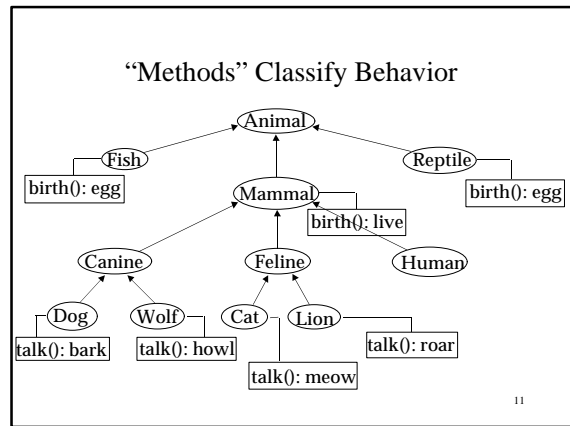
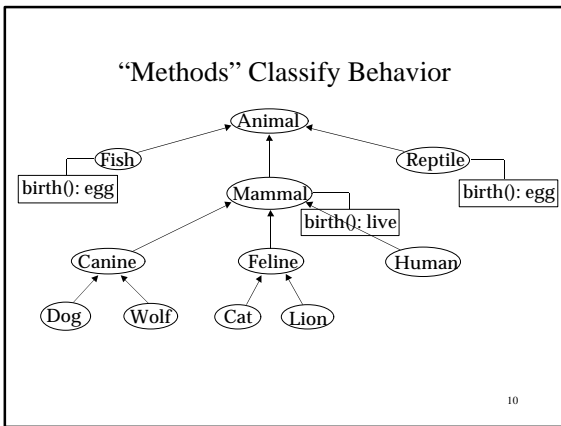
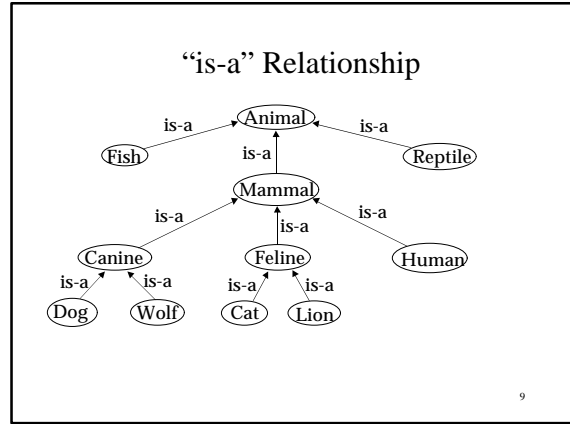
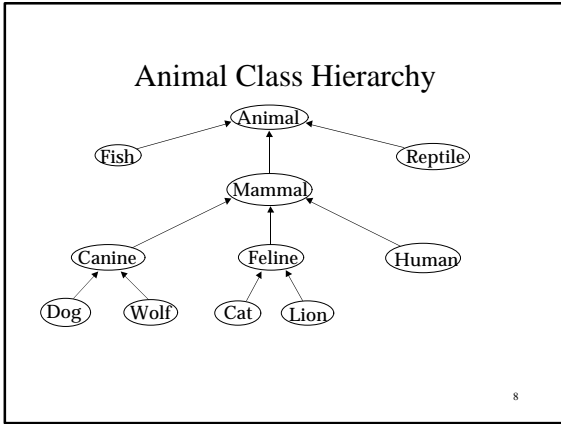
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### Inheritance

- “Is a” relationship
  - Strain gauge is a sensor
    - Shares common sensor qualities
- Specialization
  - Strain gauge is more than a sensor
    - E.g., measures a specific variable

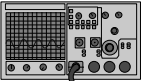
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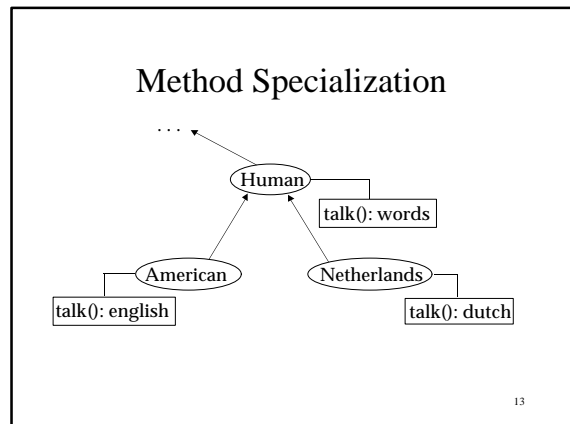
### Polymorphism

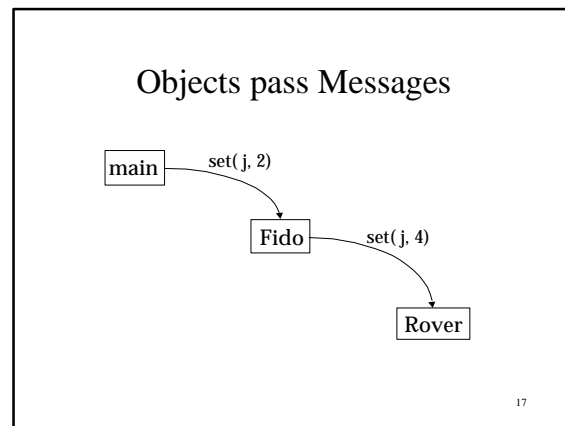
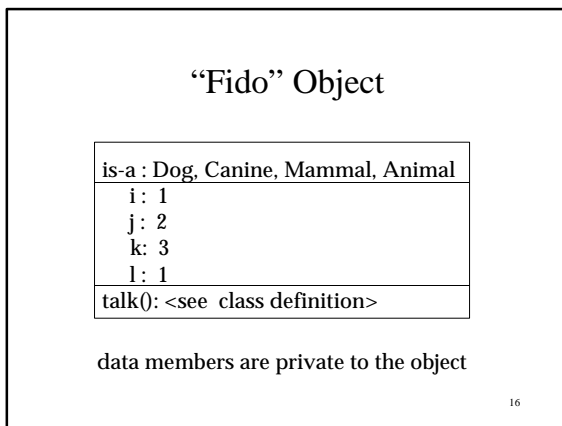
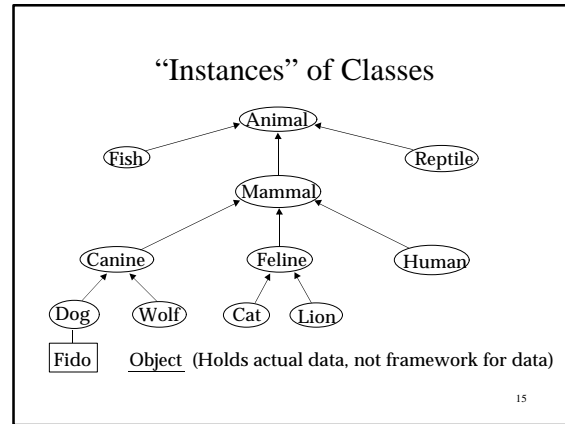
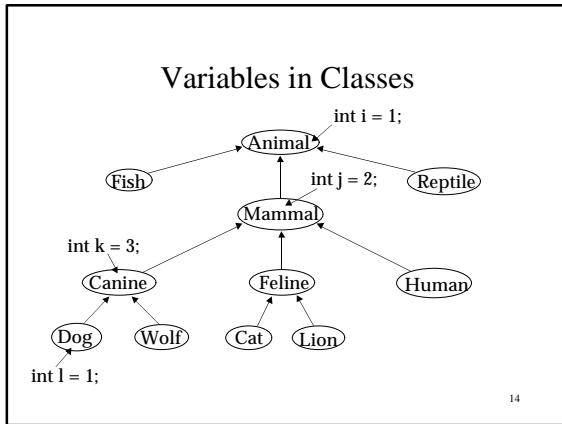
“Multiple forms”

- Derived “is a” base type
  - Implements common behavior, but ...
- Implemented differently
  - E.g., sensor calibration sequence
- “Variant over specialization”



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- ### OO Terminology
- Instances ≡ Objects
  - Classes ≡ Data Types (w/Inheritance)
  - Instance vars ≡ Private vars (in obj.)
  - Methods ≡ Functions (form interface)
  - Messages ≡ Function calls (invoke methods)
- 18

- ### OO Terminology
- Instances ≡ Objects
  - Classes ≡ class (ADT)
  - Instance vars ≡ data members
  - Methods ≡ Member Functions
  - Messages ≡ Member Function calls
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